Open Letter To The Astronomical Community

Having worked at many astronomical observatories around the world, I have a very good overview of astronomy. I have also had the privilege of working in the solar industry and I was the manager of the largest utility solar photovoltaic power system in the USA that was launched by President Barack Obama. Witnessing the incompetence that was in the utility solar industry and is still present within the industry led me to the belief that the astronomy community must turn its views toward the environment that we are living in. We live in truly unbelievable times. Autism is an epidemic in most western countries, western governments are nothing more than corrupt corporations, and corporations are routinely suppressing information regarding the toxicity of many common household items. The result is that many people are unnecessarily suffering from easily preventable developmental problems, sickness and cancer.

Much of this illness stems from incorrect human environmental conditions and is easily preventable by simply moving the human into the correct environmental conditions. Astronomers must return to studying environmental radiation for associations to human problems and incorrect environmental conditions. The future of the next generation relies on astronomers obtaining a full understanding of the rapidly changing human environmental conditions and the halting of biologically toxic corporate government policies. The overloading of the electromagnetic environment is one of these disastrous policies that must stop.

Dark Energy is poorly understood and it is clear that we are currently moving into exploring the complete electromagnetic spectrum that also includes the study of atmospheric pressure waves, atmospheric voltage effects on the cellular system, and the biological effects of the various forms of atmospheric radiation transmission. Light and the human is poorly understood by the astronomical profession, with many astronomers not understanding which light bulbs they should have in their own homes and offices! It is embarrassing that astronomers do not understand the many forms of artificial lighting that they are exposed to every day and how it affects them. It is a sad state of affairs that I do not know of any astronomer that fully understands the energy in their own daily environment. Until this changes, Dark Energy will always be a mystery to the astronomical community.

We see a continuation of astronomical incompetence in their own facilities. Promoted to the public as the latest generation facility, the 1.4 billion dollar Thirty Meter Telescope project is a continuation of environmental human biological problems that I observed on the summit of Mauna Kea, Hawaii, USA. I worked on Mauna Kea for over five years and saw my health severely degrade during that time. The two long term summit workers that I knew well died of disease conditions, another worker went on to commit suicide, and others were argumentative. Astronomers know the site is biologically toxic to their workers health, but do not inform the new hires of it, other than they may get altitude sickness and direct them to use the company supplied drugs to offset that sickness. They know that workers are inappropriately acclimatizing on a daily basis, which further aggravates the altitude sickness symptoms. The insatiable quest for knowledge is far greater than the quest for worker health and safety. If a company is advising workers to take drugs to perform their job, they probably should not be working there. Mauna Kea is a known biologically hostile work environment and one can only wonder why the astronomy community is investing 1.4 billion dollars to build the world's largest telescope there.

Steven Magee – Chartered Electrical Engineer, The Institution of Engineering and Technology (IET)
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Social Media


“Professional surfer and former Kauai mayoral candidate Dustin Barca was among those arrested Thursday while conducting peaceful demonstrations at the summit of Mauna Kea...But activists have been outspoken in their opposition to the project, including actor Jason Momoa, who took to Instagram to ask other Hawaii-based celebrities--including Dwayne "The Rock" Johnson and Kelly Slater--to join protesters atop Mauna Kea.“ [http://www.hawaiinewsnow.com/story/28730585/local-celebrities-take-part-in-mauna-kea-protests](http://www.hawaiinewsnow.com/story/28730585/local-celebrities-take-part-in-mauna-kea-protests)

Facebook

- Environmental Radiation LLC: [https://www.facebook.com/EnvironmentEMR/](https://www.facebook.com/EnvironmentEMR/)
- Protect Mauna Kea: [https://www.facebook.com/protectmaunakea/](https://www.facebook.com/protectmaunakea/)
- We Are Mauna Kea: [https://www.facebook.com/groups/393211327547061/](https://www.facebook.com/groups/393211327547061/)

Twitter

- Bruno Mars: [https://twitter.com/BrunoMars](https://twitter.com/BrunoMars)
- Dustin Barca: [https://twitter.com/barca4mayor](https://twitter.com/barca4mayor)
- Dwayne "The Rock" Johnson: [https://twitter.com/TheRock](https://twitter.com/TheRock)
- Ian Somerhalder: [https://twitter.com/iansomerhalder](https://twitter.com/iansomerhalder)
- Jason Momoa: [https://twitter.com/PrideofGypsies](https://twitter.com/PrideofGypsies)
- Jill Wagner: [https://twitter.com/JillWagner](https://twitter.com/JillWagner)
- Kelly Slater: [https://twitter.com/kellyslater](https://twitter.com/kellyslater)
- Nicole Scherzinger: [https://twitter.com/NicoleScherzy](https://twitter.com/NicoleScherzy)
- Protect Mauna Kea: [https://twitter.com/ProtectMaunaKea](https://twitter.com/ProtectMaunaKea)
- Environmental Radiation LLC: [https://twitter.com/EnvironmentEMR](https://twitter.com/EnvironmentEMR)
- TMTshutdown: [https://twitter.com/TMTshutdown](https://twitter.com/TMTshutdown)
- We Are Mauna Kea: [https://twitter.com/WeAreMaunaKea](https://twitter.com/WeAreMaunaKea)
- Zoe Isabella Kravitz: [https://twitter.com/ZoeKravitz](https://twitter.com/ZoeKravitz)

Instagram

- Dustin Barca: [https://www.instagram.com/barcalive/](https://www.instagram.com/barcalive/)
- Dwayne "The Rock" Johnson: [https://www.instagram.com/dwaynejohnson/](https://www.instagram.com/dwaynejohnson/)
- Environmental Radiation LLC: [https://www.instagram.com/environmental_radiation_llc/](https://www.instagram.com/environmental_radiation_llc/)
- Ian Somerhalder: [https://www.instagram.com/iansomerhalder/](https://www.instagram.com/iansomerhalder/)
- Jason Momoa: [https://www.instagram.com/prideofgypsies](https://www.instagram.com/prideofgypsies)
- Jill Wagner: [https://www.instagram.com/jillwagner/](https://www.instagram.com/jillwagner/)
- Kelly Slater: [https://www.instagram.com/kellyslater](https://www.instagram.com/kellyslater)
Environmental Radiation LLC - https://www.environmentalradiation.com

- Leonardo DiCaprio: https://www.instagram.com/leonardodicaprio/
- Nicole Scherzinger: https://www.instagram.com/nicolescherzy/
- #protectmaunakea: https://www.instagram.com/explore/tags/protectmaunakea/
- #wearemaunakea: https://www.instagram.com/explore/tags/wearemaunakea/
- Zoe Isabella Kravitz: https://www.instagram.com/zoeisabellakravitz/

Websites
- “Jack Johnson (musician)” https://jackjohnsonmusic.com/

Petitions
- “The Immediate Halt to the Construction of the TMT telescope on Mauna Kea”
- “Over 245,000 people are opposed to the construction of the TMT telescope on Mauna Kea in 2019.” Steven Magee CEng MIET
- “Foes of the Thirty Meter Telescope on Monday delivered to Gov. David Ige a petition with more than 53,000 signatures opposed to the $1.4 billion project on Mauna Kea.”
- “Stop TMT Construction and Arrests of Mauna Kea Protectors”

Hashtags
- #protectmaunakea
- #TMTshutdown
- #KuKiaiMauna (Ku Kia’i Mauna means “the guardians of the mountain” in Hawaiian.)
- #AlohaAinaPatriots (Aloha ‘Āina means "love of the land" in Hawaiian.)
- #WeAreMaunaKea

#WeAreMaunaKea Posters
- “Abnormal Air” http://www.environmentalradiation.com/AbnormalAir.jpg
- “Acclimatization” https://www.environmentalradiation.com/Acclimatization.jpg
- “Biological Science” http://www.environmentalradiation.com/BiologicalScience.jpg
- “Cardiovascular System” http://www.environmentalradiation.com/CardiovascularSystem.jpg
- “Drugs” http://www.environmentalradiation.com/Drugs.jpg
- “Faraday Cages & Interference Radiation”
  http://www.environmentalradiation.com/FaradayCageInterferenceRadiation.jpg
- “Magee’s Disease” http://www.environmentalradiation.com/MageesDisease.jpg
- “Mauna Kea Sickness” http://www.environmentalradiation.com/MaunaKeaSickness.jpg
Environmental Radiation LLC - https://www.environmentalradiation.com

- “Mercury Poisoning” http://www.environmentalradiation.com/MercuryPoisoning.jpg
- “Mountain Madness” http://www.environmentalradiation.com/Mountain%20Madness.jpg
- “Observatory Workers Killed”
  http://www.environmentalradiation.com/ObservatoryWorkersKilled.jpg
- “Radiation Sickness” http://www.environmentalradiation.com/RadiationSickness.jpg
- “Retinal Hemorrhages” http://www.environmentalradiation.com/Retinal%20Hemorrhages.jpg
- “Sleep Apnea” http://www.environmentalradiation.com/sleep%20apnea.jpg
- “Summit Brain” http://www.environmentalradiation.com/SummitBrain.jpg
- “Very High Altitude Hazards” http://www.environmentalradiation.com/Very%20High%20Altitude%20Hazards.JPG
- "Very High Altitude Worker Hazards"
  http://www.environmentalradiation.com/VeryHighAltitudeWorkerHazards.jpg
Latest News

- “TMT backers to seek permit for alternative site in Canary Islands...Canary Islands Astrophysics Institute Director Rafael Rebolo told The Associated Press on Monday that he received a letter from the head of the Thirty Meter Telescope project saying its board recently decided “to proceed with the request to seek a building permit” for the island of La Palma...“Our mountains are not sacred,” he said.”
  https://www.hawaiinewsnow.com/2019/08/05/tmt-backers-seek-permit-alternative-site-canary-islands/

- “WATCH: Conflict on Mauna Kea ‘Where it Stands’ mini-documentary”

- “Actor Jason Momoa rallies TMT protesters at Mauna Kea: ‘Telescope’s not being built here’..TMT opponents got support from Hawaii’s Bruno Mars. He posted a photo on Instagram of the kupuna, or Native Hawaiian elders, who have been at the base of Mauna Kea for the past several weeks. The caption reads, “I love you Hawaii, and I’m with you.”... Dwayne “The Rock” Johnson made a surprise visit to the camp, meeting with kupuna and calling for “leadership with empathy” to find a peaceful resolution to the conflict...The truth is the mountain is their church. It would be like building on their church...Hollywood A-lister Leonardo DiCaprio also posted his support for protesters in an Instagram post on Tuesday.”

- “Thirty Meter Telescope protesters train for confrontation; Sen. Bernie Sanders tweets support”

- “Hundreds of Astronomers Denounce Arrest of Native Hawaiians Protesting Thirty Meter Telescope”

- “Past Hydraulic Spill On Mauna Kea Complicates CSO Decommission Planning”

- “Decision on future of Thirty Meter Telescope in Hawaii delayed”

- "When asked about references Nees cited in his written, direct testimony, he said they were incorrect. Flores also asked Nees about the exhibits that were associated with his testimony. Nees stated that he did not read nor was he familiar with the majority of the exhibits."
  http://bigislandnow.com/2016/12/06/tmt-hearing-uh-calls-archeologist-to-the-stand/

- "Mental exam ordered for alleged telescope attacker"

- "40% less oxygen and high radiation levels can do strange things to sea level adapted humans."
  Steven Magee CEng MIET - Q

- “We think of hypoxemia as something that happens all at once leading to unconsciousness, but
it’s often not like that. The victim can be mildly to severely confused and even combative for a period of time.” [https://www.planeandpilotmag.com/article/flying-high-unpressurized/#.WEkSC2r_q00](https://www.planeandpilotmag.com/article/flying-high-unpressurized/#.WEkSC2r_q00)

- “Abnormal radiation exposure and oxygen starvation teaches you that reality is just a perception that is derived from your immediate environmental conditions in conjunction with your prior environmental exposures, your health problems, your age, and the area that you grew up in and adapted to.” Steven Magee CEng MIET - Q

- "The Hawaii state Supreme Court today invalidated the permit allowing construction of the Thirty Meter Telescope atop Mauna Kea...Today’s order could set back the project months to years while it goes through permitting again." [https://www.staradvertiser.com/breaking-news/state-supreme-court-vacates-permit-for-thirty-meter-telescope/](https://www.staradvertiser.com/breaking-news/state-supreme-court-vacates-permit-for-thirty-meter-telescope/)

- "The scandal with the Thirty Meter Telescope (TMT) atop Mauna Kea is how it managed to obtain a construction permit to build a manned telescope in a known biologically toxic environment to workers. How many more people need to die, get injured or develop long term very high altitude sickness that will last a lifetime?” Steven Magee CEng MIET - Q


- “The wrap around effect of the wind could be very severe at times,” Arimoto added, “which can swing the heavy metal door to create this kind of dent on it. The director reminded staff to be extra careful about this kind of wind effect when working outside of the enclosure.” [http://www.bigislandvideonews.com/2015/06/08/subaru-damage-not-from-bullet-observatory-confirms/](http://www.bigislandvideonews.com/2015/06/08/subaru-damage-not-from-bullet-observatory-confirms/)

Hawaiian Mauna Kea Beliefs

- “The Heart of the Hawaiian Peoples’ Arguments Against the Telescope on Mauna Kea. Native Hawaiians are not protesting science, but instead are seeking respect for sacred places, and our planet” [https://www.smithsonianmag.com/smithsonian-institution/heart-hawaiian-people-arguments-arguments-against-telescope-mauna-kea-180955057/]
- “Welcome to “Sacred Mauna Kea-He Makahiapo Kapu Na Wakea” (the sacred Firstborn child of Wakea, the Hawaiian God, of the Sky). Mauna Kea is the piko, umbilical cord, or center, of existence for Hawaiians. This page is meant to examine this custom and how this is so through history and present, oral, written, spiritual traditions and practices.” [https://sacredmaunakea.wordpress.com/about/]
- “Indigenous Religious Traditions. Mauna Kea...Mauna Kea is sacred to the Native Hawaiians and is the zenith of their ancestral ties to creation. The upper regions, Wao Akua, are the realms of the Akua (creator) and the summit is a temple of the Supreme Being in not only Hawaiian culture but also in many histories throughout Polynesia. It is the home of Na Akua (divine deities) and Na’Aumakua (divine ancestors) as well as the meeting place of Papa (Earth Mother) and Wakea (Sky Father) who are progenitors of the Hawaiian people. It is also both a burial ground and the embodiment of ancestors that include Na Alii and Kahuna (high ranking chiefs and priests.” [http://sites.coloradocollege.edu/indigenoustraditions/sacred-lands/sacred-lands-mauna-kea/]
- “This sacred mountain is the focal point of a fight over a giant telescope. Finally tonight, a most unusual battle between scientists and native Hawaiians over the construction of a massive observatory. And it is all about a plan to build the largest telescope on Earth on a shield volcano. Astronomers say it can offer unique sights to view the cosmos, but it would be created on what is also considered sacred ground.” [https://www.pbs.org/newshour/show/sacred-mountain-focal-point-fight-giant-telescope]
- “The sacred and the scientific clash on Hawaii’s Mauna Kea. Over a thousand years ago, Polynesians followed the stars in the Mauna Kea sky on their path to Hawaii. Those stars are now of interest to astronomers, who believe the mountain's summit is the perfect spot to build a giant, cutting-edge telescope. But native Hawaiians view that peak as a sacred space.” [https://www.pbs.org/newshour/show/sacred-scientific-clash-hawaiis-mauna-kea]
- “What we need to learn about Mauna Kea is not only the top of the mountain, because Mauna Kea is inclusive of all, down to the base. I think what Mauna Kea has given us is the many different levels of life. —Pualani Kanahele, Kumu Hula (hula master)” [http://www.mauna-a-wakea.info/maunakea/index.html]
- “Currently there are 13 telescopes atop Mauna Kea but many Hawaiians are angry about the push to add more telescopes to the mountain, insisting enough is enough. A resurgence of Hawaiian culture and language has led to the reclamation of sacred sites, including Mauna Kea, as areas of high cultural significance. Hawaiians wanting to preserve their cultural heritage are now clashing with proponents of the TMT. In recent months, protesters have blocked access to the mountain, halting development of the telescope.” [http://theconversation.com/mauna-a-wakea-hawaiis-sacred-mountain-and-the-contentious-thirty-meter-telescope-46069]
- “The summits of the five volcanoes of Hawaii are revered as sacred mountains; and Mauna
Kea's summit, the highest, is the most sacred. For this reason, a kapu (ancient Hawaiian law) restricted visitor rights to high-ranking aliʻi. Hawaiians associated elements of their natural environment with particular deities. In Hawaiian mythology, the summit of Mauna Kea was seen as the "region of the gods", a place where benevolent spirits reside. Poliʻahu, deity of snow, also resides there. In Hawaiian, Mauna Kea is a shortened form of Mauna a Wakea which denotes the mountain's connection to the sky father Wakea; however, the English translation of Mauna Kea is "white mountain" in reference to its seasonally snow-capped summit.

“
The culture of the Native Hawaiians is about 1500 years old and has its origins in the Polynesians who voyaged to and settled Hawaii. These Native Hawaiians developed culinary, artistic, and religious culture and practices.”

“

“I have great respect for Hawaiians and their unique culture.”

“The unique Hawaiian culture needs to be preserved and protected.”

“I came to the belief that Mauna Kea was indeed sacred because all the visions that I had on the mountain were of Hawaiians.”

“Over time, wonder replaced fear of the Hawaiian visions.”

“I feel very honored that the Hawaiian spirits chose to contact me.”

“The native Hawaiians are a great nation of people and as the years have passed my respect for them has grown. During the same time I have lost respect for what I now know to be the biologically toxic field of high altitude astronomy.”

“I was driving down alone from the summit of Mauna Kea to Hale Pohaku. Out of the dark appeared a beautiful Hawaiian princess on a horse in the middle of the road. I hit the brakes hard as I thought I was going to hit her. We spent some time looking at each other and I was wondering why she was there. I looked away, looked back and she was gone. Many years later I discovered that her name was Poli‘ahu, the snow goddess of Mauna Kea, and I now understand why she contacted me.”

“Poliʻahu. In Hawaiian mythology, Poliʻahu (Cloaked bosom or temple bosom) is one of the four goddesses of snow, all enemies of Pele. She was thought to reside on Mauna Kea, which if measured from the seafloor is the world's tallest mountain.”

“The native Hawaiians are a great nation of people and as the years have passed my respect for them has grown. During the same time I have lost respect for what I now know to be the biologically toxic field of high altitude astronomy.”

“When I was hired from Europe to work atop Mauna Kea, I had no idea how sacred the mountain was to the Hawaiians. Today, I am ashamed that I worked at the Mauna Kea Observatories (MKO).”

“There is a social responsibility for professionals to not take jobs on projects that have disrespected the indigenous population and their beliefs.”

“Exploring the timeline leading up to the ‘Conflict on Mauna Kea’”
Altitude Diseases: Altitude Damage

- “Altitude Diseases...Altitude diseases occur because of a lack of oxygen at high altitudes. Symptoms include headache, tiredness, nausea or loss of appetite, irritability, and in more serious cases, shortness of breath, confusion, and even coma. Doctors diagnose altitude diseases primarily based on the symptoms. Treatment may include rest, descending to a lower altitude, and sometimes drugs, extra oxygen, or both. People may prevent these disorders by ascending slowly and sometimes by taking drugs. As altitude increases, the atmospheric pressure decreases, thinning the air so that less oxygen is available. For example, compared with the air at sea level, the air at 19,000 feet (5,800 meters) contains only half the amount of oxygen. In Denver, which is located about 5,300 feet (1,615 meters) above sea level, the air contains 20% less oxygen. Most people can ascend to 5,000 to 6,500 feet (1,500 to 2,000 meters) in one day without problems, but about 20% of people who ascend to 8,000 feet (2,500 meters) and 40% who ascend to 10,000 feet (3,000 meters) develop some form of altitude disease. The rate of ascent, highest altitude reached, and sleeping altitude all influence the likelihood of developing the disorder. The organs most commonly affected by altitude diseases are the: Brain (causing acute mountain sickness and rarely high-altitude cerebral edema). Lungs causing high-altitude pulmonary edema)” https://www.merckmanuals.com/home/injuries-and-poisoning/altitude-diseases/altitude-diseases

- “Since the mid-20th century, a number of astronomical observatories have been constructed at very high altitudes, above 4,000–5,000 m (13,000–16,000 ft). The largest and most notable of these is the Mauna Kea Observatory, located near the summit of a 4,205 m (13,796 ft) volcano in Hawaii. The Chacaltaya Astrophysical Observatory in Bolivia, at 5,230 m (17,160 ft), was the world's highest permanent astronomical observatory from the time of its construction during the 1940s until 2009. It has now been surpassed by the new University of Tokyo Atacama Observatory, an optical-infrared telescope on a remote 5,640 m (18,500 ft) mountaintop in the Atacama Desert of Chile.” https://en.wikipedia.org/wiki/Observatory#Highest_astronomical_observatories

- “Since the mid-20th century, an increasing number of high altitude observatory sites have been developed at locations around the world, including numerous sites in Arizona, Hawaii, Chile, and the Canary Islands. The initial wave of high-altitude sites were mostly in the 2,000–2,500 m (6,600–8,200 ft) range, but astronomers soon sought even higher sites above 3,000 m (9,800 ft). Among the largest, best developed, and most renowned of these high altitude sites is the Mauna Kea Observatory located near the summit of a 4,205 m (13,796 ft) volcano in Hawaii, which has grown to include over a dozen major telescopes during the four decades since it was founded. In the first decade of the 21st century, there has been a new wave of observatory construction at very high altitudes above 4,500 m (14,800 ft), with such observatories constructed in India, Mexico, and most notably the Atacama Desert in northern Chile, now the site of several of the world's highest observatories. The scientific benefits of these sites outweigh the numerous logistical and physiological challenges which must be overcome during the construction and operation of observatories in remote mountain locations, even in desert, polar, and tropical island sites which magnify the challenges but confer additional observational advantages.” https://en.wikipedia.org/wiki/List_of_highest_astronomical_observatories

- “Altitude sickness is a great danger for high-altitude mountaineering (above 4000 or 5000 m), a moderate danger for mountain sports (such as skiing at 3000–4000 m, notably in Colorado), and
a moderate danger when flying in to a high-altitude city around 3500 m, notably Tibet (Lhasa), Peru (Cusco, especially for the Inca Trail), and Bolivia (La Paz). For moderate altitudes (such as 3500 m), the main solution is to acclimatize for a night or two at a lower altitude (near 2500 m) and take it easy for the first few days, rather than flying in and immediately going skiing or hiking. Acetazolamide (ACZ) is the most commonly used drug for prevention, and is particularly useful for flying into a high-altitude city. For higher altitudes much more care, preparation, and gradual ascent is necessary, and potent treatments are available. Particularly dangerous are tall, easy mountains, notably Kilimanjaro (5895 m) and Aconcagua (6961 m), where it's easy to get dangerously high quickly. Acclimation requires time, and rushing causes altitude sickness.”

“Into thin air: Medical problems at new heights...Although a low oxygen level is the most obvious and important cause of altitude sickness, several factors actually combine to trigger problems: Oxygen. Oxygen levels are highest at sea level, but they fall steadily at increasing altitudes. Most men won't notice any effect until about 5,000 feet; even at one mile above sea level, breathing is comfortable at rest but becomes labored with exertion. And the higher you go, the harder your lungs have to work to take in the oxygen you need. Barometric pressure. When the forecaster predicts low pressure at home, you expect dull, heavy air. But at heights, cool temperatures mean that your body will have to divert some of its oxygen simply to keep you warm. On average, ambient temperature falls about 4˚F for each 1,000 feet of elevation. Ultraviolet (UV) radiation. Thin air lets in more UV radiation, resulting in a higher risk of snow blindness and sunburn. Dehydration. Mountain air is dry, and breathing is fast at heights. The result: Lots of fluid is lost from the lungs.”

“Altitude sickness...Very high altitude. At very high altitude, 3,500 to 5,500 metres (11,500 to 18,000 ft), maximum SaO2 falls below 90% as the arterial PO2 falls below 60mmHg. Extreme hypoxemia may occur during exercise, during sleep, and in the presence of high altitude pulmonary edema or other acute lung conditions. Severe altitude illness occurs most commonly in this range.”

"After a decade of working in high altitude astronomy the medical profession discovered that I had high cholesterol, a hole in my heart, heart arrhythmia's, erratic low blood oxygen levels, small airways disease of the lungs, asthma, allergies, and various brain issues including amnesia, absence seizures and sleep disorders. High cholesterol, sleep disorders, heart, lung and brain problems appear to be long term known adverse health aspects of high altitude work and unnatural electromagnetic radiation exposures." Steven Magee CEng MIET - Q

"someone who races up to an elevation of 15,000 feet will be worse for the wear"

"A slow ascent with ample time for acclimatization do not safeguard against illness"
"experienced and professional climbers tend to show higher levels of chronic damage, suggesting that high altitude's effects may be cumulative and lasting."  
http://healthyliving.azcentral.com/high-altitude-effects-mountain-climbers-4931.html

"Three attributes of a good mountaineer are high pain threshold, bad memory, and ... I forget the third. — Joke in a mountaineering Internet chat room"
http://www.scientificamerican.com/article/brain-cells-into-thin-air/

“At the age of 45, most days in Tucson were spent feeling like I was on the summit of Mauna Kea, as I was exhibiting debilitating health symptoms that corresponded to what I saw at very high altitude. I was later to find that I had erratic low blood oxygen levels after almost a decade of high altitude work.” Steven Magee CEng MIET - Q


“Does high altitude affect You more...I've live'd in the mile high city surroundings for two years now, and it seems that every time I go away, I feel better. Not completely, but somewhat. Is it stress or is it altitude, how to tell???? I was away for 3 weeks at sea level, and only once or twice did I get mild seizures. Come back home, and here they are, with my face drooping again, and headaches starting again. ..I live at high elevation and I notice a great reduction in pain when I go to the coast.” https://www.dailystrength.org/group/fibromyalgia/discussion/does-high-altitude-affect-you-more

“Astronomers rarely visit the summit of Mauna Kea. They sit in near sea level offices and obtain their astronomical data remotely using very high altitude workers on the summit of the mountain to control the telescope and computers.” Steven Magee CEng MIET - Q

“It was clear to me that upper management and astronomers were adverse to going to very high altitude observatories.” Steven Magee CEng MIET - Q

“The longer I worked in high altitude astronomy, the sicker I became.” Steven Magee CEng MIET - Q

“I regard putting a sea level adapted human into a car and driving them to the very high altitude summit of Mauna Kea on a daily basis to be a form of workplace abuse.” Steven Magee CEng MIET - Q

“Preexisting Medical Conditions at Altitude...High Blood Pressure (HBP)...Heart Disease (Coronary Artery Disease)...Arrhythmias...Congenital Heart Problems...Heart Failure...Pulmonary Hypertension...Asthma...COPD/Emphysema...Cystic Fibrosis...Migraine...Stroke/TIA...Brain Tumors...Seizures...High Altitude Resident Mothers...Low Altitude Resident Mothers Visiting High Altitude...Recommendations for pregnant tourists visiting high altitude...Pregnancy and Travel to Altitude FAQ...ANEMIA...BLOOD CLOTTING DISORDERS...CARBON MONOXIDE...CAROTID SURGERY...DELAYED WOUND HEALING...Diabetes Mellitus...EYE PROBLEMS...IMMUNOSUPPRESSION...Obesity...SICKLE CELL DISEASE...SLEEP DISTURBANCES” http://www.altitudemedicine.org/altitude-and-pre-existing-conditions/

“Decompression sickness (DCS; also known as divers' disease, the bends or caisson disease) describes a condition arising from dissolved gases coming out of solution into bubbles inside
the body on depressurisation. DCS most commonly refers to problems arising from underwater diving decompression (i.e., during ascent), but may be experienced in other depressurisation events such as emerging from a caisson, flying in an unpressurised aircraft at altitude, and extravehicular activity from spacecraft. DCS and arterial gas embolism are collectively referred to as decompression illness...Signs and symptoms. While bubbles can form anywhere in the body, DCS is most frequently observed in the shoulders, elbows, knees, and ankles. Joint pain ("the bends") accounts for about 60% to 70% of all altitude DCS cases, with the shoulder being the most common site. Neurological symptoms are present in 10% to 15% of DCS cases with headache and visual disturbances being the most common symptom. Skin manifestations are present in about 10% to 15% of cases. Pulmonary DCS ("the chokes") is very rare in divers and has been observed much less frequently in aviators since the introduction of oxygen pre-breathing protocols.”

- “Need for cabin pressurization. Pressurization becomes increasingly necessary at altitudes above 10,000 feet (3,000 m) above sea level to protect crew and passengers from the risk of a number of physiological problems caused by the low outside air pressure above that altitude. For private aircraft operating in the US, crew members are required to use oxygen masks if the cabin altitude stays above 12,500ft for more than 30 minutes, or if the cabin altitude reaches 14,000ft at any time. At altitudes above 15,000ft, passengers are required to be provided oxygen masks as well. On commercial aircraft, the cabin altitude must be maintained at 8,000ft or less. Pressurization of the cargo hold is also required to prevent damage to pressure-sensitive goods that might leak, expand, burst or be crushed on re-pressurization.”

- “Empty plastic water bottles near seal level would become pressurized by the time we reached the very high altitude summit of Mauna Kea and empty plastic water bottles at the summit would become crushed by the time we were near sea level.”

- “Bags of chips (crisps) when taken to the very high altitude summit of Mauna Kea would commonly explode.”

- “Wards in the Sky: The RAF's Remarkable Nursing Service...because most people will go up to a certain height and just start feeling really unwell, so they have to come back down to sea level to sort themselves out.”

- “Altitude sickness 'two illnesses' says Edinburgh University study...The condition, triggered by falling oxygen levels, causes mild sickness, headaches and life-threatening problems affecting the heart, lungs and brain...One group experienced disrupted sleep but minimal headache, while another group only reported headaches and little disruption to sleep.”

- “It is well known to altitude researchers that the sea level adapted human should avoid spending time above 4,900 feet and should never venture above 10,000 feet.”

- “Having researched the biological toxicity of high altitudes, I would not take any sea level adapted human above 10,000 feet under any circumstances.”
Altitude Diseases: Mal-Acclimatization

- “Mal-acclimatization occurs when the human has no long term adaptation to any altitude due to frequent changes in altitude over 4,900 feet. Mal-acclimatization may lead to long term sickness, gender issues, genetic changes, disease and premature death in the human.” Steven Magee CEng MIET - Q
- “Mauna Kea summit workers are kept in a state of mal-acclimatization, as they are never fully acclimatized to near sea level or to the very high altitude mountain summit.” Steven Magee CEng MIET - Q
- “The big difference that I see between mountain climbers and observatory workers is that mountain climbers may venture from sea level to very high altitude several times a year, whereas some observatory workers do it approximately two hundred times per year.” Steven Magee CEng MIET - Q
- “High Altitude and Respiratory System...Sudden ascent to high altitude and stay there without adaptation is risky with high susceptibility to high altitude associated illnesses such as Acute Mountain Sickness (AMS), High Altitude Cerebral Edema (HACE) and High Altitude Pulmonary Edema (HAPE). Their frequency increases with increasing altitude. Thus height of stay matters so also rate of ascent, physical conditioning and associated morbidity, besides individual susceptibility. Young, obese and old are vulnerable. There are no specific markers to predict susceptibility but those with poor hypoxic ventilatory response(HVR) are at greater risk.” http://www.apiindia.org/pdf/medicine_update_2017/mu_056.pdf
- “If you are planning to visit the summit, we highly recommend that you stop at the Visitor Information Station (VIS) at 9,200 ft to receive a current weather update, safety information, and to adjust to the change in altitude. Mauna kea is one of the only places in the world where you can drive from sea level to 14,000 feet in about 2 hours, so altitude sickness is a high possibility. At 14,000 feet, there is 40% less oxygen than at sea level, so visitors should acclimatize to the altitude before proceeding further up the mountain. Anyone in poor health should consult their physician before planning a visit to Maunakea. We do not recommend anyone who is pregnant to go further than the VIS. People under the age of 13 should not go any further because their bodies are still developing and they are affected more rapidly when going to a high altitude. If you plan to scuba dive, do not plan to go up to the summit within 24 hours after your dive. Furthermore, we do not recommend anyone with a heart or respiratory problem to travel above the VIS.” http://www.ifa.hawaii.edu/info/vis/visiting-mauna-kea/visiting-the-summit.html
- “Mal-Acclimatisation heart damage: Sea level adapted humans ascending rapidly in an unpressurized environment increases the risk of heart attacks.” Steven Magee CEng MIET
- “I suspect that if the long term summit workers of the Mauna Kea Observatories (MKO) were studied, they would find elevated levels of mental and physical illness, gender dysphoria, disease and premature death that comes from keeping them in an abnormal state of mal-acclimatization.” Steven Magee CEng MIET - Q
- “Effect of High-Altitude Exposure in the Elderly...More than 5 million people/year over age 60 visit high altitude, which may exacerbate underlying cardiac or pulmonary disease. We hypothesized that the elderly would exhibit an impaired functional capacity at altitude, with increased myocardial ischemia compared with sea level (SL)....Moderate altitude exposure in the elderly is associated with hypoxemia, sympathetic activation, and pulmonary hypertension...”
resulting in a reduced exercise capacity that is predictable based on exercise performance at SL. Patients with coronary artery disease who are well compensated at SL do well at moderate altitude, although acutely ischemia may be provoked at modestly lower myocardial and systemic work rates. The elderly acclimatize well with normalization of SL performance after 5 days. A prudent policy would be for elderly individuals, particularly those with coronary artery disease, to limit their activity during the first few days at altitude to allow this acclimatization process to occur.” [https://www.ahajournals.org/doi/full/10.1161/01.cir.96.4.1224#d713119e1

- "I would feel lousy at the Roque De Los Muchachos Observatory in La Palma which was at 7,861 feet, and I would have to take company supplied drugs and oxygen to stay at the Mauna Kea Observatories (MKO) in Hawaii at 13,796 feet. In both cases we would rapidly ascend to the summit in two hours or less from near sea level." Steven Magee CEng MIET – Q

- "I developed a panic disorder at the Roque De Los Muchachos Observatory after two years of working there and routinely sleeping atop the high altitude summit." Steven Magee CEng MIET – Q
Altitude Diseases: Oxygen Starvation Hazards

- “When the brain is deprived of oxygen, irreversible damage may be the result, even when the deprivation has been for a short period of time. Oxygen deficiency may also lead to anemia in the organs, which can progress to arrhythmia and heart failure. Hypoxemia occurs when arterial blood is not being oxygenated sufficiently. This is a serious condition and needs to be treated quickly.” [http://www.petmd.com/dog/conditions/cardiovascular/c_multi_hypoxemia](http://www.petmd.com/dog/conditions/cardiovascular/c_multi_hypoxemia)
- “Oxygen Deprivation in Newborn Foals...complications just before, during, or after birth can result in a decreased oxygen supply to the foal’s brain. Various terms such as hypoxic ischemic encephalopathy or neonatal maladjustment syndrome have been used to describe the manifestations of oxygen deprivation. Around the barn, managers refer to these foals as wanderers, sleepers, barkers, or dummy foals.” [https://ker.com/equinews/oxygen-deprivation-in-newborn-foals/](https://ker.com/equinews/oxygen-deprivation-in-newborn-foals/)
- “Low oxygen levels will rob you of your eye sight, short term memory, and your energy. Eventually low oxygen levels will weaken your heart muscle.” [http://heartfailuresolutions.com/34/oxygen/low-oxygen-levels-how-low-is-too-low-and-should-you-worry](http://heartfailuresolutions.com/34/oxygen/low-oxygen-levels-how-low-is-too-low-and-should-you-worry)
- “Every time your oxygen level falls below 92% saturation the cells of your body are oxygen starved! The problem is that if you don’t look for evidence of this vitality draining issue, you will not find it! Low oxygen levels are identified most commonly during a hospitalization for the severe issues that are CAUSED by low oxygen. You have likely been experiencing the effects of periodic low blood oxygen LONG before a health crisis gets your attention.” [http://heartfailuresolutions.com/4782/oxygen/5-facts-to-remember-about-blood-oxygen-saturation-levels](http://heartfailuresolutions.com/4782/oxygen/5-facts-to-remember-about-blood-oxygen-saturation-levels)
- “The body needs enough oxygen to keep the blood adequately saturated, so that cells and tissues get enough oxygen to function properly. Furthermore, cells and tissues can neither "save up" nor "catch up" on oxygen — they need a constant supply. When the oxygen saturation falls below 89 percent, or the arterial oxygen pressure falls below 60 mmHg — whether during rest, activity, sleep or at altitude — then supplemental oxygen is needed.” [https://www.ucsfhealth.org/education/supplemental_oxygen/the_need_for_supplemental_oxygen](https://www.ucsfhealth.org/education/supplemental_oxygen/the_need_for_supplemental_oxygen)
- “Let me explain what does it mean to have an abnormal low level of oxygen in your blood. First of all, anything below 88% oxygen saturation is dangerous and debilitating to your entire body. In a hospital environment, blood oxygen levels below 95% cause a concern, and below 90% require intervention.” [http://www.sleep-apnea-guide.com/low-blood-oxygen-and-sleep-apnea.html](http://www.sleep-apnea-guide.com/low-blood-oxygen-and-sleep-apnea.html)
- "Federal Aviation Regulations Sec. 135.89 — Pilot requirements: Use of oxygen.(a) Unpressurized aircraft. Each pilot of an unpressurized aircraft shall use oxygen continuously when flying—(1) At altitudes above 10,000 feet through 12,000 feet MSL for that part of the flight at those altitudes that is of more than 30 minutes duration; and (2) Above 12,000 feet MSL." [http://www.risingup.com/fars/info/part135-89-FAR.shtml](http://www.risingup.com/fars/info/part135-89-FAR.shtml)
"At altitude above 10,000 ft, a person may fail to adjust to the low level of oxygen"

"14,000 feet. Blood oxygen saturation is down to a dangerous 85%. You will be increasingly
disabled at this altitude. Vision will dim. You will experience serious degradation of judgment,
memory and thought. The impairment of judgment will leave you feeling just fine and confident
in your performance, however. If hypoxia is not recognized and corrected at this stage of
impairment, it is unlikely that it will be recognized. You are in serious danger.”

"Pressurization becomes increasingly necessary at altitudes above 12,500 feet (3,800 m) to
14,000 feet (4,300 m) above sea level to protect crew and passengers from the risk of a number
of physiological problems caused by the low outside air pressure above that altitude”
https://en.wikipedia.org/wiki/Cabin_pressurization

"climbers are advised by medical experts to ascend only 300 meters a day at altitudes over
3,000 meters to give their bodies time to adapt.” https://www.ucalgary.ca/utoday/issue/2016-01-
27/study-looks-effects-oxygen-depletion-high-altitude-workers-chile

“The Neurology of Altitude” https://www.peacehealth.org/sites/default/files/Documents/mcgirr-
neurology-of-altitude.pdf

"Very high altitude astronomy only works by ignoring established biological science" Steven
Magee CEng MIET - Q

"Everyone atop Mauna Kea should have a Pulse Oximeter." Steven Magee CEng MIET – Q
http://amzn.com/B00B8L8ZX6

"Low Brain Oxygen Ups Alzheimer's Risk"
oxygen

"you could suffer brain damage by going from sea level to 14,000 feet in a couple days"
http://climbing.about.com/od/mountainclimbing/a/AltitudeStudy.htm

"I consider myself fortunate that I spent three years working at 7,775 feet before spending five
years working at 13,796 feet on the summit of Mauna Kea. I can only wonder how much more
severe my long term very high altitude sickness could have been without the initial adaptation
to the lower altitude." Steven Magee CEng MIET - Q

"Low oxygen levels affect a number of systems in the body" http://www.copdbfrg.org/?
page_id=984

“When your body doesn't have enough oxygen, you could get hypoxemia or hypoxia. These are
dangerous conditions. Without oxygen, your brain, liver, and other organs can be damaged just
minutes after symptoms start.” http://www.webmd.com/asthma/guide/hypoxia-hypoxemia#1

“The oxygen inside the facility, which began at 20.9%, fell at a steady pace and after 16 months
was down to 14.5%. This is equivalent to the oxygen availability at an elevation of 4,080 meters
(13,400 ft). Since some biospherians were starting to have symptoms like sleep apnea and
fatigue, Walford and the medical team decided to boost oxygen with injections in January and

“More dangerous was the decline in oxygen. That night in 1992, their oxygen levels dipped
temporarily, but overall their oxygen levels declined from 20.9 percent to 14.5 percent. (Any
environment below 19.5 percent oxygen is defined as oxygen-deficient by the Occupational
Safety and Health Administration, or OSHA.) The low oxygen made them lethargic. For months
they couldn’t sleep properly because it gave them sleep apnea.”
• “Research suggests that sea level adapted humans that work at the very high altitude 13,796 feet summit of Mauna Kea may eventually develop sleep apnea and fatigue from the low oxygen environment.” Steven Magee CEng MIET - Q
• “High altitude workers should be screened annually for Sleep Apnea.” Steven Magee CEng MIET - Q
• “Chest pain may occur if the heart is not receiving enough oxygen, which is especially likely if the arteries leading to the heart are narrowed by coronary artery disease...Fatigue, lethargy and irritability are common symptoms, as is impaired judgment. Breathing may be irregular, and abnormal heart rhythms are often present.” [http://www.livestrong.com/article/112789-effects-low-blood-oxygen-levels/](http://www.livestrong.com/article/112789-effects-low-blood-oxygen-levels/)
• “Immediate signs of poor oxygen circulation to the brain may include: Difficulty with complex tasks; Poor short-term memory capacity; Decreased motor control; Cyanosis (bluish tone) of the skin; Increased heart rate; Fainting” [https://www.dementia.org/oxygen-deprivation-dementia](https://www.dementia.org/oxygen-deprivation-dementia)
• "Blood Oxygen From Sea Level to 9,200 feet and Back to Sea Level" Steven Magee CEng MIET [http://www.environmentalradiation.com/Steven_Magee_9200_Feet_SPO2_Pulse.jpg](http://www.environmentalradiation.com/Steven_Magee_9200_Feet_SPO2_Pulse.jpg)
• "excessive or inappropriate supplemental oxygen can be deleterious" [http://www.uptodate.com/contents/oxygen-toxicity](http://www.uptodate.com/contents/oxygen-toxicity)
• “The Science Behind The Super Abilities Of Sherpas...In hospitals, as many as 25 percent of people with hypoxia die, Murray says, and those who survive don't recover their previous quality of life. Treatment has traditionally focused on increasing oxygen levels however possible, but that strategy often doesn't work and may even cause harm.” [https://www.npr.org/sections/goatsandsoda/2017/05/28/530204187/the-science-behind-the-super-abilities-of-sherpas](https://www.npr.org/sections/goatsandsoda/2017/05/28/530204187/the-science-behind-the-super-abilities-of-sherpas)
• "Yup, pretty much how it works" W. M. Keck Observatory [http://xkcd.com/1463/](http://xkcd.com/1463/)
• 'we were briefed on high-altitude hazards, such as dehydration, intense solar radiation and altitude illness, which can lead to life-threatening conditions such as high-altitude pulmonary edema and high-altitude cerebral edema. “There’s 40 percent less oxygen up there than you’re used to,” said Joy Pollard, who works in outreach for the Gemini Observatory. “It’ll feel like you’ve had a cocktail or two … Most people don’t get sick, but almost everyone feels something.”” [http://www.honolulumagazine.com/Honolulu-Magazine/January-2016/Walk-Inside-the-Controversial-Telescopes-Atop-Mauna-Kea-Starting-This-Month/index.php?cparticle=2&siarticle=1#artanc](http://www.honolulumagazine.com/Honolulu-Magazine/January-2016/Walk-Inside-the-Controversial-Telescopes-Atop-Mauna-Kea-Starting-This-Month/index.php?cparticle=2&siarticle=1#artanc)
• “The Mauna Kea observatories and the Imiloa Astronomy Center will hold what is being called the first Kamaaina Observatory Experience tour Saturday, Jan. 16. The tour is a free, monthly community event that welcomes Hawaii residents to the science reserve atop Mauna Kea to see world-class telescopes and learn about the cultural and environmental importance of the mountain. Those interested must be 16 years of age or older and possess a valid Hawaii ID.” [http://khon2.com/2016/01/12/monthly-observatory-tours-on-mauna-kea-begin-this-weekend/](http://khon2.com/2016/01/12/monthly-observatory-tours-on-mauna-kea-begin-this-weekend/)
• “It is totally nuts to take healthy sixteen year old sea level adapted children to the 13,796 feet very high altitude summit of Mauna Kea and put them on “Rx Only” prescription medical oxygen for two hours! I really hope that they acclimatize correctly, that they have pulse
oximeters and doctors prescriptions to ensure that the medical prescription oxygen is administered correctly and legally.” Steven Magee CEng MIET - Q

- “The United Nations Convention on the Rights of the Child defines child as "a human being below the age of 18 years unless under the law applicable to the child, majority is attained earlier". This is ratified by 192 of 194 member countries. In U.S. Immigration Law, a child refers to anyone who is under the age of 21.” https://en.wikipedia.org/wiki/Child

- “I regard taking healthy sea level adapted children to the 13,796 feet very high altitude summit of Mauna Kea as a form of child abuse.” Steven Magee CEng MIET - Q

- “It is the responsibility of parents to ensure that irresponsible scientists do not endanger their children.” Steven Magee CEng MIET - Q

- “I saw a guy faint at the W. M. Keck Observatory, he stepped out from the tour group and said to me "I'm feeling sick" and then his eyes rolled back and his knees gave way! The group caught him on his way to the ground and he got free emergency medical oxygen for half an hour before being evacuated off the summit by his tour group!!! His friends stated that he was considered the healthiest person in the group while he was gasping for breaths of life on the summit of Mauna Kea! Never saw him again.” Steven Magee CEng MIET - Q

- “Low oxygen levels in tumors ‘trigger spread of breast cancer’...Researchers have discovered that low oxygen conditions can trigger the production of proteins that contribute to the spread of breast cancer cells. This is according to a study published in the Proceedings of the National Academy of Sciences. Biologists from Johns Hopkins University found that low oxygen conditions prompted increased production of proteins called RhoA and ROCK1. High levels of these proteins are known to give cancer cells the ability to move and spread, leading to worse outcomes for breast cancer patients.” http://www.health.am/cr/more/tumors-trigger-spread-of-breast-cancer/

- “Oxygen and Cancer. Low Levels Of Oxygen Can Breed Cancer...Increasing Cellular Oxygen Can Kill Cancerous Cells. The link between oxygen and cancer is clear. In fact, an underlying cause of cancer is usually low cellular oxygenation levels. In newly formed cells, low levels of oxygen damage respiration enzymes so that the cells cannot produce energy using oxygen. These cells can then turn cancerous because they don't make enough energy to function normally in the body. In 1931 Dr. Warburg won his first Nobel Prize for proving cancer is caused by a lack of oxygen respiration in cells. He stated in an article titled "The Prime Cause and Prevention of Cancer... the cause of cancer is no longer a mystery, we know it occurs whenever any cell is denied 60% of its oxygen requirements..." http://www.cancerfightingstrategies.com/oxygen-and-cancer.html

- "There was a serious shortage of oxygen administration equipment for treating ‘Summit Brain’ in the workers at the Mauna Kea Observatories (MKO) in Hawaii." Steven Magee CEng MIET - Q
Altitude Diseases: Hypocapnia

- “Hypocapnia or hypocapnea (from the Greek words υπό meaning below normal and καπνός kapnōs meaning smoke), also known as hypocarbia, sometimes incorrectly called acapnia, is a state of reduced carbon dioxide in the blood. Hypocapnia usually results from deep or rapid breathing, known as hyperventilation.” https://en.wikipedia.org/wiki/Hypocapnia
- “Possible Value of Inhalation of Carbon Dioxide in Climbing Great Altitudes...MOUNTAIN sickness is a form of asphyxia due to the diminished partial pressure of oxygen at great altitudes. The functional disturbances in this disorder are, however, not merely anoxial, but are largely the expression of a secondary and almost equally important deficiency of carbon dioxide in the blood and tissues. Deficiency of oxygen induces hyperpnea and acapnia: that is, overbreathing and the resulting deficiency of carbon dioxide. Acapnia in turn induces subnormal respiration and a continued or even increased deficiency of oxygen. Haldane, Priestley and Douglas1 demonstrated the correctness of Miescher's somewhat poetical formulation: “Over the oxygen supply of the body carbon dioxide spreads its protecting wings.”2 Henderson3 confirmed the importance of the relation between the two gases in respiration when he found that it was possible to produce so great a deficiency of carbon dioxide by over-ventilation of the lungs that thereafter an animal may die of lack of oxygen with no effort to breathe.” https://www.nature.com/articles/135457a0
- “Angelo Mosso's Experiments at Very Low Barometric Pressures...Di Giulio C, and West JB. Angelo Moss's experiments at very low barometric pressures. High Alt Med Biol 14:78–79, 2013.—In 1898, Angelo Mosso (1846–1910) used his low-pressure chambers to carry out some remarkable experiments that are not well known. Paul Bert (1833–1886) had previously demonstrated that the deleterious effects of high altitude were due to low Po2, but this conclusion was disputed by many of the eminent scientists of the day. Mosso believed that the physiological effects of high altitude were caused by a low Pco2 (acapnia) and he made a series of low-pressure chamber experiments to test this. In some studies he added oxygen to the air in the chambers so that he could study the effects of extreme hypobaria; in one experiment he survived a barometric pressure of only 192 mm Hg equivalent to an altitude of about 10,800 m. Some of his experiments were observed by his daughter Mimi who wrote a colorful account in her book dedicated to her father “Un cercatore d'ignoto” (A seeker of the unknown).” https://www.liebertpub.com/doi/abs/10.1089/ham.2012.1082?src=recsys&journalCode=ham
- “Voluntary hyperventilation at high altitude...In the nineteenth century, most, but not all, of those who studied the effects of altitude commented on shortness of breath on high mountains. Mosso attributed mountain sickness to the acapnia caused by the hyperventilation he observed. In the last few decades, the relationship has been more fully appreciated. Hypoxia stimulates breathing; hyperventilation mitigates hypoxemia. Overbreathing is the principal defense against lack of oxygen, so the more sensitive the hypoxic ventilatory response, the less will be the impact of hypoxia, all other factors being equal...Most climbers recognize the improvement that follows a few deliberately deeper breaths but are content to let their respiratory control mechanisms take charge. However, in an emergency, carefully controlled deliberate hyperventilation may be life-saving.” https://www.wemjournal.org/article/S0953-9859(94)71149-9/pdf
Altitude Diseases: Intermittent Hypoxia

- “High Altitude Observatory Disease (HAOD) is a disease of intermittent hypoxia.” Steven Magee CEng MIET - Q
- “Intermittent hypoxia (also known as episodic hypoxia) is an intervention in which a person or animal undergoes alternating periods of normoxia and hypoxia. Normoxia is defined as exposure to oxygen levels normally found in earth's atmosphere (~21% O2) and hypoxia as any oxygen levels lower than those of normoxia. Normally, exposure to hypoxia is negatively associated to physiological changes to the body, such as altitude sickness.[1] However, when used in moderation, intermittent hypoxia may be used clinically as a means to alleviate various pathological conditions.” [https://en.wikipedia.org/wiki/Intermittent_hypoxia](https://en.wikipedia.org/wiki/Intermittent_hypoxia)
- “Intermittent Hypoxia Research in the Former Soviet Union and the Commonwealth of Independent States: History and Review of the Concept and Selected Applications... intermittent hypoxic training (IHT) has been used extensively for altitude preacclimatization; for the treatment of a variety of clinical disorders, including chronic lung diseases, bronchial asthma, hypertension, diabetes mellitus, Parkinson’s disease, emotional disorders, and radiation toxicity, in prophylaxis of certain occupational diseases; and in sports…IN CHILDREN AND ADULTS, profound, prolonged hypoxia may cause disability and even death. Less clear are the effects of tolerable, brief hypoxia for a few minutes or of transient hypoxia lasting one to several hours. Particularly at issue are the effects in humans of such transient bouts of hypoxia when repeated many times, a practice designated as intermittent hypoxia... IHT induces increased ventilatory sensitivity to hypoxia in the absence of PCO2 or pH changes; that it induces other hypoxia-related physiological changes such as increased hematopoiesis and decreased plasma volume and increase in alveolar ventilation and lung diffusion capacity; and that it may be useful in the management of certain disease states.” [http://www.go2altitude.com/data/HAMBJ/IHT_Research_Soviet_Union_Tatiana_Serebrovskaya.pdf](http://www.go2altitude.com/data/HAMBJ/IHT_Research_Soviet_Union_Tatiana_Serebrovskaya.pdf)
- “Intermittent hypoxia and sleep-disordered breathing: current concepts and perspectives...There are three major types of sleep-disordered breathing (SDB) with respect to prevalence and health consequences, i.e. obstructive sleep apnoea syndrome (OSAS), Cheyne–Stokes respiration and central sleep apnoea (CSR-CSA) in chronic heart failure, and obesity hypoventilation syndrome (OHS). In all three conditions, hypoxia appears to affect body functioning in different ways. Most of the molecular and cellular mechanisms that occur in response to SDB-related hypoxia remain unknown. In OSAS, an inflammatory cascade mainly dependent upon intermittent hypoxia has been described. There is a strong interaction between haemodynamic and inflammatory changes in promoting vascular remodelling. Moreover, during OSAS, most organ, tissue or functional impairment is related to the severity of nocturnal hypoxia. CSR-CSA occurring during heart failure is primarily a consequence of cardiac impairment. CSR-CSA has deleterious consequences for cardiac prognosis and mortality since it favours sympathetic activation, ventricular ectopy and atrial fibrillation. Although correction of CSR-CSA seems to be critical, there is a need to establish therapy guidelines in large randomised controlled trials. Finally, OHS is a growing health concern, owing to the worldwide obesity epidemic and OHS orbidities. The pathophysiology of OHS remains largely unknown. However, resistance to leptin, obesity and severe nocturnal hypoxia lead to insulin resistance and endothelial dysfunction. In addition, several adipokines may be triggered by hypoxia and explain, at least in
art, OHS morbidity and mortality. Overall, chronic intermittent hypoxia appears to have specific genomic effects that differ notably from continuous hypoxia. Further research is required to fully elucidate the molecular and cellular mechanisms.”

https://erj.ersjournals.com/content/32/4/1082

“Chronic intermittent hypoxia mimicking sleep apnoea increases spontaneous tumorigenesis in mice...Obstructive sleep apnoea (OSA) is a very prevalent disorder with well proven mid- and long-term deleterious consequences, such as increased risk of cardiovascular, metabolic and neurocognitive diseases [1]. Recently, considerable data from both animal models and patient studies also suggest that OSA increases the risk of cancer incidence and mortality [2]. Some of these studies indicate that nocturnal hypoxic events experienced by OSA patients as a consequence of recurrent upper airway obstructions may be a main challenge driving tumour progression [3, 4]. Although the clinical and experimental data available do not undoubtedly prove a relationship between cancer and OSA [5], its plausibility has raised the interest of basic and clinical researchers in the field, warranting further investigation [6].”

https://erj.ersjournals.com/content/49/2/1602111

“Vascular Effects of Intermittent Hypoxia...Animal models of sleep apnea have added substantially to scientists’ understanding of the vascular consequences of this condition. The most important contribution may be the consistent observation that sleep apnea leads to a small but significant increase in arterial pressure independent of comorbidities. The observation that systemic hemodynamics and peripheral vascular function are also altered strengthens the justification for aggressive treatment of apneas and oxygen desaturations with continuous positive airway pressure (CPAP) devices. In addition, the confirmed presence of endothelial pathologies suggests that the long term consequences of untreated sleep apnea include damage in multiple organ systems. Ongoing studies indicate that endocrine factors and oxidative stress are important players in the vascular pathologies of sleep apnea. Future studies in these areas are expected to identify potential therapeutic targets for the prevention of sleep apnea–induced vascular disease.”


“Intermittent Hypoxia and Human Diseases...The scientific field of intermittent hypoxia and its effects on living organisms is surrounded by divergent and controversial findings. Does the condition play pathogenic roles in disease states, such as sleep apnea, chronic pulmonary disease, cardiovascular disease and cancer? Or does exposure to intermittent hypoxia actually induce protective responses?”


“Intermittent hypoxia promotes melanoma lung metastasis via oxidative stress and inflammation responses in a mouse model of obstructive sleep apnea...Recently, increased tumor incidence and cancer-related mortality have been reported among patients with obstructive sleep apnea (OSA). Intermittent hypoxia (IH), the hallmark feature of OSA, contributes to the metastasis of tumors. However, the molecular mechanisms by which tumor metastasis is accelerated by OSA-like IH remain to be elucidated.”


“Intermittent Hypoxia and Hypercapnia Reproducibly Change the Gut Microbiome and Metabolome across Rodent Model Systems... In Ldlr−/− mice, we reported significant shifts in the bacterial and chemical composition of the gut on IHH exposure. The key chemical alterations included changes in microbe-dependent metabolites such as gut-derived estrogen-like molecules (phytoestrogens) and bile acids.”

https://msystems.asm.org/content/4/2/e00058-19
“Intermittent Hypoxia Induces Hyperlipidemia in Lean Mice...Obstructive sleep apnea, a syndrome leading to recurrent intermittent hypoxia (IH), has been associated previously with hypercholesterolemia, independent of underlying obesity. We examined the effects of experimentally induced IH on serum lipid levels and pathways of lipid metabolism in the absence and presence of obesity. Lean C57BL/6J mice and leptin-deficient obese C57BL/6J-Lepob mice were exposed to IH for five days to determine changes in serum lipid profile, liver lipid content, and expression of key hepatic genes of lipid metabolism. In lean mice, exposure to IH increased fasting serum levels of total cholesterol, high-density lipoprotein (HDL) cholesterol, phospholipids (PLs), and triglycerides (TGs), as well as liver TG content. These changes were not observed in obese mice, which had hyperlipidemia and fatty liver at baseline. In lean mice, IH increased sterol regulatory element binding protein 1 (SREBP-1) levels in the liver, increased mRNA and protein levels of stearoyl–coenzyme A desaturase 1 (SCD-1), an important gene of TG and PL biosynthesis controlled by SREBP-1, and increased monounsaturated fatty acid content in serum, which indicated augmented SCD-1 activity. In addition, in lean mice, IH decreased protein levels of scavenger receptor B1, regulating uptake of cholesterol esters and HDL by the liver. We conclude that exposure to IH for five days increases serum cholesterol and PL levels, upregulates pathways of TG and PL biosynthesis, and inhibits pathways of cholesterol uptake in the liver in the lean state but does not exacerbate the pre-existing hyperlipidemia and metabolic disturbances in leptin-deficient obesity.”

“Chronic intermittent hypoxia induces oxidative stress and inflammation in brain regions associated with early-stage neurodegeneration...Sleep apnea is a common comorbidity of neurodegenerative diseases, such as Alzheimer’s disease (AD) and Parkinson’s disease (PD). Previous studies have shown an association between elevated oxidative stress and inflammation with severe sleep apnea. Elevated oxidative stress and inflammation are also hallmarks of neurodegenerative diseases. We show increased oxidative stress and inflammation in a manner consistent with early stages of neurodegenerative disease in an animal model of mild sleep apnea. Male rats were exposed to 7 days chronic intermittent hypoxia (CIH) for 8 h/day during the light period. Following CIH, plasma was collected and tested for circulating oxidative stress and inflammatory markers associated with proinflammatory M1 or anti-inflammatory M2 profiles. Tissue punches from brain regions associated with different stages of neurodegenerative diseases (early stage: substantia nigra and entorhinal cortex; intermediate: hippocampus; late stage: rostral ventrolateral medulla and solitary tract nucleus) were also assayed for inflammatory markers. A subset of the samples was examined for 8-hydroxydeoxyguanosine (8-OHdG) expression, a marker of oxidative stress-induced DNA damage. Our results showed increased circulating oxidative stress and inflammation. Furthermore, brain regions associated with early-stage (but not late-stage) AD and PD expressed oxidative stress and inflammatory profiles consistent with reported observations in preclinical neurodegenerative disease populations. These results suggest mild CIH induces key features that are characteristic of early-stage neurodegenerative diseases and may be an effective model to investigate mechanisms contributing to oxidative stress and inflammation in those brain regions.”

“Effects of Acute Intermittent Hypoxia on Working Memory in Young Healthy Adults.... This study demonstrated that short-term exposure to IH per se (i.e., without the confounding influence of sleep fragmentation and medical comorbidities) can negatively impact performance on spatial working memory tasks, even in healthy young adults.”
Altitude Diseases: Asthma & Allergies

- “After working in high altitude astronomy, I was diagnosed with asthma and allergies.” Steven Magee CEng MIET - Q

- “Asthma and High Elevation Activity...Why High Elevation Triggers Asthma. If your child has asthma, they may experience struggling for air in high elevation territory because the amount of oxygen in the air decreases as altitude increases. Lungs will struggle for air and deep or quick breathing can occur. When the air is dry, especially during the winter months, it can also trigger asthma. When your child inhales cold, dry air, it can dry the mucus membranes lining their lungs. Mucus membranes are your child’s natural defense mechanism against viruses and bacteria. When your child’s mucus membranes are dry it can activate allergy symptoms. Considering 75 percent of asthmatics have allergies, this is important information to know. Continue reading! If your child’s asthma is stable, altitude will generally have little effect on their asthma. “If your child’s asthma is severe and you’re interested in traveling to high altitude, your child should see their doctor ahead of time to assure they are taking proper medications and that your child’s asthma has stabilized,” says Arnold Platzker, MD, from the Division of Pediatric Pulmonology at Children’s Hospital Los Angeles.”

- “Allergies at High Altitudes... There tend to be fewer pollen related allergens at high altitudes, and at extremely high altitudes, dust mites cannot survive either. Dryer climates also reduce some types of mold spores. High altitude water supplies tend to be high in minerals, and water may also be more alkaline than at lower altitudes, in some places. The affect on individuals can vary widely, some people improve, others struggle with the change. While wind blown pollens tend to be lower, the amount of wind in general means that there is more dust, and more potential for exposure from the pollens that do circulate. Sort of like we say about snow - there isn't much of it, but nature makes the most of it! Allergy related asthma may improve or worsen. High altitude tends to make asthma more reactive anyway, so you could go either way.”

- “ALLERGEN LEVELS AND ALTITUDE... The issue of the impact of altitude on aeroallergens is an interesting one. The benefit of high mountains on asthma control was commented on ninety years ago. But it wasn't until over forty years later than dust mites were discovered, with the subsequent realization that the decreased humidity (comparing the Netherlands to Switzerland) meant lesser mite exposure. The question of pollens isn't so clear. Altitude per se does not mean lower pollen counts. Davies discussed this in a couple of articles in 1969. The counts depended on prevailing winds, and species of grass. Buck and Levetin showed grass pollen counts in the mountains of Colorado that were considerably higher than counts we saw down in the plains around Denver. Their site was near Crested Butte, west of the Continental Divide. Since prevailing winds in North America are from the west, I suspect moist air was carrying rain to deposit as it hit the Rockies. So it depends on how much moisture there is.”

- “Does Altitude Affect Asthma?... If the asthma is so severe that the person's blood oxygen is low (very unusual except during an acute attack), being at altitude or on an air flight would further reduce the blood oxygen level. The dry and often cool conditions experienced at
significant altitude might trigger asthma symptoms. Humid air is more ideal for keeping the airways moist. Even the effects of dry, cool air, however, can be prevented by keeping the asthmatic condition under good control.” [https://www.medicinenet.com/asthma_-_the_effects_of_climate_and_altitude/ask.htm](https://www.medicinenet.com/asthma_-_the_effects_of_climate_and_altitude/ask.htm)

- “High altitude and asthma: beyond house dust mites...In this issue of the European Respiratory Journal, Rijssenbeek-Nouwens et al. [1] demonstrated that the benefit of a stay at high altitude was comparable in allergic and nonallergic adult asthmatic patients (allergy was defined on the basis of specific immunoglobulin (Ig)E to a panel of common aero-allergens). This benefit was substantial, exemplified by a discontinuation in oral steroids intake over the course of the stay in about 40% of both groups of asthmatic patients and an average reduction of 50% in the other patients.” [https://erj.ersjournals.com/content/40/6/1320](https://erj.ersjournals.com/content/40/6/1320)
Altitude Diseases: Anemia Hazards

- “I noticed a positive effect when I suspected very high altitude anemia damage may be present and started to treat it with a 65 mg iron supplement daily in 2018.” Steven Magee CEng MIET - Q
- “Hypoxemia in Dogs. When the brain is deprived of oxygen, irreversible damage may be the result, even when the deprivation has been for a short period of time. Oxygen deficiency may also lead to anemia in the organs, which can progress to arrhythmia and heart failure. Hypoxemia occurs when arterial blood is not being oxygenated sufficiently. This is a serious condition and needs to be treated quickly.”
- “High altitude anemia: validity of definition criteria...The effect of iron and folate supplementation on the hemoglobin response and iron status was studied in male and female equatorian medical students: 66 in Quito (2,800 m altitude) and 40 in Guayaquil (sea level). At the end of the supplementation, there was a nearly complete disappearance of biochemical evidence of iron deficiency in the two groups of students.”
- “Childhood Anemia at High Altitude: Risk Factors for Poor Outcomes in Severe Pneumonia...Children at high altitude present with more severe disease, and children with anemia at high altitude are at greater risk of poor outcome when being treated for severe pneumonia. Given the high global prevalence of anemia among young children, prevention and treatment of anemia should be a priority in children living at high altitude and could improve outcomes of pneumonia.”
  [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3812558/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3812558/)
- “Two weeks in the mountains can change your blood for months...Peter Ratcliffe, a medical researcher at the University of Oxford in the United Kingdom who studies how cells react to low oxygen in cancer, heart disease, stroke, and anemia. Low oxygen is also a problem when trauma—from car accidents to gunshot wounds—causes blood loss. Finding ways to kick the blood’s oxygen-carrying capacity into high gear in such an emergency, D’Alessandro says, could save lives in both the civilian sector and on the battlefield.”
- “The Effect of Altitude Change on Anemia Treatment Response in Hemodialysis Patients...Hemodialysis patients who live at high altitude use less exogenous erythropoietin but achieve higher hematocrit levels than those living at a lower altitude...These results support the hypothesis that altitude-induced hypoxia reduces erythropoietin requirements in hemodialysis patients with treatment-refractory anemia.”
- “Iron Deficiency Anemia: Symptoms and Solutions...Iron deficiency is one of the most common deficiencies in the world. Although anemia can be caused by other deficiencies including folic acid, B12, B6 or copper, iron deficiency anemia is the most common type of anemia. Anemic people may not show any symptoms at first, then start to develop symptoms over time, including: dizziness or lightheadedness, fatigue, weakness, shortness of breath, or lack of endurance during exercise, headache, poor concentration and cognitive ability, desire to chew on ice, irritability, paleness, heart palpitations or rapid heart beat, intolerance to cold, loss of appetite, and/or reduced immunity...Anemia can dramatically compound the effects at
altitude, and can also increase the risks associated with altitude sickness; if left untreated, severe anemia may cause high-output heart failure, a life-threatening problem anywhere, but especially in the mountains far from emergency rescue services.”
http://www.bodyresults.com/e2anemia.asp
• “The influence of high-altitude living on body iron...It is estimated that 20 to 30 million people worldwide live at altitudes above 3000 m commonly defined as high altitude; over half of these individuals live in the Andean region of Latin It is commonly assumed that the prevalence of iron deficiency is higher in vulnerable segments of these populations because of the added iron requirement imposed by expansion of the red cell mass.”
http://www.bloodjournal.org/content/bloodjournal/106/4/1441.full.pdf?sso-checked=true
• “Combination of anemia, high altitude challenge outcomes for children with pneumonia...Overall the study found that, while neither anemia nor high altitude alone increased the risk of treatment failure, the combination of both factors caused a fourfold increase in failure risk. Controlling for the two treatment regimens of the SPEAR study did not change the impact of altitude and anemia. Children living at high altitudes also were much more seriously ill when diagnosed -- with lower blood pressure and blood oxygen levels and an increased respiratory rate -- and took much longer to recover normal blood oxygen levels after treatment. Since low blood oxygen significantly increases the risk of death, Moschovis notes, these findings highlight the importance of providing high-quality care to children in high-altitude environments who develop pneumonia.”
https://www.sciencedaily.com/releases/2013/10/131008123156.htm
Altitude Diseases: Radiation Damage

- “AIRCREW SAFETY & HEALTH. Cosmic Ionizing Radiation. What you need to know. Aircrew and passengers are exposed to cosmic ionizing radiation on every flight. Here you can earn more about cosmic ionizing radiation, how you can be exposed, exposure levels, and possible health effects...Are there any known health effects from cosmic ionizing radiation? The World Health Organization (WHO) International Agency for Research on Cancer (IARC) says that ionizing radiation causes cancer in humans. Ionizing radiation is also known to cause reproductive problems. We are looking more specifically at whether cosmic ionizing radiation is linked to cancer and reproductive problems. Most studies of radiation health effects have looked at groups with much higher radiation doses from different kinds of radiation (atomic bomb survivors; patients who received radiation therapy).” [https://www.cdc.gov/niosh/topics/aircrew/cosmicionizingradiation.html](https://www.cdc.gov/niosh/topics/aircrew/cosmicionizingradiation.html)
- “Air travel exposes you to radiation – how much health risk comes with it?...You might guess that a frequent flyer’s radiation dose is coming from the airport security checkpoints, with their whole-body scanners and baggage x-ray machines, but you’d be wrong. The radiation doses to passengers from these security procedures are trivial. The major source of radiation exposure from air travel comes from the flight itself. This is because at high altitude the air gets thinner. The farther you go from the Earth’s surface, the fewer molecules of gas there are per volume of space. Thinner air thus means fewer molecules to deflect incoming cosmic rays – radiation from outer space. With less atmospheric shielding, there is more exposure to radiation.” [http://theconversation.com/air-travel-exposes-you-to-radiation-how-much-health-risk-comes-with-it-78790](http://theconversation.com/air-travel-exposes-you-to-radiation-how-much-health-risk-comes-with-it-78790)
- “What's to know about radiation sickness?...Living at a higher altitude, for example, in the plateau of New Mexico and Colorado, increase exposure, as does traveling in an airplane. Radon gas in homes also contributes...The many activities that can expose people to sources of radiation include: watching television. flying in an airplane. passing through a security scanner. using a microwave or cell phone” [https://www.medicalnewstoday.com/articles/219615.php](https://www.medicalnewstoday.com/articles/219615.php)
- “Backgrounder on Biological Effects of Radiation...This natural radiation that is always present is known as "background" radiation. Background levels can vary greatly from one location to the next. For example, Colorado, because of its altitude, has more cosmic radiation than the East or West Coast. It also has more terrestrial radiation from soils rich in naturally-occurring uranium. So people living in Colorado are exposed to more background radiation than residents of the coasts.” [https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/bio-effects-radiation.html](https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/bio-effects-radiation.html)
- “Radiation in Everyday Life...The term "radiation" is very broad, and includes such things as light and radio waves. In our context it refers to "ionizing" radiation, which means that because such radiation passes through matter, it can cause it to become electrically charged or ionized. In living tissues, the electrical ions produced by radiation can affect normal biological processes...The radiation exposure due to cosmic rays is very dependent on altitude, and slightly on latitude: people who travel by air, thereby, increase their exposure to radiation.” [https://www.iaea.org/Publications/Factsheets/English/radlife](https://www.iaea.org/Publications/Factsheets/English/radlife)
- “How harmful is low-level radiation?... radiation is cumulative. Most scientists agree there’s no such thing as a harmless dose...What comes from medical X-rays, airport scanners, leaking nuclear plants and similar sources is ionizing radiation — the dangerous kind, capable of..."
Environmental Radiation LLC - https://www.environmentalradiation.com

causing cancer, increasingly so as time and dosage increase...Studies of the body’s reaction to low levels of radiation have shown that as exposure increases, it causes the same cancers as very high doses although in far smaller numbers. Thyroid cancer and leukemia can follow after years of chronic overexposure. Later, in 10 or 15 years, come lung cancer, skin cancer, multiple myeloma and cancers of the breast and stomach.”

- “Do x-rays and gamma rays cause any other health problems?...Doses of radiation such as those given in radiation therapy also cause side effects. Short-term side effects depend on the area being treated but often include skin changes (ranging from mild reddening to something like a severe burn), nausea, vomiting, diarrhea, and low blood cell counts. There is also a risk of long-term side effects, which again vary depending on the area being treated. For example, radiation to the head and neck area can lead to problems with dry mouth and trouble swallowing. Radiation can weaken bones, so that they are more likely to break later on. Radiation to the bone marrow can lead to long-term problems with blood cell counts and even a disease called aplastic anemia. Radiation can also lead to infertility (problems getting pregnant or fathering children)”

- “What does radiation from a nuclear disaster actually do to our bodies?...The combination of how much radiation you are exposed to, what type, and how often will determine the effect on your cells and tissues. Low doses of nuclear radiation are more likely to change cells by modifying DNA, while high doses tend to kill cells. So long-term exposure to low doses of radiation increase the odds of getting cancer, while a single high dose will quickly cause immediate damage to cells and tissues — a process used effectively to kill tumour cells in radiation therapy.”

- “Long Term Effects of Low Level Radiation- and How to Prevent Them...ABC, CBS, CNN, Pres. Obama- they're all saying radiation levels are low in the US and of no concern to Americans. If you're reading this site, we doubt you're one of the Sheeple believing this garbage. But its not enough to know we're being poisoned, what can we practically do to prevent negative long term effects from the radiation spewing from Fukushima?”
Altitude Diseases: Ultraviolet (UV) Radiation Hazards

- “It was well known to high altitude workers that the high ultraviolet (UV) radiation levels would damage rubber, plastics and paints outdoors at the observatory.” Steven Magee CEng MIET - Q
- "The effects of UV-B radiation on human skin are varied and widespread. UV-B induces skin cancer by causing mutation in DNA and suppressing certain activities of the immune system...UV-B may also suppress the body’s immune response to Herpes simplex virus and to skin lesion development, and may similarly harm the spleen....Common eye problems resulting from over-exposure to UV-B include cataracts, snow blindness, and other ailments, both in humans and animals...Living organisms at high elevations are generally exposed to more solar radiation and with it, more UV-B than organisms at low elevations." [http://earthobservatory.nasa.gov/Features/UVB/uvb_radiation2.php]
- “Ultraviolet radiation (UVR) whether of solar or artificial origin, is a known carcinogen. Excessive exposure to UVR increases the risk of several types of cancer, cortical cataract, some conjunctival neoplasms, ocular melanoma, autoimmune and viral diseases.” [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3125012/]
- “Health Hazards in Rock Climbing...Sun exposure causes skin cancer. Don’t ignore the need to cover-up, use sunscreen, and avoid the mid-day sun. Lips are especially vulnerable, and their exposure is often ignored by outdoor sports people.” [http://www.rockclimbing.com/Articles/General/Health_Hazards_in_Rock_Climbing_36.html]
- “Kilimanjaro Health Issues...Sun related injuries. About 55% of the earth’s protective atmosphere is below an altitude of 5000m. Far less ultraviolet light is being filtered out, making the sun’s rays much more powerful, which could result in severe sun burning of the skin. It is strongly recommended to use a 20+ sun protection cream at lower altitudes, and a total block cream above an altitude of 3000m. It is also important to wear dark sun glasses preferably with side panels above 4000m in daytime and essential when walking through snow or ice. Snow blindness can be very painful, and will require your eyes to be bandaged for at least 24 hours.” [http://www.climbingkilimanjaro.com/health-issues]
- “What Is Ultraviolet Light?...Ionization. UV radiation has enough energy to break chemical bonds. Due to their higher energies, UV photons can cause ionization, a process in which electrons break away from atoms. The resulting vacancy affects the chemical properties of the atoms and causes them to form or break chemical bonds that they otherwise would not. This can be useful for chemical processing, or it can be damaging to materials and living tissues. This damage can be beneficial, for instance, in disinfecting surfaces, but it can also be harmful, particularly to skin and eyes, which are most adversely affected by higher-energy UVB and UVC radiation.” [https://www.livescience.com/50326-what-is-ultraviolet-light.html]
- “Ultraviolet light is a known carcinogen and can affect human health in many ways that are only just starting to be understood.” Steven Magee CEng MIET - Q
Altitude Diseases: Genetic Adaptation to High Altitudes

- “High elevations are challenging for humans because of low oxygen levels, but Tibetans spend their lives above 13,000 feet with little issue. They are better suited when compared to short-term visitors from low altitude due to physiological traits such as relatively low hemoglobin concentrations at altitude. Unique to Tibetans are variants of the EGLN1 and EPAS1 genes, key genes in the oxygen homeostasis system at all altitudes.” [http://www.uchospitals.edu/news/2014/20140210-genetics.html](http://www.uchospitals.edu/news/2014/20140210-genetics.html)

- “High-altitude adaptation in humans is an instance of evolutionary modification in certain human populations, including those of Tibet in Asia, the Andes of the Americas, and Ethiopia in Africa, who have acquired the ability to survive at extremely high altitudes. This adaptation means irreversible, long-term physiological responses to high-altitude environments, associated with heritable behavioural and genetic changes. While the rest of the human population would suffer serious health consequences, the indigenous inhabitants of these regions thrive well in the highest parts of the world. These people have undergone extensive physiological and genetic changes, particularly in the regulatory systems of oxygen respiration and blood circulation, when compared to the general lowland population.” [https://en.wikipedia.org/wiki/High-altitude_adaptation_in_humans](https://en.wikipedia.org/wiki/High-altitude_adaptation_in_humans)

- “High-altitude adaptation means irreversible, evolved physiological responses to high-altitude environments, associated with heritable behavioural and genetic changes. Among animals, only few mammals (such as yak, ibex, Tibetan gazelle, vicunas, llamas, mountain goats, etc.) and certain birds are known to have completely adapted to high-altitude environments...The physiological and genetic adaptations in native highlanders involve modification in the oxygen transport system of the blood, especially molecular changes in the structure and functions of hemoglobin, a protein for carrying oxygen in the body. This is to compensate for perpetual low oxygen environment. This adaptation is associated with developmental patterns such as high birth weight, increased lung volumes, increased breathing, and higher resting metabolism...The genome sequence of Tibetans in 2010 provided the first clue to the molecular evolution of high-altitude adaptation. Genes such as EPAS1, PPARA and EGLN1 are found to have significant molecular changes among the Tibetans, and the genes are involved in hemoglobin production. These genes function in concert with another gene named hypoxia inducible factors (HIF), which in turn is a principal regulator of red blood cell production in response to oxygen metabolism. Further, the Tibetans are enriched for genes in the disease class of human reproduction (such as genes from the DAZ, BPY2, CDY, and HLA-DQ and HLA-DR gene clusters) and biological process categories of response to DNA damage stimulus and DNA repair (such as RAD51, RAD52, and MRE11A), which are related to the adaptive traits of high infant birth weight and darker skin tone and, are most likely due to recent local adaptation...several genes appear to be involved in Ethiopians, including CBARA1, VAV3, ARNT2 and THRAB, which are known to play a role in HIF genetic functions.” [https://en.wikipedia.org/wiki/Organisms_at_high_altitude](https://en.wikipedia.org/wiki/Organisms_at_high_altitude)


- “Human high-altitude adaptation: forward genetics meets the HIF pathway...Humans have adapted to the chronic hypoxia of high altitude in several locations, and recent genome-wide studies have indicated a genetic basis. In some populations, genetic signatures have been
identified in the hypoxia-inducible factor (HIF) pathway, which orchestrates the transcriptional response to hypoxia. In Tibetans, they have been found in the HIF2A (EPAS1) gene, which encodes for HIF-2α, and the prolyl hydroxylase domain protein 2 (PHD2, also known as EGLN1) gene, which encodes for one of its key regulators, PHD2. High-altitude adaptation may be due to multiple genes that act in concert with one another. Unraveling their mechanism of action can offer new therapeutic approaches toward treating common human diseases characterized by chronic hypoxia.”

- “NASA has announced some preliminary results from its Twins Study, an effort to study the effects of space travel on human health. The early findings suggest space travel boosts methylation, the process of switching genes on and off.”

- “Twins Study: Space travel changes our genes...Researchers performing genome sequencing on the twins also found more than 200,000 RNA molecules that were expressed differently between the twins.”

- “Scott Kelly: NASA Twins Study Confirms Astronaut's DNA Actually Changed in Space...After landing, 93 percent of Scott Kelly’s genes returned to normal, the researchers found. The altered 7 percent, however, could indicate long-term changes in genes connected to the immune system, DNA repair, bone formation networks, oxygen deprivation and elevated carbon dioxide levels.”

- “chronic mountain sickness (CMS) or Monge’s disease... The disease is characterized by an array of neurologic symptoms, including headache, fatigue, sleepiness and depression. Often, people with CMS suffer from strokes or heart attacks in early adulthood because of increased blood viscosity (resistance to blood flow that can result in decreased oxygen delivery to organs and tissues)...They identified two genes, ANP32D and SENP1, with significantly increased expression in the CMS individuals when compared to the non-CMS individuals, and hypothesized that down-regulating these genes could be beneficial in coping with hypoxia.”

- “Adapting to High Altitude...There is considerable variability between individuals and between populations in their ability to adjust to the environmental stresses of high mountain regions. Usually, the populations that are most successful are those whose ancestors have lived at high altitudes for thousands of years.”

- “Oxygen therapy for eczema and allergies...we now know that oxygen controls over 8000 genes and a course of 20 sessions increases stem cells eightfold.”

- “Genetic adaptation processes may be triggered in sea level adapted humans that spend prolonged time at high altitudes.”

- “Altitude Roaming Range (ARR): The human appears to have a range of plus or minus 4,900 feet from the altitude that it grew up at before it may see abnormally high or low altitude health issues that may trigger genetic adaption processes. For humans with genetic adaptation above 10,000 feet, the ARR reduces to plus or minus 2,500 feet due to high levels of changes in environmental radiation levels. For most humans, ARR has the lower end limit of sea level (0’) and the upper end limit of ten thousand (10,000’) feet that should never be exceeded.”
“Genetic Altitude Adaptation Of Humans (GAAH): Sea level adapted genetics with altitude roaming range (ARR) of 0’ to 4,900’. 8,000’ High altitude adapted genetics with ARR of 3,100’ to 10,000’. 13,000’ Very high altitude adapted genetics with ARR of 10,500’ to 15,500’.

“Genetic Adaptation To Very High Altitude (GAVHA): Populations that have lived for generations at very high altitude are the only people known to function effectively there.” Steven Magee CEng MIET

“No amount of acclimatization to very high altitude will prevent long term health problems and genetic adaptation processes from developing in the sea level adapted human.” Steven Magee CEng MIET - Q
Altitude Diseases: Dermatology

- “High Altitude Dermatology...Approximately, 140 million people worldwide live permanently at high altitudes (HAs) and approximately another 40 million people travel to HA area (HAA) every year for reasons of occupation, sports or recreation. In India, whole of Ladakh region, part of Northwest Kashmir, Northern part of Sikkim and Tenga valley of Arunachal are considered inhabited areas of HAA. The low quantity of oxygen, high exposure of ultraviolet (UV) light, very low humidity, extreme subzero temperature in winter, high wind velocity, make this region difficult for lowlanders as well as for tourists. Acute mountain sickness, HA pulmonary edema, HA cerebral edema, and thromboembolic conditions are known to occur in HA. However, enough knowledge has not been shared on dermatoses peculiar to this region. Xerosis, UV-related skin disorders (tanning, photomelanosis, acute and chronic sunburn, polymorphic light eruption, chronic actinic dermatitis, actinic cheilitis, etc.), cold injuries (frostbite, chilblains, acrocyanosis, erythrocyanosis, etc.) nail changes (koilonychias), airborne contact dermatitis, insect bite reaction, and skin carcinoma (basal cell carcinomas, squamous cell carcinomas, and also rarely malignant melanoma) are the dermatoses seen in HAAs. Early diagnosis and knowledge of HA dermatoses may prevent serious consequences of disease and improve the quality of life for the visitors as well as for native of the place.”

- “The Lowdown on Elevation in Show Low During the Summer...Why is it that you’re more likely to get a bad sunburn in Show Low than while sitting on a sunny beach in Southern California? One word: elevation. The city of Show Low sits at an elevation of 6,400 feet above sea level. At that altitude, the sun’s rays aren’t filtered as well by the atmosphere as they are at sea level—so the sun is much more intense. Even worse, the effects of the sun on your skin are very subtle, so you could be developing a severe sunburn without even realizing it until it’s too late...Your exposure to Ultraviolet (UV) rays actually increases by 10% for every 3,000 feet in altitude you ascend. This means in Show Low, where you’re a little more than twice that at 6,400 feet, you’re exposed to 25% greater UV radiation than you are at sea level!”

- “SUNSHINE ISN’T SEASONAL – REMEMBER TO BRING YOUR SUNSCREEN...Our high elevation is a major cause for increased chance for sun exposure, but probably not for the reason you are thinking. The reason you are more likely to get sunburned here is due to UV rays having less atmosphere to travel through. Even though Florida is closer to the equator (and technically in more direct sunlight), you are more likely to get sunburned in Colorado because there are physically less particles to deflect light on its way from the sun. A study conducted here found that a person with average complexion at noon in Vail, Colorado at 11,000 feet would burn in six minutes without protection. Six minutes! Furthermore, it does not have to be a hot day to burn your skin at altitude. A mild temperature does not mean you cannot burn and can be misleading to the Vail Valley resident. Sunburns can occur at 70-80 degree weather in the Vail Valley if sunscreen is not applied.”

- “Why Higher Altitudes are So Hard on Your Skin...In the Mile High City, we’re already at a higher altitude, but a short drive away puts you in the heart of the Rocky Mountains and elevations between 12,000-14,000+ feet. Along with world-class skiing, climbing, hiking, rafting, and other alpine recreation, higher mountain altitudes can wreak havoc on the skin...at
the highest elevations of the Colorado Rockies, UV radiation can be more than twice as intense as it would be at sea level… At very high altitudes of 14,000+ feet, extra stress hormone and reduced ability to deliver oxygen to skin tissue makes it even harder for the skin to heal. And this increased healing time inevitably leads to a higher risk of skin infections. Dry, cracked skin is also susceptible to opportunistic infections. Similarly, lungs and sinuses may be prone to secondary infections resulting from continuously breathing in dry, mountain air.”

- “Snow, sun and high altitude puts ski resort employees, patrons at greater risk for skin cancer...Data collected by local researchers show there is an important reason to minimize exposure to potentially harmful ultraviolet rays, especially at the higher altitudes of Utah's ski resorts. "It's not just unique to ski areas, but a lot of the recreational things we do in Utah," said Dr. Christopher Hull, a dermatologist with University of Utah Health Care. A combination of the higher elevation and the reflection of sun on the snow makes for higher UV exposure "in the dead of winter, even with cloud cover," Hull said. Dan Steffen, a ski instructor at Deer Valley for 23 years, said he was diagnosed "out of the blue" with late-stage metastatic melanoma in 2005 and went through a rigorous and side-effect-filled treatment regimen, only to have the cancer return 10 years later. "It's a pretty trying experience. I wouldn't wish it on anybody," he said.”

- “Wilderness dermatology: mountain exposures...Exploring the mountains is a highly rewarding pastime; however, certain high-altitude exposures can lead to dermatologic manifestations. In this review article, the authors will describe cold, solar, and severe weather that one may experience when spending time outdoors. Factors such as increased ultraviolet radiation, temperature extremes, and low partial pressure of oxygen, along with human physiologic parameters also contribute to disease severity and presentation. This review article will address the diagnosis, treatment, and prevention of high-altitude dermatology exposures.”

- “High altitude and the skin...The 23 members of the expedition spent 3 months at or above 17000 feet. The highest altitude reached was 25750 feet. Several skin conditions were encountered: frostbite, chillblains, fissuring of finger pulps, dry skin, eczema, folliculitis, sunburn and polymorphic light eruption. The most interesting finding was that six members developed numerous splinter haemorrhages. This may reflect a more widespread capillary fragility which occurs at high altitudes,1 and may be important in the pathogenesis of high-altitude pulmonary and cerebral oedema.”

- “The 7 Worst Jobs for Your Skin...1) Office workers Why? Regular 9-to-5ers with indoor corporate jobs seem unlikely candidates for being at high risk for skin cancer, but research shows that melanoma occurs when people are exposed to bursts of sun. For those who are indoors all week, that burst of sun on the weekends could be dangerous. 2) Pilots and flight attendants Why? It may be the radiation from the high altitude in-flight that ups your risk similar to an indoor tanning bed session, reports a new study in JAMA Dermatology. In fact, air crew members have "approximately twice the incidence of melanoma compared to the general population." 3) Firefighters Why? Exposure to noxious fumes from flames.”

- “Polymorphic light eruption...PMLE generally affects adult females aged 20–40, although it sometimes affects children and males in 25% of cases. It is particularly common in places
where sun exposure is uncommon, such as Northern Europe, where it is said to affect 10–20% of women holidaying in the Mediterranean area. It is less common in Australasia. It has also been reported to be relatively common at higher altitudes compared to sea level. PMLE can affect all skin phototypes, though it is more often diagnosed in white skin than in skin of colour. There is a genetic tendency to PMLE, and it is sometimes associated with or confused with photosensitivity due to lupus erythematosus, which generally is more persistent than PMLE. Some patients experience PMLE during phototherapy, which is used to treat skin conditions such as psoriasis and dermatitis.”

“Skin with Altitude. Maintaining healthy skin a mile high above the sea...Maintaining healthy skin at altitude takes vigilance and is important not just to stave off wrinkles, but also to prevent deadly skin cancers. According to the World Health Organization, the risk of skin cancer rises with altitude...“The 20 percent increase in UV exposure at our altitude leads to photoaging, which is premature aging of the skin from UV damage,” Hobbs said. “The UV exposure from both UVA and UVB radiations play a role in photoaging by damaging the elastin fibers and the extracellular matrix that composes our skin, which, ultimately, leads to increased wrinkles and loss of elasticity.” Aside from aging, Hobbs added, “UV radiation causes increased pigmentation, or lentigos, precancerous growths called actinic keratoses, and skin cancers, including basal and squamous cell carcinomas, and melanoma.”

“What I Wish I Knew About Skin Care Before Moving to the Mountains...what I didn’t expect was for my skin to dry out, new wrinkles to form, and even my nipples to start flaking. I also noticed small, itchy, dry patches around my mouth and chin that had never been there before. And I really started to worry when, in a matter of months, two horizontal wrinkles on opposite ends of my forehead finally connected into one line, taunting me. It was time for a change.”

“Skin Cancer in Military Pilots: A Special Population With Special Risk Factors...Military pilots may be at greater risk for skin cancer, particularly melanoma. Military-specific studies are limited, but skin cancer rates in civilian pilots and aircrews have previously been examined. Risk factors for all pilots may include exposure to UV radiation (UVR) at higher altitudes, cosmic radiation, and electromagnetic energy from cockpit instruments, as well as altered sleep-wake cycles...Military and civilian pilots have an increased risk for melanoma and nonmelanoma skin cancer, likely due to unique occupational exposures. We recommend annual skin cancer screening for all pilots to help assess their individual risk.”

“Is High Altitude a Risk Factor in Development of Herpes Zoster?... Lowlanders working at high altitude are at high risk to develop HZ in comparison with persons working at plains.”

“Sun Protection at High Altitude...here in Colorado Springs, which is about 6,000 feet above sea level, the UV exposure is 36 percent higher than at sea level. If you’re skiing on the slopes at around 9,000 feet above sea level, the UV exposure jumps to about 42 percent more exposure...Do not let the higher SPF sunscreen lull you into a false sense of security. Even with a strong sunscreen, you are still at risk for UV exposure...Remember that sun protection is just as important during the winter, especially since the rays of the sun reflect off the snow.”
“SUN PROTECTION AT HIGHER ALTITUDES...Benefits of moderate sun exposure may include stronger bones, improved moods during all seasons, and a more robust immune system. Unfortunately, living at a higher elevation also exposes us to approximately 25 percent more ultraviolet radiation when compared to sea level. Hence, while we enjoy a high number of sun-filled days here in Colorado, it is important to be aware of the increased long-term risks to our skin and health that come with high altitude sun exposure. Exposure to ultraviolet radiation from the sun is the primary cause of all skin cancers. Moreover, through years of sun exposure our skin becomes wrinkled, hyper-pigmented and thin. Ninety percent of wrinkles are caused by sun exposure alone.”

“high altitude skin care advice from our boulder dermatologists... If you’ve never lived in a high altitude before, it can wreak havoc on your skin. Higher altitudes mean increased UV exposure, which can damage your skin and even cause skin cancer if you are not properly protected. Our climate also includes low humidity levels, which can leave your skin feeling dry, flaky, and more sensitive. In the winter, humidity levels drop further right along with the temperatures, and keeping your skin properly moisturized may feel downright impossible.”
Altitude Diseases: Infertility

- “Frequent flyers, skiing, and hiking: high altitude’s links to fertility...The management consultant from a major Chicago-area printing company stepped forward to address a convention of book sellers, artisans, and production staffers at a recent convention held in the high Colorado ski town of Vail (elevation 8,022’ above sea level). Though adjusting to altitude typically takes 24 to 48 hours for sea-level dwellers -- he’d been in the mountains for less than an hour – the consultant valiantly delivered his pitch for all of 60 seconds before succumbing to the effects of altitude sickness. A host of research studies indicate that the effects of high altitude, where oxygen is scarcer and dehydration processes operate faster, could extend to male fertility. Both legend and science seem to agree on this point.”

- “Effect of high altitude exposure on spermatogenesis and epididymal sperm count in male rats...Epiddymal sperm count was significantly reduced at day 7 of exposure to high altitude and maintained low levels with respect to sea level up to 42 days. In conclusion, high altitude exposure affects spermatogenesis, particularly onset of mitosis and spermiation. This in turn affects epididymal sperm count.”

- “Sperm forward motility is negatively affected by short-term exposure to altitude hypoxia...During the ascent, blood oxygen saturation at 3.848 m above sea level was found to be decreased when compared to sea level (P < 0.02). The sperm forward motility at sea level after the expedition showed a significant reduction (P < 0.02)...luteinising hormone levels after altitudes trekking significantly increased compared to levels before the expedition (P < 0.05). Because of the short-term exposure, we can assume that the reduced forward motility described here may result from the effects of the acute altitude hypoxia on spermatozoa during the epididymal transit where they mature acquiring their motility.”

- “Exposure to Hypoxia at High Altitude (5380 m) for 1 Year Induces Reversible Effects on Semen Quality and Serum Reproductive Hormone Levels in Young Male Adults...This study investigated the effect of hypoxia at high altitude on the semen quality and the serum reproductive hormone levels in male adults. A total of 52 male soldiers were enrolled in this cohort study. They were exposed to hypoxia at high altitude (5380 m) for 12 months when undergoing a service. After exposure, they were followed up for 6 months. The samples of semen and peripheral blood were collected at 1 month before exposure (M0), 6 months of exposure (M6), 12 months of exposure (M12), and 6 months after exposure (M18). The semen quality was assessed with computer-assisted analysis system, and the serum levels of reproductive hormones, including prolactin (PRL), luteinizing hormone (LH), follicle-stimulating hormone (FSH), and testosterone were analyzed by ELISA. Compared with those at M0, total sperm count, sperm density, motility, survival rate, and serum levels of LH, PRL and testosterone were significantly decreased, whereas the liquefaction time was significantly prolonged and serum FSH level was significantly increased at M6 (p<0.05). At M12, total sperm count and sperm density increased, whereas sperm motility, survival rate, and the liquefaction time further decreased. Sperm velocities, progression ratios, and lateral head displacements were also decreased. Serum FSH level decreased while serum LH, PRL, and testosterone levels increased. Compared with those at M6, the changes in these detected parameters of semen and hormone at M12 were significant (p<0.05). At M18, all these detected
parameters except testosterone level returned to levels comparable to those before exposure. In conclusion, hypoxia at high altitude causes adverse effects on semen quality and reproductive hormones, and these effects are reversible.” [https://www.ncbi.nlm.nih.gov/pubmed/26288097]

- “Fertility in a high-altitude environment is compromised by luteal dysfunction: the relative roles of hypoxia and oxidative stress...Exposure of the sheep to high-altitude hypobaric hypoxia for short or long time periods affects the development and function of the corpus luteum. Moreover, the observed association of oxidative stress with hypoxia and the absence of any significant effect of antioxidant vitamins on most anatomical and functional corpus luteum traits suggests that the effects of high altitude on this ovarian structure are mainly mediated by hypoxia. Thus, these findings may help explain the decrease in sheep fertility at a high altitude.” [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3614875/]

- “Effect of high altitude exposure on spermatogenesis in male military personnel... The Ganbala group had the lowest semen volume (2.72 mL), which was significantly lower than that of the other 3 groups. The sperm density in the Ganbala group (33.89×10^6/mL) was markedly lower than that of the other three groups. The total sperm count was the lowest in the Golmud group (80.61×10^6). The percentage of grade A sperms in the Lhasa group (12.04%) and the Ganbala group (12.31%) was significantly lower than that of the Golmud group (18.63%) and Chengdu group (18.73%). The percentage of grade A+B sperms in the Lhasa group (24.50%) and the Ganbala group (24.93%) was significantly lower than that of the Golmud group (29.35%) and Chengdu group (30.54%). Conclusion High altitude (> 3650 m) has marked impact on semen quality.” [http://www.ijcem.com/files/ijcem0018367.pdf]

- “Altitude and Fertility...CLINICIANS OFTEN REMARK that aircraft personnel seem to form a disproportionately large percentage of infertile men...The Spanish conquerors at 14,000 feet (Potosi, Bolivia) did not have offspring until 58 years after the city was founded. In 1535 the capital of Peru was transferred from Fauja (11,500 ft.) to Lima (sea level) because the horses, fowl and pigs did not reproduce. Monge speaks of the loss of libido and of the increased risk of miscarriage and stillbirth which lowlanders undergo when transferred to high altitudes. Only the unacclimatized individual loses fertility at high altitudes; the native populations experience no difficulty.” [https://www.fertstert.org/article/S0015-0282(16)30128-5/pdf]
Altitude Diseases: Pregnancy Damage

• “Pregnancy and high altitude” https://www.bmj.com/rapid-response/2011/11/03/pregnancy-and-high-altitude
• “Is It Safe To Be At A High Altitude During Pregnancy?...There is limited data on the actual impact of high altitude in pregnancy and what's available suggests that this may aggravate complications of pregnancy and prenatal life such as: Fetal growth retardation. An increased incidence of the complications of pre-eclampsia. Neonatal hyperbilirubinemia. Short-term abnormalities in fetal heart rate.” https://www.babymed.com/daily-living/high-altitude-elevation-during-pregnancy-and-complications
Altitude Diseases: Brain Damage

- “Mountain Climbing Bad for the Brain...Overall, the researchers found that the cognitive abilities that were most likely to be affected were the climbers’ executive function and memory...are most likely to be due to progressive, subtle brain insults caused by repeated high-altitude exposure.” [https://well.blogs.nytimes.com/2008/10/20/mountain-climbing-bad-for-the-brain/]
- “Evidence of Brain Damage after High-altitude Climbing by Means of Magnetic Resonance Imaging...We conclude that there is enough evidence of brain damage after high altitude climbing; the amateur climbers seem to be at higher risk of suffering brain damage than professional climbers.” [http://www.amjmed.com/article/S0002-9343(05)00674-1/fulltext]
Altitude Diseases: Lung Damage

- “Lung testing has shown that I have an above average lung volume which is consistent with a decade of high altitude work.” Steven Magee CEng MIET - Q
- “The lung at high altitude...A new classification of altitude levels based on the effects on performance and well-being has been recently proposed [1]: the decrease in partial pressure of oxygen reduces maximal oxygen uptake and impairs "aerobic" performance by reducing maximal aerobic power. Submaximal exercise performance is also impaired at altitude. When the acclimatization is not adequate, hypoxia triggers maladaptive responses that lead to various forms of high altitude illness or acute mountain sickness (AMS), characterized by headache plus gastrointestinal symptoms (anorexia, nausea) and sleep disturbances. AMS is present in 10-30% of subjects at altitudes between 2500 and 3000 m a.s.l. and is usually due to a fast ascent. It is well defined by the short phrase: "Too fast, too high". Less frequent, but much more serious, consequences are high-altitude cerebral edema (HACE), and high-altitude pulmonary edema (HAPE).”
- “Lung Disease at High Altitude...hypoxia triggers maladaptive responses that lead to various forms of acute and chronic high altitude illness, such as high-altitude pulmonary edema or chronic mountain sickness. Because the respiratory system plays a critical role in these adaptive and maladaptive responses, patients with underlying lung disease may be at increased risk for complications in this environment and warrant careful evaluation before any planned sojourn to higher altitudes. In this review, we describe respiratory disorders that occur with both acute and chronic exposures to high altitudes. These disorders may occur in any individual who ascends to high altitude, regardless of his/her baseline pulmonary status. We then consider the safety of high-altitude travel in patients with various forms of underlying lung disease. The available data regarding how these patients fare in hypoxic conditions are reviewed, and recommendations are provided for management prior to and during the planned sojourn.”
- “Effects of high altitude exposure on the lungs of young rats...Month-old male rats were exposed in a hypobaric chamber to a simulated altitude of 4200 m (Pb = 450 mm Hg). After 20–21 days, exposed animals had significantly greater lung volumes and alveolar surface areas than controls. Animals sacrificed after 7 days of exposure had lungs that were abnormally heavy relative to their volume; this increase in lung density was due to an increase in non-blood lung water, presumably as edema fluid. After 20–21 days, lung density and water content had returned essentially to normal. The volume of blood remaining in the lungs after removal from the animal was not influenced by high altitude exposure. The findings indicate that young rats exposed to high altitude undergo an initial period of mild pulmonary edema; during this period the rate of alveolar development is probably not increased above normal. With continued exposure, the edema subsides and alveolar proliferation occurs at a faster rate than in control animals. This results eventually in increased lung volumes and alveolar surface areas in high altitude animals, a change which probably has adaptive significance.”
- "Pulmonary Hypertension...Mountain climbers all develop the condition"
- “Pulmonary Hypertension - This condition of high blood pressure in the lungs can occur from
many causes. Since high blood pressure in the pulmonary vessels is a main mechanism that leads to HAPE, persons with pulmonary hypertension have a much higher risk of developing HAPE and need to consider this risk before coming to altitude.”

http://www.altitudemedicine.org/altitude-and-pre-existing-conditions/

- "The finding that the lung, not the heart, is the limiting factor at high altitude is reassuring to older persons, but cautionary for those with minor lung problems." Going Higher. Oxygen, Man, And Mountains.
Altitude Diseases: Heart Damage

- “I routinely encountered people in high altitude observatories that openly stated that they had medically diagnosed heart issues. A high altitude observatory is a place where these people probably should not have been working due to the increased risk of heart attacks.” Steven Magee CEng MIET - Q
- “Effect of Altitude on the Heart and the Lungs...patients with cardiovascular disease seek advice from their physician about journeying to high altitude. We have attempted to make some reasonable recommendations on the basis of published evidence and pathophysiology. High-altitude exposure may unpredictably precipitate an acute coronary syndrome or death. Not only will sea level exercise capacity be reduced on account of physiological changes, but angina may worsen at least for the first few days in association with increased heart rate and systolic blood pressure. In addition, the symptoms of high-altitude illnesses may be confused with those of cardiopulmonary disease such as myocardial infarction, acute pulmonary embolism, and heart failure. Exposure to high altitude may unmask coronary artery disease, left ventricular dysfunction, or pulmonary hypertension that was asymptomatic at sea level.”
  https://www.ahajournals.org/doi/full/10.1161/circulationaha.106.650796
- “Why heart function is reduced at high altitude...For over a century, we have known that high altitude reduces the amount of blood the heart pumps around the body with each beat. New research has unearthed why this is the case and the findings will be important for people who live, travel and exercise at high altitudes.”
  https://www.sciencedaily.com/releases/2018/05/180529092127.htm
- “Physically Unprepared Skiers Face Heart Risk. High Altitudes and Low Temperatures Add to Risk of a Heart Attack on the Slopes...Altitude may also play a role, he tells WebMD. The heart attacks occurred at an average altitude of 4,429 feet, while the patients lived at an average of only 557 feet above sea level....American Heart Association spokesman Ray Gibbons, MD, professor of medicine at the Mayo Clinic in Rochester, Minn., tells WebMD that inadequate physical preparation, high altitudes, and cold temperatures create a "perfect storm" for heart attacks.”
  https://www.webmd.com/heart/news/20100901/physically_unprepared_skiers_face_heart_risk
- “Heart risks for climbers at altitude...in a team of 16 healthy mountaineers, without a previous history of heart disease, more than half (56.3%) experienced rhythm disturbances at altitudes of 4,100 metres or above. These were either significant pauses in their heart beat – where the heart stops for three seconds or more – or very fast or irregular heartbeats. The pauses generally took place at night, while the climbers were asleep. All identified abnormalities disappeared once climbers descended below 4100m...going above 4000m could potentially exacerbate any pre-existing conditions which climbers may, or may not already be aware of, and this should be taken into account when planning expeditions.”
- "A high prevalence of patent ductus arteriosus and atrial septal defect was found at the three high altitude sites and the effect of altitude was progressive."
- “Minor heart feature may mean trouble at high altitude. Small opening in heart that doesn't close in infancy is linked to potentially serious health complications...Most surprising to researchers was that, even after two weeks of living at 17,000 feet, the PFO subjects didn't
increase ventilation to the same extent as the subjects without PFO. Forty percent of the PFO subjects were still suffering from acute mountain sickness after five days at altitude, whereas 10 percent of subjects without PFO still had acute mountain sickness at five days.”

- “ECGs of immigrants to high altitude demonstrate an increase in RV hypertrophy with increased duration of high-altitude residence. Loss of normal circadian rhythm and QTc prolongation have been described in both infants and adults.”

- “The amount of people I met that had heart problems surprised me in high altitude astronomy. I had not seen it in other fields. After a decade of working at high altitudes, I was also diagnosed with a heart problem.” Steven Magee CEng MIET - Q

- “Relationship of Hypoxia to Arrhythmia and Cardiac Conduction Hemorrhage”

- “The hypoxemia (lowering of SpO2) is the independent risk factor leading to arrhythmia...Compared with the non-cardiac disease group, patients in cardiac disease group has significantly lower toleration ability against hypoxia, and its SpO2 warning value is lower than 0.95.”

- “Study shows increased risk of heart attack from physical exertion at altitude and low temperatures during winter sports vacations..The research shows that inadequate preparation for the intense physical exertion required, combined with the effects of altitude and low temperature, leads to an increase in heart attack incidents, particularly during the first two days of vacation...sudden cardiac death accounts for a staggering 40 percent of the total fatalities amongst winter sport tourists in the Austrian Alps and, of these, acute myocardial infarction is the leading cause.”

- “Sleeping Altitude and Sudden Cardiac Death..The study found the risk of dying of (sudden cardiac death) on the first day of vigorous mountain exercise was more than five times as high in individuals who had slept at lower elevations on the previous evening as in those who slept at higher elevations...Spending the first night at a higher altitude may have resulted in some degree of acclimatization by reducing the effects of myocardial ischemia, or reduced blood flow to heart tissue, and other triggers of sudden cardiac death.”

- “How to Protect Your Heart While Hiking...Cardiac arrest is the number three killer in the outdoors, and it's responsible for half of all mountain-climbing fatalities. What's more, the typical victim isn't collecting Social Security: He's a 45-year-old weekend warrior bent on matching his youthful pace. .That's because intense exertion, cold weather, and altitude increase stress on the heart, exacerbating key factors like family history, obesity, and smoking.”

- "Chronic exposure to the low oxygen levels found at high altitude can have harmful effects on the cardiovascular system, including elevated pulmonary artery pressure and excessive production of red blood cells...the constellation of symptoms caused by chronic exposure to low oxygen includes either heart failure or a high risk of developing heart failure – in particular, failure of the right ventricle, which pumps blood into the lungs." Going Higher. Oxygen, Man, And Mountains.
Altitude Diseases: Acute Mountain Sickness (AMS)

- “Acute Mountain Sickness...Hikers, skiers, and adventurers who travel to high altitudes can sometimes develop acute mountain sickness. Other names for this condition are altitude sickness or high altitude pulmonary edema. It typically occurs at about 8,000 feet, or 2,400 meters, above sea level. Dizziness, nausea, headaches, and shortness of breath are a few symptoms of this condition. Most instances of altitude sickness are mild and heal quickly. In rare cases, altitude sickness can become severe and cause complications with the lungs or brain.” [https://www.healthline.com/health/acute-mountain-sickness](https://www.healthline.com/health/acute-mountain-sickness)

- “Acute mountain sickness...Acute mountain sickness is an illness that can affect mountain climbers, hikers, skiers, or travelers at high altitudes, usually above 8,000 feet (2,400 meters). You are at higher risk for acute mountain sickness if: You live at or near sea level and travel to a high altitude. You have had the illness before. You ascend quickly. You have not acclimatized to the altitude. Alcohol or other substances have interfered with acclimatization. You have medical problems involving the heart, nervous system, or lungs.” [https://medlineplus.gov/ency/article/000133.htm](https://medlineplus.gov/ency/article/000133.htm)

- “Acute Mountain Sickness...It is the most common type of high-altitude illness and occurs in more than one-fourth of people traveling to above 3500 m (11,667 ft) and more than one-half of people traveling to above 6000 m (20,000 ft). Symptoms include headache, fatigue, poor appetite, nausea or vomiting, light-headedness, and sleep disturbances. Symptoms usually occur 6 to 12 hours after ascent and can range from mild to severe. Symptoms usually improve after 1 to 2 days if there is no further ascent, but they can sometimes last longer. In less than 1% of cases, symptoms can progress to high-altitude cerebral edema, a life-threatening condition marked by symptoms of wobbly gait, confusion, and decreased consciousness.” [https://jamanetwork.com/journals/jama/fullarticle/2662892](https://jamanetwork.com/journals/jama/fullarticle/2662892)

- “Acute Mountain Sickness...It is the most common type of high-altitude illness and occurs in more than one-fourth of people traveling to above 3500 m (11,667 ft) and more than one-half of people traveling to above 6000 m (20,000 ft). Symptoms include headache, fatigue, poor appetite, nausea or vomiting, light-headedness, and sleep disturbances. Symptoms usually occur 6 to 10 hours of ascent and often include headache and one or more other symptoms, such as light-headedness, loss of appetite, nausea, vomiting, fatigue, weakness, or irritability. Some people describe the symptoms as similar to those of a hangover. Symptoms usually last 24 to 48 hours. Rarely, acute mountain sickness progresses to a more severe form of altitude disease known as high-altitude cerebral edema.” [https://www.merckmanuals.com/home/injuries-and-poisoning/altitude-diseases/altitude-diseases](https://www.merckmanuals.com/home/injuries-and-poisoning/altitude-diseases/altitude-diseases)

- “Altitude Diseases...As altitude increases, the atmospheric pressure decreases, thinning the air so that less oxygen is available. For example, compared with the air at sea level, the air at 19,000 feet (5,800 meters) contains only half the amount of oxygen. In Denver, which is located about 5,300 feet (1,615 meters) above sea level, the air contains 20% less oxygen. Most people can ascend to 5,000 to 6,500 feet (1,500 to 2,000 meters) in one day without problems, but about 20% of people who ascend to 8,000 feet (2,500 meters) and 40% who ascend to 10,000 feet (3,000 meters) develop some form of altitude disease. The rate of ascent, highest altitude reached, and sleeping altitude all influence the likelihood of developing the disorder. The organs most commonly affected by altitude diseases are the Brain (causing acute mountain sickness and rarely high-altitude cerebral edema) Lungs (causing high-altitude pulmonary edema)” [https://www.merckmanuals.com/home/injuries-and-poisoning/altitude-diseases/altitude-diseases](https://www.merckmanuals.com/home/injuries-and-poisoning/altitude-diseases/altitude-diseases)
altitude-diseases
Altitude Diseases: Subacute Mountain Sickness (SMS)

- “A Review of the Physiology and Nutrition in Cold and in High-Altitude Environments by the Committee on Military Nutrition Research...Subacute Mountain Sickness. A new syndrome, termed subacute mountain sickness, was observed in healthy young soldiers who had spent several months at extremely high altitudes of approximately 22,000 ft (6,706 m) (Anand et al., 1990). As described by Anand and Chandrashekhar (see Chapter 18 in this volume), the syndrome appeared to be one of severe systemic and congestive heart failure without pulmonary hypertension. About 20 percent of the group developed shortness of breath, puffiness of the face and eyelids, anasarca (generalized pitting edema), and pericardial fluid accumulation, with a normal heart size and normal pericardium. Left ventricular function was also normal on cardiac catheterization. These accumulations of fluid all disappeared in a few weeks at sea level with no additional therapy.”

https://www.ncbi.nlm.nih.gov/books/NBK232855/
Altitude Diseases: Subacute Infantile Mountain Sickness (SIMS)

- “A Case of Subacute Infantile Mountain Sickness in a Kyrgyz Child…Subacute infantile mountain sickness (SIMS) is a syndrome of severe pulmonary hypertension and right heart failure that develops in infants born in the lowlands and subsequently brought to live at high altitudes. Earlier postmortem studies have demonstrated significant remodeling of small pulmonary arteries as well as right ventricular hypertrophy and dilatation. In this report, we present a case of SIMS in a Kyrgyz child born to a native highlander mother evaluated by conventional echocardiography and tissue Doppler imaging. An echocardiogram showed severe pulmonary hypertension, a markedly dilated right ventricle with flattening of interventricular septum, and right ventricular dysfunction. To our knowledge, this is the first report of noninvasive imaging of pulmonary circulation and right ventricle in an infant with SIMS and confirmed the diagnosis using echocardiography.”

- “Children at High Altitude: An International Consensus Statement by an Ad Hoc Committee of the International Society for Mountain Medicine, March 12, 2001...In addition to the studies of AMS in children that are outlined in Table 1, members of the consensus group are aware of a number of anecdotes in which altitude may have been a contributing factor to significant illness and death. These cases include children with no underlying disease, children with a history of perinatal pulmonary disorders, children with respiratory infections, and children with underlying cardiac conditions. Some of these case reports are sketched in Table 2.”

- “Up to which altitude above sea level a potential risk of hypoxia is negligible for infants? Under which circumstances?... Unfortunately, the particular risks of exposure of children to high altitude have been little studied and much of the advice must necessarily be extrapolated from adult data with due consideration of the influence of growth and development…In circumstances where the child is traveling above 2500m altitude because of parental occupation and prolonged altitude residence is anticipated, slow graded ascent should be undertaken. For infants (<1 year) planning to reside permanently at altitude, delaying ascent to altitude until beyond the first year of life is recommended because of the slight risk of SIMS (subacute infantile mountain sickness) above 3000m. This is usually impractical if parental separation is to be avoided. Therefore, after a careful physical exam before ascent and initial acclimatization to high altitude, the infant should be followed closely with respect to growth percentiles, pulse oximetry may be useful, especially during sleep, and the ECG should be monitored periodically for the development of right ventricular hypertrophy.”

- “The effects of flight and altitude...Increasing numbers of infants and children journey by aeroplane, or travel to high altitude destinations, for example, on holiday or as part of a population migration. Most are healthy, although increasingly children may be transported by aeroplane or helicopter specifically to obtain treatment for severe illness or injury. It is therefore useful to review the effects of altitude, and their relevance to children who undertake flights or travel to, or at high altitudes, particularly those with acute and chronic medical conditions… Recent recommendations for children included advice to start descent immediately in any child who becomes unwell above 2500 m. Because of the risks of subacute infantile mountain sickness, it was also recommended that children under 2 should sleep no higher than 2000 m,
and children 2–10 years, no higher than 3000 m. In addition, travellers should be aware of the underlying illnesses that increase susceptibility to hypoxia related problems”
https://adc.bmj.com/content/89/5/448

- “Children in the mountains. High mountain trekking holidays are best avoided for the very young...Prolonged exposure to high altitude should be avoided in infants aged under 1 year because of the risk of subacute infantile mountain sickness. This condition is characterised by pulmonary hypertension and consequent fatal right heart failure and occurs in up to 1% of infants of lowland parents who are born at 3000-5000 m or arrive there shortly after birth. It was first described in Tibet, where it almost exclusively affects infants of Han Chinese origin who have recently migrated from low altitude areas.”
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1112806/

- “Are Children Safe at High Altitudes?...I am planning to go to Lhasa via train with my 3-year-old. The city is at 12,500 feet and the train goes over a pass as high as 16,650 feet. I want to know if it is safe to take children to such a high altitude...the challenge of traveling with toddlers is that they will not be able to communicate if they are having symptoms...My advice is not to take the train to Lhasa with the 3-year-old.”

- “The observatory management team were advised not to allow an infant to stay at the high altitude observatory by their observatory director and the National Optical Astronomical Observatory (NOAO) health and safety manager. They ignored both of them and allowed the infant to stay at the industrialized research facility. The industrial facility was regarded as health and safety risk to the infant and had infestations of rodents and scorpions. It was regularly sprayed with pesticides by pest control.” Steven Magee CEng MIET - Q

- “NOAO is the national center for ground-based nighttime astronomy in the United States and is operated by the Association of Universities for Research in Astronomy (AURA), under cooperative agreement with the National Science Foundation.”
https://www.noao.edu/

- "Pesticides and your baby...Pesticides are more dangerous for babies and children than adults because their bodies are still developing. Some research shows that exposure to pesticides as a baby may be linked to childhood cancer and development or behavior problems."" https://www.marchofdimes.org/pesticides-and-your-baby.aspx

- "Inside Edition Appearance by Scorpion Sweepers...In this clip from Inside Edition you will see the story of a baby that was stung by a scorpion in Oracle, Arizona. The child was rushed to the University of Arizona Medical Center, after five agonizing days she was released having fully recovered." https://www.scorpsweep.com/inside-edition-appearance/

- "Kids, Mice and Rats: The Medical Risks of Rodents in Your Home, & 10 Ways to Get Rid of Them...our kids were exposed to rats in a mobile home we visit on a country property. A few days after the rat exposure, my 11-year-old developed a fever of 103 for six days. I feared the worst– my mom-pediatrician brain knew he could have rat-bite fever or a fatal rodent-borne illnesses...keep the kids away from the rodents. If you have mice in your attic or basement, the kids can’t go there. If there are rats in your shed or crawl space or under your mobile home, you need to keep your kids out of these areas.”
Altitude Diseases: High-Altitude Cerebral Edema (HACE)

- "High-altitude cerebral edema (HACE) is a medical condition in which the brain swells with fluid because of the physiological effects of traveling to a high altitude. It generally appears in patients who have acute mountain sickness and involves disorientation, lethargy, and nausea among other symptoms. It occurs when the body fails to acclimatize while ascending to a high altitude. It appears to be a vasogenic edema (fluid penetration of the blood–brain barrier), although cytotoxic edema (cellular retention of fluids) may play a role as well. Individuals with the condition must immediately descend to a lower altitude or coma and death can occur. Patients are usually given supplemental oxygen and dexamethasone as well. HACE can be prevented by ascending to heights slowly to allow the body more time to acclimatize. Acetazolamide also helps prevent the condition. Untreated patients usually die within 48 hours. Those who receive treatment may take weeks to fully recover. It is a rare condition, occurring in less than one percent of people who ascend to 4,000 metres (13,000 ft). First described in 1913, little was known about the cause of the condition until MRI studies were performed in the 1990s."

- "Altitude Illness, Cerebral Syndromes, High Altitude Cerebral Edema (HACE)...High Altitude Cerebral Edema (HACE) is a severe and potentially fatal manifestation of high altitude illness and is often characterized by ataxia, fatigue, and altered mental status. HACE is often thought of as an extreme form/end-stage of Acute Mountain Sickness (AMS). Although HACE represents the least common form of altitude illness, it may progress rapidly to coma and death as a result of brain herniation within 24 hours, if not promptly diagnosed and treated...HACE generally occurs after 2 days above 4000m but can occur at lower elevations (2500m) and with faster onset."

- "High altitude cerebral edema with a fatal outcome within 24 h of its onset: Shall acclimatization be made compulsory?...HACE presents a serious threat to the life hence, graded, reasonable rate of ascent to high altitude must be done in order to prevent HACE. Early recognition of the symptoms and its treatment, proper oxygenation and descent to lower altitude is the key to surviving this clinical entity. Acclimatization should be made compulsory or a word of caution is warranted to the young, healthy, and enthusiastic tourists to high altitude to hold their nerves before indulging in recreational activities and should give time to adjust to the environment."

- "HIGH-ALTITUDE CEREBRAL EDEMA...Injury Prevention. Gradual ascent – Less than 1,000 meters (3,300 feet) per day. Avoid sleeping higher than 300 meters (980 feet) for more than one night. Acetazolamide or dexamethasone can lower the risk of developing HACE."

- "Climbers Face Lasting Effects if Brain Swells...HACE typically occurs at altitudes above 7,000 feet and is considered the end stage of severe acute mountain sickness, or altitude sickness. It's long been thought to be a fully reversible condition if the patient survives, but some work suggests that it does leave traces in the brain – particularly, hemosiderin deposits, or remnants of microbleeds. These can be picked up on a very sensitive form of MRI called susceptibility-weighted imaging, Knauth said. So he and colleagues conducted these scans on 36 mountaineers...Overall, Knauth and colleagues found that the microbleeds in the corpus callosum occurred almost exclusively in climbers who'd had HACE -- 8 of the 10 of these mountaineers had definite evidence of microbleeds, while two had "questionable" bleeds. Only
one patient with severe acute mountain sickness also showed evidence of microbleeds, the lone false-positive result, Knauth said. There was one questionable finding in a patient who'd had HAPE and two questionable findings in those who'd been at altitude without becoming ill.”

https://www.medpagetoday.com/meetingcoverage/rsna/36195
Altitude Diseases: High-Altitude Pulmonary Edema (HAPE)

- “High-altitude pulmonary edema (HAPE) is a life-threatening form of non-cardiogenic pulmonary edema (fluid accumulation in the lungs) that occurs in otherwise healthy mountaineers at altitudes typically above 2,500 meters (8,200 ft).[1] However, cases have also been reported at lower altitudes (between 1,500–2,500 metres or 4,900–8,200 feet in highly vulnerable subjects), though what makes some people susceptible to HAPE is currently unknown. HAPE remains the major cause of death related to high-altitude exposure, with a high mortality rate in the absence of adequate emergency treatment.”
  https://en.wikipedia.org/wiki/High-altitude_pulmonary_edema

- “What Happens to Your Body When You Climb Everest...Lungs.  Starting at around 9,000 feet, your lungs may begin to swell due to a constriction of blood vessels, which can cause fluid to leak and accumulate. This can lead to a persistent cough, labored breathing, and greater perceived exertion upon exercise, all of which are common among climbers or even just people traveling from sea level to Colorado.  If the swelling in your lungs exacerbates, however, a dangerous condition called high-altitude pulmonary edema (HAPE) can occur. Symptoms to look out for include a bluish discoloration of the skin, abnormally rapid breathing, and fever. Like HACE, the most effective treatment for HAPE is descending immediately, and the best way to prevent it is to ascend slowly and with proper acclimatization.”

- “High altitude pulmonary edema-clinical features, pathophysiology, prevention and treatment...High altitude pulmonary edema (HAPE) is a noncardiogenic pulmonary edema which typically occurs in lowlanders who ascend rapidly to altitudes greater than 2500-3000 m. Early symptoms of HAPE include a nonproductive cough, dyspnoea on exertion and reduced exercise performance. Later, dyspnoea occurs at rest. Clinical features are cyanosis, tachycardia, tachypnoea and elevated body temperature generally not exceeding 38.5°C. Rales are discrete initially and located over the middle lung fields. HAPE mainly occurs due to exaggerated hypoxic pulmonary vasoconstriction and elevated pulmonary artery pressure. It has been observed that HAPE is a high permeability type of edema occurring also due to leaks in the capillary wall (‘stress failure’). Slow descent is the most effective method for prevention; in addition, graded ascent and time for acclimatization, low sleeping altitudes, avoidance of alcohol and sleeping pills, and avoidance of exercise are the key to preventing HAPE. Treatment of HAPE consists of immediate improvement of oxygenation either by supplemental oxygen, hyperbaric treatment, or by rapid descent.”
  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3617508/

- “High-Altitude Pulmonary Edema Is Initially Caused by an Increase in Capillary Pressure...High-altitude pulmonary edema (HAPE) is characterized by severe pulmonary hypertension and bronchoalveolar lavage fluid changes indicative of inflammation. It is not known, however, whether the primary event is an increase in pressure or an increase in permeability of the pulmonary capillaries...Conclusions—HAPE is initially caused by an increase in pulmonary capillary pressure.”
  https://www.ahajournals.org/doi/abs/10.1161/01.cir.103.16.2078
Altitude Diseases: Hypoxic Pulmonary Vasoconstriction (HPV)

- “Hypoxic pulmonary vasoconstriction (HPV), also known as the Euler-Liljestrands mechanism, is a physiological phenomenon in which small pulmonary arteries constrict in the presence of alveolar hypoxia (low oxygen levels). By redirecting blood flow from poorly-ventilated lung regions to well-ventilated lung regions, HPV is thought to be the primary mechanism underlying ventilation/perfusion matching.[1][2] The process might initially seem counterintuitive, as low oxygen levels might theoretically stimulate increased blood flow to the lungs to increase gas exchange. However, the purpose of HPV is to distribute bloodflow regionally to increase the overall efficiency of gas exchange between air and blood. While the maintenance of ventilation/perfusion ratio during regional obstruction of airflow is beneficial, HPV can be detrimental during global alveolar hypoxia which occurs with exposure to high altitude, where HPV causes a significant increase in total pulmonary vascular resistance, and pulmonary arterial pressure, potentially leading to pulmonary hypertension and pulmonary edema. Several factors inhibit HPV including increased cardiac output, hypocapnia, hypothermia, acidosis/alkalosis, increased pulmonary vascular resistance, inhaled anesthetics, calcium channel blockers, positive end-expiratory pressure (PEEP), high-frequency ventilation (HFV), isoproterenol, nitric oxide, and vasodilators.”

- “Hypoxic Pulmonary Vasoconstriction...Characterization of Hypoxic Pulmonary Vasoconstriction. Increased pulmonary vascular resistance (PVR) and pulmonary artery (PA) pressure upon ascent to high altitude or exposure to normobaric hypoxia universally occur in humans and other mammals. HPV can be detected with elevations in altitude as low as 1600—2500 m or with reductions in FIO2 to 0.15–0.18 (Levine et al., 1997; Smith et al., 2012; Swenson et al., 1994). The magnitude of HPV can vary almost five-fold among individuals (Fig. 1; Gruenig et al., 2000) and among species, in part related to total pulmonary vascular smooth muscle (Fig. 2; Faraci et al., 1984; Tucker et al., 1975), and with time at altitude from minutes to several days (Dorrington et al., 1997; Groves et al., 1987). HPV is the earliest mechanism that elevates PA pressure and PVR with hypoxic or high altitude exposure, but ultimately other mechanisms (perhaps partly in reaction to the initial elevation of pressure initiated by HPV along with greater cardiac output), but also activation of pressure-independent hypoxia- sensitive inflammatory and proliferative pathways (Voelkel et al., 2013) may more importantly contribute to the sustained pulmonary vascular resistance as a consequence of vascular remodeling that is generally established within days to weeks of continuous alveolar hypoxia (Grover, 1985; Sommer et al., 2008). These aspects beyond early HPV are discussed elsewhere in this issue by Welsh and Peacock. Acute HPV progressively diminishes over time with sustained hypoxia in newcomers to high altitude, as assessed by a fall in pressure and resistance with oxygen breathing. As early as 8 hours (Dorrington et al., 1997) through 1–3 days (Kronenberg et al., 1971; Maggiorini et al., 2001), the rise in pressure cannot be quickly and fully reversed with return to normoxia (Fig. 2). Within one to several weeks there is little response to oxygen over the first several hours of inhalation (Dubowitz and Peacock, 2007; Groves et al., 1987; Rotta et al., 1956). Reversibility with oxygen is usually the method to assess acute HPV in subjects already at altitude rather than exposing the subjects to more hypoxia, which of course is the means to test for HPV at low altitude. Whether those that have little vasodilation with oxygen also have little further vasoconstriction with additional hypoxia
has never been studied.”

- “Hypoxic pulmonary vasoconstriction...Altitude sickness is a commonly used term for syndromes encountered at an altitude >2500 m, comprising acute mountain sickness (AMS), high-altitude cerebral oedema (HACE), and high-altitude pulmonary oedema (HAPE). The high-altitude environment causes hypobaric hypoxia. In this environment HPV is triggered in all lung regions, and the response can become exaggerated and pathological. In HAPE there is increased sympathetic tone and very active HPV, resulting in uneven pulmonary vasoconstriction, leading to over-perfusion of some regions of the pulmonary vascular bed. Increased pulmonary capillary pressure then leads to stress failure of pulmonary capillaries. The end result is a patchy accumulation of extravascular fluid in the alveolar spaces that impairs lung function and can, in severe instances, prove fatal. In people at altitude who are susceptible to HAPE, dexamethasone can reduce the HPV response and be used to prevent and treat HAPE. The calcium channel blocker nifedipine is another drug used to prevent and treat HAPE. However, the most effective and reliable treatment of established HAPE is immediate descent and adequate flow of supplemental oxygen accompanied by rest from strenuous physical activity.”

- “Hypoxic Pulmonary Vasoconstriction. From Molecular Mechanisms to Medicine...Hypoxic pulmonary vasoconstriction (HPV) is a homeostatic mechanism that is intrinsic to the pulmonary vasculature. Intrapulmonary arteries constrict in response to alveolar hypoxia, diverting blood to better-oxygenated lung segments, thereby optimizing ventilation/perfusion matching and systemic oxygen delivery. In response to alveolar hypoxia, a mitochondrial sensor dynamically changes reactive oxygen species and redox couples in pulmonary artery smooth muscle cells (PASMC). This inhibits potassium channels, depolarizes PASMC, activates voltage-gated calcium channels, and increases cytosolic calcium, causing vasoconstriction. Sustained hypoxia activates rho kinase, reinforcing vasoconstriction, and hypoxia-inducible factor (HIF)-1α, leading to adverse pulmonary vascular remodeling and pulmonary hypertension (PH). In the nonventilated fetal lung, HPV diverts blood to the systemic vasculature. After birth, HPV commonly occurs as a localized homeostatic response to focal pneumonia or atelectasis, which optimizes systemic PO2 without altering pulmonary artery pressure (PAP). In single-lung anesthesia, HPV reduces blood flow to the nonventilated lung, thereby facilitating thoracic surgery. At altitude, global hypoxia causes diffuse HPV, increases PAP, and initiates PH. Exaggerated or heterogeneous HPV contributes to high-altitude pulmonary edema. Conversely, impaired HPV, whether due to disease (eg, COPD, sepsis) or vasodilator drugs, promotes systemic hypoxemia. Genetic and epigenetic abnormalities of this oxygen-sensing pathway can trigger normoxic activation of HIF-1α and can promote abnormal metabolism and cell proliferation. The resulting pseudohypoxic state underlies the Warburg metabolic shift and contributes to the neoplasia-like phenotype of PH. HPV and oxygen sensing are important in human health and disease.”
Altitude Diseases: Hypoxic Ventilatory Response (HVP)

- “Hypoxic ventilatory response (HVR) is the increase in ventilation induced by hypoxia that allows the body to intake and process oxygen at higher rates. It is initially elevated in lowlanders who travel to high altitude, but reduces significantly over time as people acclimatize.[1][2] In biological anthropology, HVR also refers to human adaptation to environmental stresses resulting from high altitude.[3] In mammals, HVR invokes several physiological mechanisms. It is a direct result of the decrease in partial pressure of oxygen in arterial blood, and leads to increased ventilation. The body has different ways of coping with acute hypoxia. Mammals that rely on pulmonary ventilation will increase their ventilation to account for the lack of oxygen reaching the tissues.[2] Mammals will also experience decreases in aerobic metabolism and oxygen demand, along with increases in ATP production. The physiological mechanisms differ in effect and in course of time. HVR is time dependent and can be divided into two phases: the first (0–5 minutes) of ventilation increase, and the second (5–20 minutes) of slow decline.[4] The initial increase in ventilation from HVR is initiated by the carotid bodies, which are bilaterally located at the port of brain circulation.[2] Carotid bodies contain oxygen-sensitive cells that become more active in response to hypoxia. They send input to the brainstem which is then processed by respiratory centers. Other mechanisms include hypoxia-inducible factors, particularly HIF1.[2] Hormonal changes have also been associated with HVR, particularly those that affect the functioning of the carotid bodies.[5] As HVR is a response to decreased oxygen availability,[1] it shares the same environmental triggers as hypoxia. Such precursors include travelling to high altitude locations[6] and living in an environment with high levels of carbon monoxide.[7] Combined with climate, HVR can affect fitness and hydration.[2] Especially for lowlanders who traverse past 6000 meters in altitude, the limit of prolonged human exposure to hypoxia, HVR may result in hyperventilation and ultimately the deterioration of the body. Oxygen consumption is reduced to a maximum of 1 liter per minute.[8] Travelers acclimatized to high altitudes exhibit high levels of HVR, as it provides advantages such as increased oxygen intake, enhanced physical and mental performance, and lower susceptibility to illnesses associated with high altitude.[1] Adaptations in populations living at high altitudes range from cultural to genetic, and vary among populations. For example, Tibetans living at high altitudes have a more sensitive hypoxic ventilatory response than do Andean peoples living at similar altitudes,[5][9] even though both populations exhibit greater aerobic capacity compared to lowlanders.[10] The cause of this difference is most likely genetic, although developmental factors may also contribute.[10]”

- “Hypoxic ventilatory response in successful extreme altitude climbers...A very high ventilatory response to hypoxia is believed necessary to reach extreme altitude without oxygen. Alternatively, the excessive ventilation could be counterproductive by exhausting the ventilatory reserve early on. To test these alternatives, 11 elite climbers (2004 Everest-K2 Italian Expedition) were evaluated as follows: 1) at sea level, and 2) at 5,200 m, after 15 days of acclimatisation at altitude. Resting oxygen saturation, minute ventilation, breathing rate, hypoxic ventilatory response, maximal voluntary ventilation, ventilatory reserve (at oxygen saturation = 70%) and two indices of ventilatory efficiency were measured. Everest and K2 summits were reached 29 and 61 days, respectively, after the last measurement. Five climbers summited without oxygen, the other six did not, or succeeded with oxygen (two climbers). At
sea level, all data were similar. At 5,200 m, the five summiteers without oxygen showed lower resting minute ventilation, breathing rate and ventilatory response to hypoxia, and higher ventilatory reserve and ventilatory efficiency, compared to the other climbers. Thus, the more successful climbers had smaller responses to hypoxia during acclimatisation to 5,200 m, but, as a result, had greater available reserve for the summit. A less sensitive hypoxic response and a greater ventilatory efficiency might increase ventilatory reserve and allow sustainable ventilation in the extreme hypoxia at the summit.”


- “Analysis of Hypoxic and Hypercapnic Ventilatory Response in Healthy Volunteers...This is the largest study to date reporting the relationship between gender and HVR/HCVR and the first study assessing the association between genetic polymorphisms in humans and HVR/HCVR. The data suggest that gender has a large effect on hypoxic breathing response.”
  https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0168930

- “Similar hypoxic ventilatory responses in sea-level natives and high-altitude Andean natives living at sea level... it is clear that these migrants from HA had hypoxic sensitivities that were substantially greater than reported for HA subjects resident at HA. This was true not only for the subjects of group A but also for subjects of group B who had been resident at HA from birth for >20 yr and at SL for <5 yr. Particularly for these latter subjects, the evidence from prior studies is persuasive that they should have developed blunting while resident at HA.”
  https://www.physiology.org/doi/full/10.1152/jappl.1998.84.3.1024

- “Reduced hypoxic ventilatory response with preserved blood oxygenation in yoga trainees and Himalayan Buddhist monks at altitude...Caucasian subjects practicing yoga maintain a satisfactory oxygen transport at high altitude, with minimal increase in ventilation and with reduced hematological changes, resembling Himalayan natives. Respiratory adaptations induced by the practice of yoga may represent an efficient strategy to cope with altitude-induced hypoxia.”

- “High altitude respiratory physiology and pathophysiology...At high altitude, reduced atmospheric pressure causes the partial pressure of oxygen to decrease – creating an environment of hypobaric hypoxia which presents a unique set of challenges for the respiratory system. Pulmonary physiological responses such as the hypoxic ventilatory drive are essential for successful acclimatisation, whilst others such as hypoxic pulmonary vasoconstriction may be implicated in the development of altitude illnesses...Hypobaric hypoxia can cause a number of pathophysiological respiratory problems, including some of the most common (e.g. cough) and the most serious (e.g. high altitude pulmonary oedema) altitude related ailments. Hypoxia at altitude can also have significant effects on chronic respiratory conditions such as chronic obstructive pulmonary disease. Further research is required to improve understanding of these conditions and refine treatments. Visitors to altitude should prepare carefully (e.g. planning appropriate ascents and ensuring adequate control of other conditions) before journeying to altitude to minimise risks as much as possible.”
  https://www.shortnessofbreath.it/materiale_cic/872_4_3/7426_high/article.htm
Altitude Diseases: Hypocapnia

- “Hypocapnia or hypocapnea (from the Greek words υπό meaning below normal and καπνός kapnós meaning smoke), also known as hypocarbia, sometimes incorrectly called acapnia, is a state of reduced carbon dioxide in the blood. Hypocapnia usually results from deep or rapid breathing, known as hyperventilation...Symptoms include tingling sensation (usually in the limbs), abnormal heartbeat, painful muscle cramps, and seizures. Acute hypocapnia causes hypocapnic alkalosis, which causes cerebral vasoconstriction leading to cerebral hypoxia, and this can cause transient dizziness, fainting, and anxiety.[1] A low partial pressure of carbon dioxide in the blood also causes alkalosis (because CO2 is acidic in solution), leading to lowered plasma calcium ions and increased nerve and muscle excitability. This explains the other common symptoms of hyperventilation —pins and needles, muscle cramps and tetany in the extremities, especially hands and feet.”
- “Relativity applied to hyperventilation at high altitude...It is well known that the shortfall of PIO2 due to an ascent to high altitude is compensated by hyperventilation that brings about hypocapnia and respiratory alkalosis.”
- “Cerebrovascular Responses to Hypoxia and Hypocapnia in Ethiopian High Altitude Dwellers..The cerebral circulation of Ethiopian high altitude dwellers is insensitive to hypoxia, unlike Peruvian high altitude dwellers. Cerebrovascular responses to PETco2 were greater in Ethiopians than Peruvians, particularly at high altitude. This, coupled with their high PETco2 levels, would lead to high cerebral blood flows, and may be advantageous for altitude living.”
- “Hypoxia, hypocapnia and spirometry at altitude...Both hypoxia and hypocapnia can cause broncho-constriction in humans, and this could have a bearing on performance at high altitude or contribute to altitude sickness. We studied the relationship between spirometry, arterial oxygen saturation and end-tidal carbon dioxide (ETCO2) concentration in a group of healthy lowland adults during a stay at high altitude, and then evaluated the response to supplementary oxygen and administration of a beta 2 agonist. 2. We collected spirometric data from 51 members of the 1994 British Mount Everest Medical Expedition at sea level (barometric pressure 101.2-101.6 kPa) and at Mount Everest Base Camp in Nepal (altitude 5300 m, barometric pressure 53-54.7 kPa) using a pocket turbine spirometer. A total of 205 spirometric measurements were made on the 51 subjects during the first 6 days after arrival at Base Camp. Further measurements were made before and after inhalation of oxygen (n = 47) or a beta 2 agonist (n = 39). ETCO2 tensions were measured on the same day as spirometric measurements in 30 of these subjects. 3. In the first 6 days after arrival at 5300 m, lower oxygen saturations were associated with lower forced expiratory volume in 1 s (FEV1; P < 0.02) and forced vital capacity (FVC; P < 0.01), but not with peak expiratory flow (PEF). Administration of supplementary oxygen for 5 min increased oxygen saturation from a mean of 81%-94%, but there was no significant change in FEV1 or FVC, whilst PEF fell by 2.3% [P < 0.001; 95% confidence intervals (CI) -4 to -0.7%]. After salbutamol administration, there was no significant change in PEF, FEV1 or FVC in 35 non-asthmatic subjects. Mean ETCO2 at Everest Base Camp was 26 mmHg, and a low ETCO2 was weakly associated with a larger drop in FVC at altitude compared with sea level (r = 0.38, P < 0.05). There was no correlation between either ETCO2 or oxygen saturation and changes in FEV1 or PEF compared with sea-level values. 4. In this study, in normal subjects who were acclimatized to hypobaric hypoxia at an altitude of
5300 m, we found no evidence of hypoxic broncho-constriction. Individuals did not have lower PEF when they were more hypoxic, and neither PEF nor FEV1 were increased by either supplementary oxygen or salbutamol. FVC fell at altitude, and there was a greater fall in FVC for subjects with lower oxygen saturations and probably lower ETCO2.”

Altitude Diseases: Respiratory Alkalosis

- “Alkalosis...Your blood is made up of acids and bases. The amount of acids and bases in your blood can be measured on a pH scale. It’s important to maintain the correct balance between acids and bases. Even a slight change can cause health problems. Normally, your blood should have a slightly higher amount of bases than acids. Alkalosis occurs when your body has too many bases. It can occur due to decreased blood levels of carbon dioxide, which is an acid. It can also occur due to increased blood levels of bicarbonate, which is a base...Symptoms of alkalosis can vary. In the early stages of the condition, you may have: nausea, numbness, prolonged muscle spasms, muscle twitching, hand tremors...If alkalosis isn’t treated right away, severe symptoms can develop. These symptoms could lead to shock or coma. Call 911 or go to the nearest emergency room if you experience any of these symptoms: dizziness, difficulty breathing, confusion, stupor, coma” https://www.healthline.com/health/alkalosis

- “Lessons from high-altitude physiology...High-altitude exposure causes a series of normal physiological responses, termed acclimatisation, which mitigate the effects of hypobaric hypoxia. Hypoxic ventilatory stimulation results in improved oxygen uptake but is associated with respiratory alkalosis that may trigger periodic breathing, particularly during sleep, thereby impairing sleep quality. As travelling to high altitude is popular, high-altitude related illnesses that affect subjective wellbeing, reduce physical performance and alter mental status are also frequently observed. They encompass acute mountain sickness (AMS), high-altitude cerebral oedema (HACE) and high-altitude pulmonary oedema (HAPE). Depending on ascent rate and individual susceptibility, symptoms usually occur at altitudes above 2,500 m. Therapeutic options include descent accompanied by administration of oxygen and drugs as required. Prevention is based on appropriate acclimatisation, moderate ascent rate, low sleeping altitude and drugs, including acetazolamide, dexamethasone and nifedipine.” https://breathe.ersjournals.com/content/4/2/122

- “Injurious Effects of Hypocapnic Alkalosis in the Isolated Lung...Mechanical ventilation can worsen morbidity and mortality by causing ventilator-associated lung injury, especially where adverse ventilatory strategies are employed. Adverse strategies commonly involve hyperventilation, which frequently results in hypocapnia. Although hypocapnia is associated with significant lung alterations (e.g., bronchospasm, airway edema), the effects on alveolar-capillary permeability are unknown. We investigated whether hypocapnia could cause lung injury independent of altering ventilatory strategy. We hypothesized that hypocapnia would cause lung injury during prolonged ventilation, and would worsen injury following ischemia–reperfusion. We utilized the isolated buffer-perfused rabbit lung model. Pilot studies assessed a range of levels of hypocapnic alkalosis. Experimental preparations were randomized to control groups (Fi CO2 = 0.06) or groups with hypocapnia (Fi CO2 = 0.01). Following prolonged ventilation, pulmonary artery pressure, airway pressure, and lung weight were unchanged in the control group but were elevated in the group with hypocapnia; elevation in microvascular permeability was greater in the hypocapnia versus control groups. Injury following ischemia–reperfusion was significantly worse in the hypocapnia versus control groups. In a preliminary series, degree of lung injury was proportional to the degree of hypocapnic alkalosis. We conclude that in the current model (1) hypocapnic alkalosis is directly injurious to the lung and (2) hypocapnic alkalosis potentiates ischemia–reperfusion-induced acute lung injury.” https://www.atsjournals.org/doi/full/10.1164/ajrccm.162.2.9911026
“Do Over 200 Million Healthy Altitude Residents Really Suffer from Chronic Acid–Base Disorders?...As the oxygen tension of inspired air falls with increasing altitude in normal subjects, hyperventilation ensues. This acute respiratory alkalosis, induces increased renal excretion of bicarbonate, returning the pH back to normal, giving rise to compensated respiratory alkalosis or chronic hypocapnia. It seems a contradiction that so many normal people at high altitude should permanently live as chronic acid–base patients. Blood gas analyses of 1,865 subjects at 3,510 m, reported a PaCO2 (arterial carbon dioxide tension ± SEM) = 29.4 ± 0.16 mmHg and pH = 7.40 ± 0.005. Base excess, calculated with the Van Slyke sea level equation, is −5 mM (milliMolar or mmol/l) as an average, suggesting chronic hypocapnia. THID, a new term replacing “Base Excess” is determined by titration to a pH of 7.40 at a PaCO2 of 5.33 kPa (40 mmHg) at sea level, oxygen saturated and at 37°C blood temperature. Since our new modified Van Slyke equations operate with normal values for PaCO2 at the actual altitude, a calculation of THID will always result in normal values—that is, zero.”

“High-Altitude Illnesses: Physiology, Risk Factors, Prevention, and Treatment...Hyperventilation accelerates CO2 elimination and produces a respiratory alkalosis by lowering the PaCO2 and raising the pH of the blood. The decrease in PaCO2 and the resulting alkalosis combine to act on the medullary chemoreceptor to decrease ventilation. Consequently, the ventilatory response to hypoxia, the HVR, becomes especially important in maintaining oxygen saturation, since the normal CO2-mediated ventilatory drive is diminished by the hypocapnia. The magnitude and rapidity of onset of the HVR on arrival at altitude varies considerably from individual to individual, and a failure to increase the HVR contributes to hypoxemia and the development of AMS...the initial response to high-altitude hypoxia is a respiratory alkalosis produced by hyperventilation. Within minutes, the kidneys respond to the alkalosis with an increased excretion of bicarbonate ions; this renal effect can continue for hours or days and functions to correct the alkalosis and return the pH of the serum toward a normal value. The kidneys also respond to hypoxia by the secretion of erythropoietin. Erythropoietin leads to an increase in red cell mass and the oxygen-carrying capacity of the blood (dissolved oxygen accounts for only about 2% of the oxygen-carrying capacity); however, it takes several days before an increased rate of erythrocyte production can be measured, and the process is not complete for weeks or months.”

“Ventilatory response at altitude...As distance from the sea level increases, barometric pressure of the air falls; however, the O2 concentration remains unchanged as does water vapor pressure. At sea level barometric pressure is 760mmHg, with 47mmHg vapor pressure, leaving PO2 as 0.21 * (760-47) ≈ 150mmHg. At 19,000ft (Mount Kilimanjaro) the barometric pressure is 380mmHg and thus PO2: 0.21 * (380-47) = 70mmHg. Thus, the PO2 of the inspired air decreases with increasing altitude (decreasing barometric pressure) and the body begins to adapt. These adaptations can be thought of as immediate and delayed (over days to weeks). The most important immediate adaptation is hyperventilation and thus increase in minute ventilation due to the decrease in PaO2, this via stimulation of the peripheral chemoreceptors (central chemoreceptors are not sensitive to falls in PaO2). This results in a respiratory alkalosis. This respiratory alkalosis inhibits breathing, however over the next 2-3 days the pH of the CSF compensates via bicarbonate loss and bicarbonate is further excreted by the kidneys to return blood to normal pH. This allows a continued increase in minute ventilation (via both increasing RR and TV). At altitude the inspired pO2 may fall sufficiently that oxyhemoglobin dissociation
curve is no longer in its upper flat portion. The body compensates by increasing cardiac output to compensate in the short term. In the long term, compensation includes increases in hemoglobin concentration via hypoxia-mediated renal secretion of erythropoietin, thus maintaining DO2 at the expense of increasing viscosity of blood. The oxyhemoglobin dissociation curve shifts rightwards at moderate altitude to assist in unloading of O2, but shifts leftwards with continued increases in altitude to assist in pulmonary oxygen loading. This first rightward shift is caused by increases in 2,3-DPG resulting from the metabolic alkalosis. This adaptation occurs over hours to days. The long-term adaption with sustained presence at altitude causes arterial pH to return to normal and arterial pO2, pCO2 and HCO3- to remain reduced. The body’s sensitivity to rises in pCO2 increases. PVR becomes increased chronically due to hypoxic vasoconstriction. The CO returns to normal with a few days of acclimatization. With continued presence at altitude, vital capacity and FRC is unchanged from baseline, but MV remains elevated.”
Altitude Diseases: High-Altitude Edema

- “High-Altitude Edema...Many hikers experience moderate facial and lower extremity edema during exposure to high altitude with a diuresis and loss of edema on return to a lower elevation. Women are more likely to experience edema than men. A high salt intake will accentuate the edema. The use of acetazolamide (Diamox) or furosemide (Lasix) will prevent fluid retention. The condition is asymptomatic and occurs in normal subjects. The cause is unknown, but aldosterone or other steroids may play a role since an abrupt, moderate decrease in plasma volume occurs within the first 24 hours after exposure to high altitude and may increase the output of sodium-retaining steroids.”
https://jamanetwork.com/journals/jama/article-abstract/657371
Altitude Diseases: Headache

- “High altitude headache. Headache is the most common symptom of high altitude sickness...The International Headache Society (IHS), an international group of headache specialists, has included a definition of high altitude headache in the second edition of their International Classification of Headache Disorders. Their definition is: A. Headache with at least two of the following characteristics and fulfilling criteria C and D, Bilateral, Frontal or frontotemporal (at the front of the head in the region of the temples), Dull or pressing quality, Mild or moderate intensity, Aggravated by exertion, movement, straining, coughing, or bending. B. Ascent to altitude above 2500 metres C. Headache develops within 24 hours after ascent. D. Headache resolves within eight hours of descent.”
- “Six Tips to Avoid A High Altitude Headache and Migraine...Ascend Slowly: Slow your ascent at a rate of 300 metres or 1000 feet a day, if possible, allowing two days of acclimatization. Plan a stopover at a lower altitude. Wait a day before that mountaintop hike or snowmobile ride. Delay Exertion: Wait a day prior to engaging in strenuous exercise at high altitudes. Avoid Alcohol: Find another way to celebrate. Those apres-ski libations at the ski lodge boost your risk. Hydrate Heavily: Make sure you get at least 64 ounces or 2 litres of water a day. Avoid Other Triggers: Limit bright sun reflected by the snow with high-quality goggles or sunglasses. Pack Ibuprofen: If you feel a headache coming on, take ibuprofen quickly to manage inflammation.”
- “Altitude, Acute Mountain Sickness and Headache...AMS headache is usually intense, throbbing and is either generalized or in the forehead. It develops within six hours to four days of arrival at high altitude and can last for up to five days. The headache often worsens with exertion, coughing, straining or lying flat. Facial flushing, eye redness and sensitivity to light may accompany headache.”
- “Higher Altitude Tied to Increased Migraine Prevalence, Symptoms...People who live at high altitudes may experience increased migraine prevalence, duration, and severity of symptoms, according to results from a population-based study conducted in Nepal and published in the European Journal of Neurology.”
- “Does altitude or pressure affect your allergies? - Asthma and allergies...I've been keeping a journal of all the air pressures. Every time the barometer drops below 30, I have been getting a migraine. If I take the butalbital/caffeine tabs early enough when the symptoms appear, I can keep the pain down. But, next to taking a barometer with me at all times, it's hard to monitor when a headache is going to come on...You might ask about having an ear/nose/throat (ENT) doctor do a CT scan of your sinuses. I have had seasonal allergies for years, but have gotten worse in recent years (I'm 58). Yes, changes in altitude/barometric pressure have an effect on my headaches. It turns out that in addition to allergies and the related swelling/mucus, I had a blocked sinus, which was just remedied with surgery. I am hoping this coming summer I won't be getting my annual sinus infection”
https://www.inspire.com/groups/living-with-asthma/discussion/des-altitude-or-pressure-affect-your-allergies/
Altitude Diseases: High Altitude Seizures (HAS)

- “I was diagnosed with absence seizures after a decade of high altitude work up to 13,797 feet.” Steven Magee CEng MIET - Q
- “Absence seizures are one of several kinds of generalized seizures. These seizures are sometimes referred to as petit mal seizures (from the French for "little illness", a term dating from the late 18th century).[1] Absence seizures are characterized by a brief loss and return of consciousness, generally not followed by a period of lethargy (i.e. without a notable postictal state).” https://en.wikipedia.org/wiki/Absence_seizure
- “Altitude induced seizures...Someone asked if being in or maybe it was moving to higher altitudes, or something about altitudes can cause seizures. The answer is now officially - YES. I've had epilepsy mildly all of my life. Then I went from 350 feet above sea level to over 5000 feet and started having seizures nearly immediately (2 days later). I maintained to my then "doctor" that I felt going up in altitude and coincidentally starting to sz was TOO coincidental. He insisted there was no literature to support that. Well guess what? Now there is.” https://www.epilepsy.com/connect/forums/corner-booth/altitude-induced-seizures
- “Altitude and Epilepsy...Seizures have been reported at higher altitudes than the person is accustomed to. Mountain climbing should be avoided for your own safety.” https://www.medhelp.org/posts/Neurology/Altitude-and-Epilepsy/show/697634
- “Seizures at high altitude-still a mystery?...Isolated generalized tonic-clonic seizure at high altitude in a young male trekker with a positive family history of seizure.” https://www.ncbi.nlm.nih.gov/pubmed/25211650
- “Isolated generalized tonic-clonic seizure at high altitude in a young male trekker with a positive family history of seizure.” https://www.ncbi.nlm.nih.gov/pubmed/24559380
- “How do you approach seizures in the high altitude traveler?...Counseling patients who suffer first-time or break-through seizures can be difficult, particularly when controllable external factors may be contributing to the lowering of their seizure threshold. High altitude as a potential trigger for seizures is a common question in our epilepsy clinics in Colorado, and this article reviews the existing anecdotal literature, presents our local experience with high altitude seizures (HAS), offers possible mechanisms to explain how high altitude may trigger seizures, and suggests an initial work-up and prophylactic strategies for future high altitude exposures.” https://www.ncbi.nlm.nih.gov/pubmed/21452959
- “New epilepsy seizure at high altitude without signs of acute mountain sickness or high altitude cerebral edema...Neurological disturbances may be present at high altitude independently of high altitude cerebral edema. We report here the case of a patient who experienced for the first time generalized seizures after spending a night at an altitude of 5200 m, with no preceding symptoms of acute mountain sickness. An initial CT scan performed 12 hours after his loss of consciousness and an MRI scan performed 2 months later were normal. An EEG, obtained 2 months after the event, showed epileptiform discharges triggered by hyperventilation. The description of the clinical event obtained from the witness and the presence of a positive family history strongly support a high altitude-triggered new epileptic seizure. This report suggests that at high altitudes seizure risks in a seizure-prone person may be higher than for normal individuals.” https://www.ncbi.nlm.nih.gov/pubmed/16544970
- “Seizure and hemiparesis at high-altitude outside the setting of acute mountain
Neurologic problems at high altitudes are well known. What is probably less emphasized are neurologic problems at altitude outside the setting of high-altitude cerebral edema. Because neurologic symptoms for these kinds of problems at high altitude are often transient, neuroradiologic scanning for these problems is usually not done or reported. Furthermore, diagnostic testing facilities may be unavailable in these remote high-altitude settings. A patient is described here with transient seizure and right-sided hemiparesis at high altitude with no preceding symptoms of acute mountain sickness. Computed tomography of the head was obtained in a hospital at lower altitude where the patient was taken promptly. The findings of the scan revealed probable focal cerebral edema in the left parietal lobe in keeping with his temporary right-sided weakness. Possible treatment modalities on the mountain for this problem are also discussed.”

- “Fatal grand mal seizure in a Dutch trekker...A 35-year-old healthy Dutch woman went on a trek (Lang Tang) in Nepal up to an approximate altitude of about 3800 meters. She had no prior history of any medical problems except attacks of generalized epilepsy when she was 19 years old, which had been controlled with antiepileptic medications. She had had no attacks after the age of 20. A CT scan done around that time had apparently been normal...When her friends returned to the hotel she was having another grand mal seizure. Medical help was sought, but she died before the doctor arrived to control her seizures. When the doctor did arrive and carried out CPR for half an hour it was to no avail as she continued to have no pulse or blood pressure.” [https://www.ncbi.nlm.nih.gov/pubmed/9876200](https://www.ncbi.nlm.nih.gov/pubmed/9876200)
**Altitude Diseases: High Altitude Stroke (HAS)**

- “High Altitude Stroke...A high altitude stroke (HAS) is usually caused by a blood clot, as the result of the natural thickening of the blood during acclimatization. The decreased blood supply to the brain causes a rapid loss in brain functions, resulting in a stroke. Symptoms usually start suddenly and develop over just seconds or minutes, and further symptoms typically do not arise beyond those first few minutes. Symptoms depend on what part of the brain is affected and may include weakness or numbness in the face, arms or legs, especially on one side of the body, confusion, slurred speech, dizziness, loss of balance, trouble in seeing out of one or both eyes, and severe headache.” [https://www.mountainprofessor.com/high-altitude-stroke.html](https://www.mountainprofessor.com/high-altitude-stroke.html)

- “High altitude exposure and ischemic stroke...This review includes the relationship between acute and chronic high altitude exposure and the possible development of ischemic stroke in high altitude populations. Several risk factors are identified in high altitude dwellers such as polycythemia, increased platelet adhesiveness and greater risk to develop vascular thrombosis. Other conditions such as dehydration, extreme cold and immobilization might lead to increased risk of ischemic stroke in newcomers. Taking into account the limited number of studies, it is argued that high altitude and chronic hypoxia may be risk factors for the development of ischemic stroke. The altitude associated with higher prevalence of ischemic stroke is not clear, but it appears that there is increased risk above 3000m.” [https://www.researchgate.net/publication/270273416_High_altitude_exposure_and_ischemic_stroke](https://www.researchgate.net/publication/270273416_High_altitude_exposure_and_ischemic_stroke)

- “Stroke at High Altitude: Indian Experience... Long-term stay at high altitude is associated with higher risk of stroke. Although all types of stroke were seen, ischemic stroke was the commonest. Massive infarcts were common. Polycythemia was an important risk factor.” [https://www.liebertpub.com/doi/abs/10.1089%2FLI.2F20020753639513](https://www.liebertpub.com/doi/abs/10.1089%2FLI.2F20020753639513)
Altitude Diseases: High Altitude Retinopathy (HAR)

- “High-Altitude Retinal Hemorrhages...Retinal hemorrhages and disc edema at high altitudes have been previously reported. Tschudi in 18391 noted ocular symptoms and signs (blurred vision, ocular pain, and conjunctival hemorrhages) at 12,000 ft in Peru. Sédan2 found retinal hemorrhages in hypertensive subjects at 12,000 ft in 1938. Frayser et al,3 in 1968, found a 37.5% incidence of retinal hemorrhages in climbers on Mt Logan (17,500 ft). Subsequent studies have found even higher frequencies.” https://jamanetwork.com/journals/jama/article-abstract/373695

- “Delayed Appearance of High Altitude Retinal Hemorrhages...When closely examined, a very large amount of climbers exhibit retinal hemorrhages during exposure to high altitudes. The incidence of retinal hemorrhages may be greater than previously appreciated as a definite time lag was observed between highest altitude reached and development of retinal bleeding. Retinal hemorrhages should not be considered warning signs of impending severe altitude illness due to their delayed appearance...Many individuals who ascend to heights above 3000 m develop HAR, reported as engorgement and tortuosity of the retinal vessels, and optic disc hyperemia and swelling, retinal hemorrhages, nerve fiber layer infarction, and even vitreous hemorrhage.” https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3040733/

- “Ocular Problems In High Altitude Travelling” http://www.ijtmgh.com/article_46490_93a5194d8196fd0ca71bb5b401b29a23.pdf

- “High Altitude and the Eye...High altitude has both short-term and long-term effects on the eyes. The short-term effects include high-altitude retinopathy, change in corneal thickness, and photokeratitis. Long-term effects include pterygium, cataract, and dry eye syndrome. High-altitude retinopathy of mild degree does not affect vision but has a predictive value for the development of high-altitude cerebral edema. Change in corneal thickness at altitude induces refractive changes in eyes with radial keratotomy and in eyes with LASIK. High altitude does not adversely affect visual acuity and contrast sensitivity; scotopic vision may be affected if supplemental oxygen is not used.” https://www.ncbi.nlm.nih.gov/pubmed/26107334

Altitude Diseases: High Altitude Renal Syndrome (HARS)

- “High Altitude Renal Syndrome (HARS)...More than 140 million people live permanently at high altitude (>2400 m) under hypoxic conditions that challenge basic physiology. Here we present a short historical review of the populating of these regions and of evidence for genetic adaptations and environmental factors (such as exposure to cobalt) that may influence the phenotypic responses. We also review some of the common renal physiologic responses focusing on clinical manifestations. The frequent presentation of systemic hypertension and microalbuminuria with relatively preserved GFR coupled with the presence of polycythemia and hyperuricemia suggests a new clinical syndrome we term high altitude renal syndrome (HARS). ACE inhibitors appear effective at reducing proteinuria and lowering hemoglobin levels in these patients.” [http://jasn.asnjournals.org/content/22/11/1963.full](http://jasn.asnjournals.org/content/22/11/1963.full)

- “Polyuria (/ˌpɒliˈjʊərɪə/) is excessive or an abnormally large production or passage of urine (greater than 2.5[5] or 3[6] L over 24 hours in adults). Frequent urination is usually an accompanying symptom. Increased production and passage of urine may also be termed diuresis.[7][8] Polyuria often appears in conjunction with polydipsia (increased thirst), though it is possible to have one without the other, and the latter may be a cause or an effect. Psychogenic polydipsia may lead to polyuria. [9] Polyuria is usually viewed as a symptom or sign of another disorder (not a disease by itself), but it can be classed as a disorder, at least when its underlying causes are not clear.[citation needed]...High-altitude diuresis occurs at altitudes above 10,000 feet (3,000 m) and is a desirable indicator of adaptation to high altitudes. Mountaineers who are adapting well to high altitudes experience this type of diuresis. Persons who produce less urine even in the presence of adequate fluid intake are probably not adapting well to altitude.” [https://en.m.wikipedia.org/wiki/Polyuria](https://en.m.wikipedia.org/wiki/Polyuria)

- “Short-term responses of the kidney to high altitude in mountain climbers...Systemic fluid balance and its renal regulation are at the core of adaptation to high altitude and high-altitude sickness. The initial decrease in plasma volume is a quick and powerful reaction to hypoxia that is based on several mechanisms. The magnitude and characteristics of this response may be helpful in predicting the symptoms of AMS.” [http://europepmc.org/articles/PMC3938295](http://europepmc.org/articles/PMC3938295)

- “Volume Regulation and Renal Function at High Altitude across Gender...We report details of changes in hormonal patterns across high altitude sojourn. To our knowledge we are not aware of any study that has examined these hormones in same subjects and across gender during high altitude sojourn.” [http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0118730](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0118730)

- “At altitude, a very common reaction is increased urinary output. The body's kidneys sense the lower level of oxygen immediately and kick into high gear. The kidneys release a hormone, erythropoietin, that commands the bone marrow to produce more red blood cells to increase the oxygen-carrying capacity of the blood. To make room for the increased red cells, the body dumps fluid from the blood - excess urine and collection of fluid in the body's tissues are two direct results of these biological actions.” [https://www2.keck.hawaii.edu/observing/visitor/hyalt.html](https://www2.keck.hawaii.edu/observing/visitor/hyalt.html)

- “Cardiovascular and renal effects of chronic exposure to high altitude...Over 140 million people live at high altitude, defined as living at an altitude of 2400 m or more above sea level. Subjects living under these conditions are continuously living under hypoxic conditions and, depending on the population, various adaptations have developed. Interestingly, subjects living chronically at high altitude appear to have a decreased frequency of obesity, diabetes and coronary artery
disease. However, these benefits on health are balanced by the frequent development of systemic and pulmonary hypertension. Recently, it has been recognized that subjects living at high altitude are at risk for developing high-altitude renal syndrome (HARS), which is a syndrome consisting of polycythemia, hyperuricemia, systemic hypertension and microalbuminuria, but with preserved glomerular filtration rate. More studies should be performed to characterize the mechanisms and etiology of HARS; as such studies may be of benefit not only to the high-altitude population, but also to better understanding of the renal consequences of acute and chronic hypoxia.”

Altitude Diseases: High Altitude Retinal Hemorrhage (HARH)

- “High Altitude Retinal Hemorrhage...To conclude the pathophysiology of HARH remain still obscure and even the retina and the optic nerve are closely related to the brain and cranial structures there is no clear relation between HARH and HACE or even HAPE. Prevention to avoid lesions is mandatory even though retinal lesions could resolve spontaneously. Most of the posterior pole lesions resolve spontaneously in a few days or weeks, but a few of them can leave sequela such as scotomas of visual field [7]. More research need to be done to rule out the relation between retinal and cerebral lesions to avoid severe and irreversible problems.”

- “Delayed Appearance of High Altitude Retinal Hemorrhages...When closely examined, a very large amount of climbers exhibit retinal hemorrhages during exposure to high altitudes. The incidence of retinal hemorrhages may be greater than previously appreciated as a definite time lag was observed between highest altitude reached and development of retinal bleeding. Retinal hemorrhages should not be considered warning signs of impending severe altitude illness due to their delayed appearance.”
  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3040733/

- “High altitude retinal hemorrhage...The accessibility of high-altitude areas presents the risk of high altitude retinal hemorrhages (HARH). Four cases reported illustrate localized macular, diffuse, and familial incidence of HARH. Fluorescein angiography indicated no leakage, and a superficial retinal location of the hemorrhages. Marked retinal artery and vein dilation occurs. Ophthalmodynamometry showed retinal vascular hypertension in the presence of HARH. The complete resolution of hemorrhages occurs in most cases. Despite the return of visual acuity to normal, visual function studies indicate the persistance of defects.”

- “High Altitude Retinal Hemorrhages–An Update...Retinal hemorrhages represent a common phenomenon in eyes of high altitude climbers. In this review, we present an update about this entity, with focus on its pathophysiology and practical implications. Due to their delayed appearance in the course of an expedition, retinal hemorrhages are not predictive when assessing the risk for life-threatening complications related to hypobaric hypoxia. Consequences for ocular health depend greatly on the extent and localization of retinal bleedings, but are generally mild and reversible in healthy eyes.”

- “Retinal changes in various altitude illnesses...HARHs occur more frequently in younger individuals who perform strenuous exercise at high altitude. Its severity is significantly associated with illnesses like HAPE and HACE. As a majority of these patients show resolution of retinal lesions and recovery of visual acuity, visual symptoms alone are not an indication for urgent descent. However, in the event of progression or worsening of the symptoms, descent is mandatory.”
  https://apamedcentral.org/Synapse/Data/PDFData/0022SMJ/smj-52-685.pdf

- “High Altitude Retinal Hemorrhage...First retinal hemorrhages related with high altitude were detected in 1968 in Mount Logan in Canada. Their relation with high altitude were first described in 1970 by Frayser et al. And first optic discharges associated with high altitude were described by Singh et al.[1,2]. The mountain sickness syndrome includes acute mountain syndrome (AMS), high altitude retinal hemorrhage (HARH) and the severe forms high-altitude pulmonary oedema (HAPE) and cerebral oedema (HACE). These diseases are different facets
of failure to acclimatize at high altitude. These conditions are associated with the rapid ascent to above 3000 m.”

- "Retinal hemorrhages do appear to be commonplace at altitudes above 12,000 to 14,000 feet, and may or may not reflect similar hemorrhages in the brain...Peripheral high altitude retinal hemorrhages (HARH) and retinal hypoxia do not permanently affect visual function. But macular hemorrhage threatens permanent partial visual loss. By the very nature of its random occurrence, macular hemorrhage can recur with repeated hypoxic exposure." Going Higher. Oxygen, Man, And Mountains.
Altitude Diseases: Amaurosis

- “Amaurosis (Greek meaning darkening, dark, or obscure) is vision loss or weakness that occurs without an apparent lesion affecting the eye.[1] It may result from either a medical condition or excess acceleration, as in flight. The term is the same as the Latin gutta serena.”  
  https://en.wikipedia.org/wiki/Amaurosis

- “Amaurosis fugax (Latin fugax meaning fleeting, Greek amaurosis meaning darkening, dark, or obscure) is a painless temporary loss of vision in one or both eyes...The experience of amaurosis fugax is classically described as a temporary loss of vision in one or both eyes that appears as a "black curtain coming down vertically into the field of vision in one eye;" however, this altitudinal visual loss is relatively uncommon. In one study, only 23.8 percent of patients with transient monocular vision loss experienced the classic "curtain" or "shade" descending over their vision.[2] Other descriptions of this experience include a monocular blindness, dimming, fogging, or blurring.[3] Total or sectorial vision loss typically lasts only a few seconds, but may last minutes or even hours. Duration depends on the cause of the vision loss. Obscured vision due to papilledema may last only seconds, while a severely atherosclerotic carotid artery may be associated with a duration of one to ten minutes.[4] Certainly, additional symptoms may be present with the amaurosis fugax, and those findings will depend on the cause of the transient monocular vision loss.”  
  https://en.wikipedia.org/wiki/Amaurosis_fugax

- “Transient Monocular Amaurosis at High Altitude.”  
  https://www.liebertpub.com/doi/10.1089/152702901750067963

- “TRANSIENT AMAUROSIS ASSOCIATED WITH INTRAOCULAR GAS DURING ASCENDING HIGH–SPEED TRAIN TRAVEL.”  
  https://journals.lww.com/retinajournal/Citation/2001/10000/TRANSIENT_AMAUROSIS_ASSOCIATED_WITH_INTRAOCULAR_18.aspx

- “High Altitude and the Eye...The purpose of this study was to review the available data on the effect of high altitude on the eyes. We carried out electronic literature search on www.pubmed.com for articles published through year 2011. The search terms included high altitude and the eye, high-altitude retinopathy, eye problems in the Himalayas, and eye diseases in Tibet. Other terms like visual functions, intraocular pressure, corneal thickness, tear function, and ocular motility, at high altitude, were searched separately and in combination. Data were retrieved from both prospective and retrospective studies published in the English language. High altitude has both short-term and long-term effects on the eyes. The short-term effects include high-altitude retinopathy, change in corneal thickness, and photokeratitis. Long-term effects include pterygium, cataract, and dry eye syndrome. High-altitude retinopathy of mild degree does not affect vision but has a predictive value for the development of high-altitude cerebral edema. Change in corneal thickness at altitude induces refractive changes in eyes with radial keratotomy and in eyes with LASIK. High altitude does not adversely affect visual acuity and contrast sensitivity; scotopic vision may be affected if supplemental oxygen is not used.”  
  https://www.researchgate.net/publication/272474295_High_Altitude_and_the_Eye

- “Ocular Problems in High-Altitude Traveling: A Review With Focus on Management...Individuals whose travels take them to high altitudes may experience some ocular problems, particularly disorders related to dry and cold environments. Physicians, especially ophthalmologists, should be knowledgeable in prevention techniques and treatments for these conditions. The main management for ocular disorders related to dry and cold
environments include the use of eye shields and artificial tear drops. Descending to low-altitude lands is the key to management of eye problems associated with low-pressure environments. Patients with past ocular problems or ocular surgery should consult their doctors before ascending to high altitudes.”

http://www.ijtmgh.com/article_46490_93a5194d8196fd0ca71bb5b401b29a23.pdf

- “Retinal changes following rapid ascent to a high-altitude environment...PurposeTo determine what impact rapid ascension to a high-altitude environment has on the retina with the aim of preventing and treating high-altitude oculopathy.Patients and methodsParticipants in the study were members of the Chinese military assigned to the high-altitude environment of the Tibetan plateau. Ninety-one participants were enrolled in the study. Optical coherence tomography was used to measure the thickness of retina-related indicators. Measurements were taken before and after exposure to the high-altitude environment and upon return to the baseline altitude.ResultsFollowing exposure to the high-altitude environment in Tibet, there was a significant increase in retinal nerve fiber layer (RNFL) thickness in the temporal and nasal quadrants of the optic disc, whilst a significant decrease in RNFL thickness in the inferior optic disc was also observed. A significant increase in RNFL thickness in the superior and inferior macula was also evident, along with a significant increase in the ganglion cell layer thickness in the superior macula. Upon return to the baseline altitude, all measurements returned to baseline levels except for the RNFL of the inferior macula, which was significantly thicker. Pathological changes were also documented in the eyes of nine participants upon returning to baseline altitude, including ischemic optic neuropathy, myopia, and cortical amaurosis.ConclusionsThe high-altitude environment can have a negative impact on the health of the retina and may contribute to the incidence of various eye diseases. This study deepens the understanding of what impact a high-altitude environment has on retina and provides reliable data for blindness prevention and treatment.”


- “A blurred view from Everest...Direct ophthalmoscopy showed engorged retinal veins and wide large flame-shaped haemorrhages extending into both maculae ( figure). The climber descended to base camp and eventually flew home to Australia. The scotomas resolved in 3 months, but the flame-shaped haemorrhages took 6 months to resolve. When last seen in May, 2002, he had no complaints and no discernible ophthalmological abnormalities.”

https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(03)15017-9/fulltext
Altitude Diseases: Barotrauma

- “Barotrauma is physical damage to body tissues caused by a difference in pressure between a gas space inside, or in contact with the body, and the surrounding gas or fluid.[1][2] The initial damage is usually due to over-stretching the tissues in tension or shear, either directly by expansion of the gas in the closed space, or by pressure difference hydrostatically transmitted through the tissue. Tissue rupture may be complicated by the introduction of gas into the local tissue or circulation through the initial trauma site, which can cause blockage of circulation at distant sites, or interfere with normal function of an organ by its presence. Barotrauma generally manifests as sinus or middle ear effects, decompression sickness (DCS), lung overpressure injuries, and injuries resulting from external squeezes. Barotrauma typically occurs when the organism is exposed to a significant change in ambient pressure, such as when a scuba diver, a free-diver or an airplane passenger ascends or descends, or during uncontrolled decompression of a pressure vessel such as a diving chamber or pressurised aircraft, but can also be caused by a shock wave. Ventilator induced lung injury (VILI) is a condition caused by over-expansion of the lungs by mechanical ventilation used when the body is unable to breathe for itself, and is associated with relatively large tidal volumes and relatively high peak pressures. Barotrauma due to overexpansion of an internal gas-filled space may also be termed volutrauma. Bats can be killed by lung barotrauma when flying in low-pressure regions close to operating wind-turbine blades....Examples of organs or tissues easily damaged by barotrauma are: Middle ear (barotitis or aerotitis)[1][2][4][5][6][7]. Paranasal sinuses[1][2][5] (causing Aerosinusitis). Lungs[1][2][8][9]. Eyes[1][2] (the under-pressure air space is inside the diving mask[10]). Skin[1][2] (when wearing a diving suit which creates an air space). Brain and cranium (temporal lobe injury secondary to temporal bone rupture)[11]. Teeth (causing Barodontalgia, i.e., barometric pressure related dental pain,[12][13][14][15][16] or dental fractures[17][18][19]). Genital (squeeze and associated complications of P-valve use)[20]”

https://en.m.wikipedia.org/wiki/Barotrauma

- “Dysbarism refers to medical conditions resulting from changes in ambient pressure.[citation needed] Various activities are associated with pressure changes. Underwater diving is the most frequently cited example, but pressure changes also affect people who work in other pressurized environments (for example, caisson workers), and people who move between different altitudes.”

https://en.m.wikipedia.org/wiki/Dysbarism

- “Weather pains, weather-related pain, or meteoropathy is a phenomenon that occurs when people with conditions such as arthritis or limb injuries claim to feel pain, particularly with changes in barometric pressure, humidity or other weather phenomena.[1][2] Scientific evidence, however, does not support a connection between weather and arthritic pain and concludes that it is largely or entirely due to perceptual errors such as confirmation bias.[3][4] The term is from Greek meteora, celestial phenomena, and pathos, feeling, pain, suffering.”

https://en.m.wikipedia.org/wiki/Weather_pains

- “TRAPPED GAS - AIR EXPANSION AT ALTITUDE... There are several locations in the human body where gas can accumulate and possibly become trapped. These medical conditions, known collectively as ‘Trapped Gases’ often lead to discomfort, pain, and possibly destruction of surrounding tissues. Much like the condition of decompression illness, trapped gases commonly affect aircrew and scuba divers, due to the frequent exposure to significant pressure changes. The most common locations where this medical condition will develop are the middle
ear, the sinuses, the lungs, the gastrointestinal tract, and the teeth.”  
http://goflightmedicine.com/trapped-gas/

- “The most painful experience that I had in high altitude astronomy was ear barotrauma on descent from the observatory. After experiencing this horrible condition a few times, I got wise and would always carry nasal decongestant medication with me to help prevent it. I saw many people experience the condition so severe that we had to stop descending in the car and sit at the side of the road until it subsided in the unfortunate high altitude worker.”  
Steven Magee CEng MIET - Q

- “I now suffer from hearing loss and wonder how much high altitude work contributed to this condition?”  
Steven Magee CEng MIET - Q

- “All high altitude workers should have their hearing tested annually.”  
Steven Magee CEng MIET - Q

- “Ear Barotrauma...Occasional ear barotrauma is common, especially in environments where the altitude changes. While the condition isn’t harmful in some people, frequent cases may cause further complications.”  
https://www.healthline.com/health/ear-barotrauma

- “What impact does high altitude have on hearing loss?...If you’ve ever had ear pain when flying, you’ve experienced the effects of barotrauma. A result of the pressure changes that occur when moving to higher or lower altitudes, barotrauma often goes after a few hours but can cause serious hearing damage in some cases.”  

- “Ears & Altitude...Many experienced air travelers use a decongestant pill or nasal spray an hour or so before descent This will shrink the membranes and help the ears pop more easily. Travelers with allergy problems should take their medication at the beginning of the flight for the same reason. Decongestant tablets and sprays can be purchased without a prescription However, they should be avoided by persons with heart disease, high blood pressure, irregular heart rhythms, thyroid disease or excessive nervousness.”  
http://www.entcarolina.com/education-ears-altitude.php

- “EARS AND ALTITUDE. Your ears and altitude changes could cause a host of problems as the ear drum and middle ear are very sensitive to changes in atmospheric pressure. In order for the ear drum to vibrate most efficiently, air pressure on both sides of it should be the same. As atmospheric pressure changes, air pressure behind the ear drum (pressure in the middle ear) equilibrates to atmospheric air pressure by opening of the Eustachian tube which connects the middle ear space to the nasopharynx. This usually occurs unknowingly when you swallow. During rapid changes in air pressure as in flying and scuba diving, the Eustachian tube may sometimes act as a one way valve allowing air to escape from the middle ear but not allowing air to get back in. When this happens, there can be sudden tension on the ear drum which can cause severe ear pain and rupture of the ear drum. A rapid change in middle ear pressure can also lead to a fluid buildup in the middle ear and even rupture of one of the delicate membranes that separate the middle ear from the inner ear.”  
https://www.advancedent.com/conditions-we-treat/ear-hearing-disorders/ears-altitude/

- “Ear Barotrauma & Meniere’s. This is interesting because since I have Meniere’s Disease, any time a storm is coming I tend to get bad headaches & off balance. Once the storm has past I start to feel better. Guess I don’t need the local Weatherman.”  
https://livingwithmenieresdisease.com/2015/09/02/ear-barotrauma-menieres/

- “Ménière's disease (MD) is a disorder of the inner ear that is characterized by episodes of feeling like the world is spinning (vertigo), ringing in the ears (tinnitus), hearing loss, and a
fullness in the ear.[3][4] Typically only one ear is affected, at least initially; however, over time both ears may become involved.[3] Episodes generally last from 20 minutes to a few hours.[5] The time between episodes varies.[3] The hearing loss and ringing in the ears may become constant over time.[4] The cause of Ménière's disease is unclear but likely involves both genetic and environmental factors.[1][3] A number of theories exist for why it occurs including constrictions in blood vessels, viral infections, and autoimmune reactions.[3] About 10% of cases run in families.[4] Symptoms are believed to occur as the result of increased fluid build up in the labyrinth of the inner ear.[3] Diagnosis is based on the symptoms and frequently a hearing test.[3] Other conditions that may produce similar symptoms include vestibular migraine and transient ischemic attack.[1] There is no known cure.[3] Attacks are often treated with medications to help with the nausea and anxiety.[4] Measures to prevent attacks are overall poorly supported by the evidence.[4] A low salt diet, diuretics, and corticosteroids may be tried.[4] Physical therapy may help with balance and counselling may help with anxiety.[3][4] Injections into the ear or surgery may also be tried if other measures are not effective but are associated with risks.[3][5] The use of tympanostomy tubes, while popular, is not supported.[5]

Ménière's disease was first identified in the early 1800s by Prosper Ménière.[5] It affects between 0.3 and 1.9 per 1,000 people.[1] It most often starts in people 40 to 60 years old.[3] Females are more commonly affected than males.[1] After 5 to 15 years of symptoms, the episodes of the world spinning generally stop and the person is left with mild loss of balance, moderately poor hearing in the affected ear, and ringing in their ear.[5]

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• “aerodontalgia [ār″o-don-tal´jah] toothache experienced at lowered atmospheric pressures, as in aircraft flight or in a decompression chamber, caused by the expansion of air in the maxillary sinuses.” [https://medical-dictionary.thefreedictionary.com/aerodontalgia](https://medical-dictionary.thefreedictionary.com/aerodontalgia)

• “Barodontalgia, commonly known as tooth squeeze and previously known as aerodontalgia, is a pain in tooth caused by a change in ambient pressure. The pain usually ceases at ground level. [1][2][3] Dental barotrauma is a condition in which such changes in barometric pressure changes cause damage to the dentition. The most common victims are underwater divers because in deep dives pressures can increase by several atmospheres,[4] and military pilots because of rapid changes.[5][6][7][8] In pilots, barodontalgia may be severe enough to cause premature cessation of flights.[9]” [https://en.m.wikipedia.org/wiki/Barodontalgia](https://en.m.wikipedia.org/wiki/Barodontalgia)
Altitude Diseases: Barometric Pressure Issues

- “Feel It? 4 Ways Barometric Pressure Affects Your Health...Can you feel a storm coming a mile away? Have you been told you’re a human barometer who can sense changes in barometric pressure? You’re not crazy and you’re not alone. It is possible to feel that storm coming “in your bones” – or in your head...Some of the ways changing weather barometric pressure changes can affect your health include: 1 – Headaches and Migraine attacks, 2 – Blood pressure, 3 – Blood sugar, 4 – Joint pain.” [https://migraineagain.com/feel-4-ways-barometric-pressure-affects-health/](https://migraineagain.com/feel-4-ways-barometric-pressure-affects-health/)

- “Inverse Association between Air Pressure and Rheumatoid Arthritis Synovitis...Rheumatoid arthritis (RA) is a bone destructive autoimmune disease. Many patients with RA recognize fluctuations of their joint synovitis according to changes of air pressure, but the correlations between them have never been addressed in large-scale association studies. To address this point we recruited large-scale assessments of RA activity in a Japanese population, and performed an association analysis. Here, a total of 23,064 assessments of RA activity from 2,131 patients were obtained from the KURAMA (Kyoto University Rheumatoid Arthritis Management Alliance) database. Detailed correlations between air pressure and joint swelling or tenderness were analyzed separately for each of the 326 patients with more than 20 assessments to regulate intra-patient correlations. Association studies were also performed for seven consecutive days to identify the strongest correlations. Standardized multiple linear regression analysis was performed to evaluate independent influences from other meteorological factors. As a result, components of composite measures for RA disease activity revealed suggestive negative associations with air pressure. The 326 patients displayed significant negative mean correlations between air pressure and swellings or the sum of swellings and tenderness (p=0.00068 and 0.00011, respectively). Among the seven consecutive days, the most significant mean negative correlations were observed for air pressure three days before evaluations of RA synovitis (p=1.7×10−7, 0.00027, and 8.3×10−8, for swellings, tenderness and the sum of them, respectively). Standardized multiple linear regression analysis revealed these associations were independent from humidity and temperature. Our findings suggest that air pressure is inversely associated with synovitis in patients with RA.” [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3893195/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3893195/)

- “I don't have problems with arthritis (yet) but those that I do know both here in Colorado Springs and in Denver do have problems with barometric pressure. Whether or not that really has an medical affect (or effect) on arthritis is still up in the air as to it's validity. The thing is, those I know with joint problems (me, it's allergies), can sense a thunderstorm coming on long before it's apparent.” [http://www.city-data.com/forum/denver/310811-how-arthritis-denver.html](http://www.city-data.com/forum/denver/310811-how-arthritis-denver.html)


- “How Weather Impacts Knee Pain. Why do joints hurt more when the weather changes?...Many clinicians agree that changes in barometric pressure, or air pressure, can potentially cause an increase in joint pain. One theory is that the tissues that surround your knee function like a balloon and when the pressure from the air increases, those tissues cannot expand. However, the reverse is true as well. When the air pressure decreases, the tissues have room to expand and put pressure on your joint, causing pain.” [https://www.brainlab.org/how-](https://www.brainlab.org/how-)
Altitude Diseases: Skeletal Hazards

- “Bone atrophy at high altitude...Abstract. The bone metabolism in high mountaineering was investigated. The bone densities of 24 members of Himalayan expedition parties were measured before and after expedition by single photon absorptiometry and digital image processing method. As a result, decrease of bone density of 1/6 radial distal portion was 3.2±5.4% (p<0.01). The bone atrophy tended to recover in 5 months and 12 months follow-up measurement, but did not recover completely in a year. Among the indices of bone metabolism, moreover, serum Ca and 1,25-(OH)2D3 decreased of 4.5±4.1% and 22.4±21.9% respectively, during the Himalayan expedition. Concerning the nutritional state, 4.5±4.0% decrease of body weight was observed, but the serum cholesterol was increased of 12.6±14.8%, and this fact could not be explained by malnutrition alone. The special environment of high mountain, that is, low barometric pressure and low oxygen tension, is probably responsible for the bone atrophy.” https://link.springer.com/article/10.1007/BF02383459

- “The Effect of High-Altitude on Human Skeletal Muscle Energetics: 31P-MRS Results from the Caudwell Xtreme Everest Expedition...Abstract. Many disease states are associated with regional or systemic hypoxia. The study of healthy individuals exposed to high-altitude hypoxia offers a way to explore hypoxic adaptation without the confounding effects of disease and therapeutic interventions. Using 31P magnetic resonance spectroscopy and imaging, we investigated skeletal muscle energetics and morphology after exposure to hypobaric hypoxia in seven altitude-naïve subjects (trekkers) and seven experienced climbers. The trekkers ascended to 5300 m while the climbers ascended above 7950 m. Before the study, climbers had better mitochondrial function (evidenced by shorter phosphocreatine recovery halftime) than trekkers: 16±1 vs. 22±2 s (mean ± SE, p<0.01). Climbers had higher resting [Pi] than trekkers before the expedition and resting [Pi] was raised across both groups on their return (PRE: 2.6±0.2 vs. POST: 3.0±0.2 mM, p<0.05). There was significant muscle atrophy post-CXE (PRE: 4.7±0.2 vs. POST: 4.5±0.2 cm2, p<0.05), yet exercising metabolites were unchanged. These results suggest that, in response to high altitude hypoxia, skeletal muscle function is maintained in humans, despite significant atrophy.” https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2873292/

- “Influence of high-altitude grazing on bone metabolism of growing sheep...Concentrations of 25-OH-Vitamin D, carboxy-terminal telopeptide of type I collagen and activities of bone-specific alkaline phosphatase were always higher in the HA group than in the C group, except on the last two sampling dates. Bone mineral content and density increased in both groups during the experiment, but more intensively in the HA group. In addition, the cortical thickness of the HA group increased. The present study demonstrates an increase in bone turnover and mineral content of the bones of the growing sheep grazing in high alpine pastures.”

- “Effects of altitude acclimatization and deacclimatization on bone and marrow volume in dog...Marrow fat in the whole skeleton as well as in the individual parts of the skeleton was lowered on acclimatization and increased on deacclimatization. Of the fat lost, one-third was from the flat bones while one-half of the fat deposited on deacclimatization occurred in flat bones. The marrow water as well as the functional marrow (fat-free, by definition) in either the whole or the various parts of the skeleton was increased on acclimatization and decreased on deacclimatization.”

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Altitude Diseases: Polycythemia - Thick Blood

- “Polycythemia vera (POL-e-si-THEE-me-ah VAY-rah or VE-rah), or PV, is a rare blood disease in which your body makes too many red blood cells. The extra red blood cells make your blood thicker than normal. As a result, blood clots can form more easily. These clots can block blood flow through your arteries and veins, which can cause a heart attack or stroke. Thicker blood also doesn't flow as quickly to your body as normal blood. Slowed blood flow prevents your organs from getting enough oxygen, which can cause serious problems, such as angina (an-JI-nuh or AN-juh-nuh) and heart failure. (Angina is chest pain or discomfort.)...Another type of polycythemia, called secondary polycythemia, isn't related to the JAK2 gene. Long-term exposure to low oxygen levels causes secondary polycythemia. A lack of oxygen over a long period can cause your body to make more of the hormone erythropoietin (EPO). High levels of EPO can prompt your body to make more red blood cells than normal. This leads to thicker blood, as seen in PV. People who have severe heart or lung disease may develop secondary polycythemia. People who smoke, spend long hours at high altitudes, or are exposed to high levels of carbon monoxide where they work or live also are at risk. For example, working in an underground parking garage or living in a home with a poorly vented fireplace or furnace can raise your risk for secondary polycythemia.”
  https://www.nhlbi.nih.gov/health-topics/polycythemia-vera

- “Polycythemia (Elevated Red Blood Cell Count)...Polycythemia is a condition that results in an increased level of circulating red blood cells in the bloodstream. People with polycythemia have an increase in hematocrit, hemoglobin, or red blood cell count above the normal limits. Polycythemia is normally reported in terms of increased hematocrit (hematocrit is the ratio of he volume of red blood cells to the total volume of blood) or hemoglobin concentration emoglobin is a protein responsible for transporting oxygen in the blood).”
  https://www.medicinenet.com/polycythemia_high_red_blood_cell_count/article.htm#what_is_polycythemia

- “Excessive polycythemia of high altitude: role of ventilatory drive and lung disease...Persons residing at high altitude who develop excessive polycythemia are more hypoxemic than normal high-altitude residents. We investigated the causes of hypoxemia in 20 patients with excessive polycythemia residing at an altitude of 3,100 m. Lung disease evidenced by abnormal spirometric features and results of a respiratory questionnaire was present in 10 of 20 patients and resulted in increased alveolar-arterial difference for PO2 [(A-a)PO2]. The excessive hypoxemia in the patients with normal lungs was not due to increased (A-a)PO2. We measured ventilatory responses to hypoxia and to hypercapnia to determine whether blunting of these responses was a cause of this excessive hypoxemia. We found, however, that chemical drives to breathe, although blunted, were the same in patients with polycythemia as in high-altitude control subjects. However, an abnormal breathing pattern was observed; the polycythemic patients had a smaller tidal volume and a greater ratio of dead space to tidal volume than did the normal subjects. In addition, the polycythemic patients had increased minute ventilation on breathing 100 percent O2, whereas the normal subjects did not. Thus, hypoxic depression of ventilation may have been present. Our findings suggested that blunted chemical drives are not causative in this disease, and that some other cause of hypoxemia must be present.”

- “The Polycythemia of High Altitudes: Iron Metabolism and Related Aspects...Observations on
the iron metabolism as related to the influence of a low oxygen tension at high altitudes, and after the disappearance of this factor upon return to sea level, have been made in human subjects. They consisted mainly of studies of intestinal absorption and turnover rate of iron by means of the radioactive isotope of this metal (Fe-59). Additional observations were made on blood volume, reticulocytosis, bone marrow cytology, life span of the red cells and hemoglobin breakdown pigments.”

- “Associations of high altitude polycythemia with polymorphisms in EPHA2 and AGT in Chinese Han and Tibetan populations...High altitude polycythemia (HAPC) refers to the long-term living in the plateau of the hypoxia environment is not accustomed to cause red blood cell hyperplasia. The pathological changes are mainly the various organs and tissue congestion, blood stasis and hypoxia damage. Although chronic hypoxia is the main cause of HAPC, the related molecular mechanisms remain largely unclear. This study aims to explore the genetic basis of HAPC in the Chinese Han and Tibetan populations. We enrolled 100 patients (70 Han, 30 Tibetan) with HAPC and 100 healthy control subjects (30 Han, 70 Tibetan). To explore the hereditary basis of HAPC and investigate the association between EPHA2 with AGT and HAPC in Chinese Han and Tibetan populations. Using the Chi-squared test and analyses of genetic models, rs2291804, rs2291805, rs3768294, rs3754334, rs6603856, rs6669624, rs11260742, rs13375644 and rs10907223 in EPHA2, and rs699, rs4762 and rs5051 in AGT showed associations with reduced HAPC susceptibility in Han populations. Additionally, in Tibetan populations, rs2478523 in AGT showed an increased the risk of HAPC. Our study suggest that polymorphisms in the EPHA2 and AGT correlate with susceptibility to HAPC in Chinese Han and Tibetan populations.”

- “Thick Blood (Hypercoagulability)... What are the symptoms of thick blood? Many don’t have any symptoms of thick blood until they experience a blood clot. The blood clot usually occurs in a person’s vein, which can cause pain and affect circulation in and around the area where the clot occurs...Having too many blood cells can lead to a variety of symptoms. Examples of these include blurred vision, dizziness, easy bruising, excessive menstrual bleeding, gout, headache, high blood pressure, itching skin, lack of energy, shortness of breath.”

- “All you need to know about thick blood...Other possible and frequently serious complications of blood clots are: Stroke if a blood clot moves to the brain and blocks an artery that sends oxygenated blood to the brain. Heart attack resulting from a blood clot in a coronary artery. Acute kidney injury, resulting from a blockage or blood clot of one or both of the renal veins that move blood away from the kidneys.”

- “5 Things You Need to Know About Thick Blood Disease...Most importantly, immediate medical care is needed if a blood clot, stroke or heart attack is suspected. A blood clot in the leg can cause redness, pain, warmth and swelling in the lower leg. A heart attack or a blood clot in the lungs or heart can cause shortness of breath, chest pain, chest heaviness or pressure and discomfort in the neck, jaw, upper back or arms. Symptoms of a stroke include difficulty speaking or understanding speech, headaches or paralysis that is typically on one side of the body. These symptoms require emergency medical care to determine the cause and receive live-saving treatment as soon as possible.”

- “Polycythaemia ...However, people with PV can have a slightly lower life expectancy than
normal due to the increased risk of problems, such as heart attacks and strokes. PV can also sometimes cause scarring of the bone marrow (myelofibrosis), which can eventually lead to you having too few blood cells. In some rare cases, the condition can develop into a type of cancer called acute myeloid leukaemia (AML).” https://www.nhs.uk/conditions/polycythaemia/
Altitude Diseases: Deep Vein Thrombosis (DVT)

- “Acute mountain sickness high altitude pulmonary oedema (HAPE) and high altitude cerebral oedema (HACE) are common at high altitude but just a few cases of coronary and cerebral thrombosis and phlebitis of limbs have been reported1…The successful medical treatment results from the fact that all disorders of coagulation return to normal on decent to lower heights i.e. less than 10000 ft (ideally sea levels) and early anticoagulant therapy with adequate mobilization. This is to highlight the role of high altitude as a factor leading to tendency towards hypercoagulability.” http://jpma.org.pk/full_article_text.php?article_id=2418
- “High altitude induced deep venous thrombosis: A study of 28 cases... It is well recognized that a hypercoagulable state exists when a person is exposed to high altitude environment...In view of the greatly increased risk of getting deep venous thrombosis in leg veins at high altitude, we wish to define this definite disease entity as High Altitude Induced Deep Venous Thrombosis (HADVT).” http://www.bioline.org.br/abstract?is06022
- “What causes blood clots on long-haul flights?…Studies comparing people on long-haul flights to those sitting still on the ground have indicated that there is a difference between the two groups, although it isn't clear exactly why. Researchers have suggested that the explanation could lie with passenger stress, poor air quality, low humidity, low air pressure, or exposure to cosmic radiation.” https://www.nature.com/news/2006/060515/full/060515-7.html
- “Deep Vein Thrombosis and Pulmonary Embolism in a Mountain Guide: Awareness, Diagnostic Challenges, and Management Considerations at Altitude...For mountaineers and those working at high altitude, additional risks exist. However, despite there being a high degree of vigilance for “classic” conditions encountered at altitude (eg, acute mountain sickness, high altitude pulmonary edema, and high altitude cerebral edema), mainstream awareness regarding thrombotic conditions and their complications in mountain athletes is relatively low. This is significant because thromboembolic events (including deep vein thrombosis, pulmonary embolism, and cerebral vascular thrombosis) are not uncommon at altitude.” https://www.wemjournal.org/article/S1080-6032(15)00349-X/pdf
- “Hypoxia, such as encountered at high altitude, promotes deep vein thrombosis in mice...Venous thromboembolism (VTE), including deep vein thrombosis (DVT) and its life-threatening complication, pulmonary embolism (PE), are among the most frequent causes of morbidity and mortality in developed countries. In the United States alone, the number of deaths due to VTE approaches 300,000 annually [1]. Blood flow restriction or stasis is considered a major factor driving DVT [2]. Regardless of its initial cause (bed-ridden position, long-haul flights, limb paralysis, etc.), delayed blood renewal in stasis is believed to produce limited oxygen supply to the vein walls (hypoxia), especially in the valvular sinus, which triggers thrombus development [2].” https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3773282/
- “Post-Thrombotic Syndrome...Post-thrombotic syndrome (PTS) is a long-term condition that occurs as a result of a deep vein thrombosis (DVT). The veins in our arms and legs have small valves inside that ensure the blood flows correctly back toward the heart. A DVT is a blockage or clot that obstructs the vein and can lead to the valves becoming damaged. More than one third of people who have DVT then develop PTS, the symptoms of which include redness, swelling, ulcers, and chronic leg pain. PTS can affect your mobility and is expensive to treat, so it’s best to take preventative measures. It is most common for a DVT to occur in the legs.” https://www.healthline.com/health/post-thrombotic-syndrome
Altitude Diseases: Pulmonary Embolism (PE)

- “Pulmonary Embolism Masquerading as High Altitude Pulmonary Edema at High Altitude...Pulmonary embolism (PE) at high altitude is a rare entity that can masquerade as or occur in conjunction with high altitude pulmonary edema (HAPE) and can complicate the diagnosis and management. When HAPE cases do not improve rapidly with descent, other diagnoses, including PE, ought to be considered.”
  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5175419/
- “Pulmonary embolism at high altitude and hyperhomocysteinemia...This case report describes pulmonary embolism in a patient as a complication of extended stay at high altitude. He also had increased plasma homocysteine levels. Hypercoagulability at high altitude along with hyperhomocysteinemia is a risk factor for arterial and venous thrombosis.”
  https://www.researchgate.net/publication/7331673_Pulmonary_embolism_at_high_altitude_and_hyperhomocysteinemia
- “Profile of pulmonary embolism in service personnel posted at high altitude area...We evaluated the clinical presentation and risk factors of pulmonary embolism (PE) in soldiers posted at high altitude areas (HAA)...PE is a common complication of HAA and hereditary thrombophilia contributes in a minority of the patients. Further studies are needed to ascertain the risk factors of PE at HAA.”
- “About 86% of patients were between 20-40 years of age. Dyspnea was the commonest symptom (40%) while tachypnea was the commonest clinical finding in these soldiers. D-dimer value was < 250 in only 10% of patients. Pleural effusion was the commonest radiological abnormality(40%) while non-specific T-wave inversions were noted as the most frequent ECG change(44%). Ventilation-perfusion (V/Q) scan was confirmatory in 80% of patients and spiral CT chest in 56%. When the frequency of risk factors of pulmonary embolism were analyzed, 50% of patients had high altitude as the only risk factor. Hereditary thrombophilic disorder was found in 14%, connective tissue disorder/infections in 20% and miscellaneous others in 16%...Pulmonary embolism occurs at an increased frequency in soldiers working at high altitude, without any other co-existent risk factor.”
Altitude Diseases: Cerebral Vascular Thrombosis (CVT)

- “Cerebral venous thrombosis at high altitude: A systematic review...Long-term stays at high altitude in association with a hypercoagulable state - in particular, congenital or acquired thrombophilia - appears to predispose to CVT. The association of CVT with a single exposure to high altitude seems low, but the risk cannot as yet be specifically estimated.”
Altitude Diseases: Cerebral Venous Sinus Thrombosis (CVST)

- “Cerebral venous sinus thrombosis at high altitude...Cerebral venous sinus thrombosis (CVST) is a rare but potentially life-threatening medical condition. We describe a case of a 47-year-old woman who presented with headache, speech defects, and visual disturbances, and was later diagnosed with cerebral venous sinus thrombosis. The article describes a possible risk of such thrombotic events with exposure to high altitude environment in patients with coagulation defects such as Factor V Leiden mutation. Besides, such neurological conditions can occur independent of altitude illness and need to be recognized as their management differs.”
- “Cerebral Venous Sinus Thrombosis Masquerading as High Altitude Cerebral Edema at Extreme Altitude... Extreme altitude travel has gained popularity globally for adventurous, scientific, and military endeavors. Cerebral venous sinus thrombosis (CVST) at extreme altitude is a rare, covert, and emergent condition requiring immediate intervention... CVST at extreme altitude can occur spontaneously due to prolonged hypobaric hypoxia which can precipitate thrombosis through capillary damage, haemoconcentration, and a hypercoagulable state.”
  http://www.ijtmgh.com/article_33033_eec801fcd4adb9a7c550fa55a3167ff.pdf
Altitude Diseases: Sleep Apnea

- “Effects of High Altitude on Sleep and Respiratory System and Their Adaptations...High-altitude (HA) environments have adverse effects on the normal functioning body of people accustomed to living at low altitudes because of the change in barometric pressure which causes decrease in the amount of oxygen leading to hypobaric hypoxia. Sustained exposure to hypoxia has adverse effects on body weight, muscle structure and exercise capacity, mental functioning, and sleep quality. The most important step of acclimatization is the hyperventilation which is achieved by hypoxic ventilatory response of the peripheral chemoreceptors. Hyperventilation results in increase in arterial carbon dioxide concentration. Altitude also affects sleep and cardiac output, which is the other determinant of oxygen delivery. Upon initial exposure to HA, the resting pulse rate increases rapidly, but with acclimatization, heart rate and cardiac output tend to fall. Another important component that leads to decrease in cardiac output is the reduction in the stroke volume with acclimatization. During sleep at HA, the levels of CO2 in the blood can drop very low and this can switch off the drive to breathe. Only after the body senses a further drop in O2 levels breathing is started again. Periodic breathing is thought to result from instability in the control system through the hypoxic drive or the response to CO2.”
  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3654241/

- "Is There a Connection Between Sleep Apnea and High Altitude?...When a person visits or lives at a high altitude (greater than 4,000 feet), the air is thinner. In order to compensate, you breathe faster in an attempt to get more oxygen into your lungs, and your heart works harder to get oxygen-rich blood into circulation. At high altitudes, a breathing pattern known as high-altitude periodic breathing can occur whereby individuals alternate between rapid breathing and not breathing adequately. Altitude also impacts sleep as the low level of oxygen disrupts the area of your brain that monitors sleep. As a result, people might experience a decrease in the total time and quality of sleep, along with frequent instances of awakenings."
  http://curemysleepapnea.com/sleepsource/2014/01/23/connection-sleep-apnea-high-altitude/

- "Central Sleep Apnea at High Altitude...The discovery of central sleep apnea (CSA) at high altitude is usually attributed to Angelo Mosso who published in 1898. It can occur in susceptible individuals at altitude above 2000 m, but at very high altitude, say above 5000 m, it will occur in most subjects. Severity is correlated with ventilatory responsiveness, particularly to hypoxia...It occurs due to the interaction of hypocapnia with stages 1 and 2 NREM sleep, in the presence of increased loop-gain...The severity of the CSA can be reduced by descent, supplemental oxygen therapy, oral or intravenous acetazolamide."  
  https://link.springer.com/chapter/10.1007/978-1-4899-7678-9_19

- "Central sleep apnea due to high-altitude periodic breathing...Central sleep apnea due to high-altitude periodic breathing affects about a quarter of people who ascend to 2500 meters and almost 100% of those who ascend to 4000 meters or higher. It is characterized by central apneas, periodic breathing, insomnia, and sleep fragmentation."  
  http://www.medlink.com/article/central_sleep_apnea_due_to_high-altitude_periodic_breathing

- "What you need to know about sleep apnea at high altitude...At high altitude areas like Denver, the oxygen levels are low which results in certain physiological changes in the body to adjust to the climatic conditions and this process of adjustment is known as acclimatization. The body adjusts in a number of ways to compensate for the low oxygen availability. The breathing and the heart rate increases to inhale and supply more oxygen to the tissues. Increased urination is
also common as a response to the change in the body’s acid-base balance. Amongst all the changes, altitude affects the respiration the most and studies have shown the occurrence of sleep apnea at high altitude despite acclimatization, even in healthy individuals visiting or living at high altitudes."
https://www.denversleeps.com/sleep-apnea-at-high-altitude/

- "High Altitudes Impact Sleep Apnea...When vacation time comes around, many people head to the mountains for camping, skiing, or just to get away from the hustle and bustle of their daily lives. Although a visit to the mountains is great for the spirit, sufferers of sleep apnea should take care. Sudden altitude gains can exacerbate your symptoms."
https://www.rocklandsmiles.com/blog/high-altitudes-impact-sleep-apnea/

- "Effects of altitude on sleep apnea...Altitude has a HUGE impact on your breathing. It can be a serious problem for those who do not have sleep apnea. You can get altitude sickness very easily and if your breathing is already reduced it might pose a serious risk to your life. I live in Colorado at 5,280 feet, and when we have visitors go up to the mountain passes we see that they sometimes get altitude sickness."
http://www.sleepguide.com/forum/topics/effects-of-altitude-on-sleep

- "Travelling to High Altitudes Lead to Difficult Sleeping- Review... High-altitude (HA) environments have adverse effects on the normal physiological functioning of body in the people who are accustomed to living at low altitudes. New arrivals to altitude commonly experience decline in quality sleep. Most people don’t sleep well at altitude. Sojourns commonly report vivid dreams, feelings of being suffocated and wake up in the morning feeling un-refreshed. These complaints are commonly associated with increased fragmentation of sleep by frequent brief arousals, which are in turn linked to periodic breathing...Changes in sleep architecture include a shift toward lighter sleep stages, with noticeable decrements in slow wave sleep and with variable decreases in REM sleep. Increased hypoxic ventilatory responsiveness and loss of regularization of breathing during sleep contribute to the occurrence of periodicity."

- "FAA Announces New Policy for Sleep Apnea in Pilots...In 2008, the impact of sleep apnea (specifically, obstructive sleep apnea, or OSA) on pilots attracted heightened public attention when a commercial flight missed its destination. The commuter jet, carrying 40 passengers between islands in Hawaii, flew 26 miles past its destination. Air-traffic controllers lost contact with the jet for 18 minutes. Fortunately, the plane landed safely. The pilot was reported to suffer from previously undiagnosed OSA."
https://www.tmjtherapyandsleepcenter.com/blog/faa-announces-new-policy-for-sleep-apnea-in-pilots/

- "FAA Revises Sleep Apnea Guidelines..., the Federal Aviation Administration (FAA) introduced rules that would have forced all pilots with a body mass index (BMI) of 40 or more to undergo mandatory sleep apnea testing. However, protests from pilots’ groups and timely action by the House and Senate led FAA to back off and rewrite the rules, coming up with a new system for sleep apnea screening for pilots...the FDA’s own statistics note that of the 4917 pilots diagnosed with sleep apnea, only 347 (7%) have a BMI of 40 or greater...In the words of FAA, “Untreated OSA has always been and will continue to be a disqualifying medical condition.”"
https://www.tmjtherapyandsleepcenter.com/blog/faa-revises-sleep-apnea-guidelines/
Altitude Diseases: Central Sleep Apnea

- “Central sleep apnea due to high-altitude periodic breathing...This article includes discussion of central sleep apnea due to high-altitude periodic breathing, altitude insomnia, and high-altitude periodic breathing. The foregoing terms may include synonyms, similar disorders, variations in usage, and abbreviations...In this article, the authors explain the basics of central sleep apnea due to high-altitude periodic breathing. Included are updates related to sleep timing, oxygen saturation and pulse oxymetry measurements at high-altitude. Central sleep apnea due to high-altitude periodic breathing affects about a quarter of people who ascend to 2500 meters and almost 100% of those who ascend to 4000 meters or higher. It is characterized by central apneas, periodic breathing, insomnia, and sleep fragmentation. There are a variety of medications that may be beneficial, including sedative hypnotics, acetazolamide, steroids, and nonsteroidal anti-inflammatory drugs (NSAIDs). Women are more resistant to the effects of high altitude than men. Pregnant women at high altitudes tend to have increased neonatal complications and high risk of low birthweight in newborns.”
  http://www.medlink.com/article/central_sleep_apnea_due_to_high-altitude_periodic_breathing
- “The Effects of Altitude Associated Central Apnea on the Diagnosis and Treatment of Obstructive Sleep Apnea: Comparative Data from Three Different Altitude Locations in the Mountain West...This study demonstrates that central apnea becomes significantly more common at increasing altitude in both diagnostic and treatment portions of split-night polysomnography in patients with significant OSA. An apparent exponential increase in the percentage of OSA patients with a CAI > 5.0 occurs with increasing altitude. Altitude associated central apnea has a significant negative effect on the quality of OSA treatment obtained during PAP titration for patients living at the altitudes addressed in this study.”
  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3227706/
Altitude Diseases: Periodic Breathing

- “There was no monitoring of sleep in very high altitude workers that were sleeping at 9,200 feet. No warnings were given about high altitude induced sleep disorders.” Steven Magee CEng MIET - Q
- “ALTITUDE SICKNESS...Every year, people die of altitude sickness. All of these deaths are preventable. If you are travelling above 2500m (8000ft), read this information and tell your companions about it - it could save your life...Two things are certain to make altitude sickness very likely - ascending faster than 500m per day, and exercising vigourously. Physically fit individuals are not protected - even Olympic athletes get altitude sickness. Altitude sickness happens because there is less oxygen in the air that you breathe at high altitudes....Periodic breathing (Cheyne Stokes breathing, or PB) is common at high altitude and becomes more frequent with increasing altitude. Periodic breathing involves alternating periods of deep breathing and shallow breathing. Typically, three to five deep breaths will be followed by a couple of very shallow breaths or even a complete pause in breathing. A pause in breathing like this usually lasts around 5 to 15 seconds and is called an apnoea. Apnoeas may end with a gasp that sometimes wakes the individual or their sleeping companions! People may breathe this way for most of the night. During apnoeic phases, oxygen levels drop and heart rate slows. Oxygen levels and heart rate rise again when breathing resumes resulting in cyclical variations in heart rate and the amount of oxygen in the blood. Low oxygen levels overnight are likely to disturb sleep but PB may also contribute to arousals: periods when you almost or completely wake up. Arousals are more frequent at altitude, but they can occur even in the absence of periodic breathing. Perhaps surprisingly, although PB may disturb sleep, it doesn’t seem to make the other symptoms of acute mountain sickness worse. Why does periodic breathing happen? At sea level the build up of the waste gas, carbon dioxide, in the blood controls breathing. If you hold your breath, carbon dioxide levels rise and create the urge to breathe. At high altitude, the body senses low oxygen levels and this becomes the main drive to breathe. Breathing faster and deeper at high altitude leads to a profound reduction in the carbon dioxide levels in the blood. You can read more about the effects of breathing harder at altitude here. During sleep at high altitude, the levels of carbon dioxide in the blood can drop very low and this can switch off the drive to breathe. Only after the body senses a further drop in oxygen levels do you start breathing again. During the apnoea carbon dioxide levels rise but levels fall again when ventilation resumes, continuing the cycle.”
- “Travelling to High Altitudes Lead to Difficult Sleeping- Review...Background: High-altitude (HA) environments have adverse effects on the normal physiological functioning of body in the people who are accustomed to living at low altitudes. New arrivals to altitude commonly experience decline in quality sleep. Most people don’t sleep well at altitude. Sojourns commonly report vivid dreams, feelings of being suffocated and wake up in the morning feeling un-refreshed. These complaints are commonly associated with increased fragmentation of sleep by frequent brief arousals, which are in turn linked to periodic breathing. Findings: Changes in sleep architecture include a shift toward lighter sleep stages, with noticeable decrements in slow wave sleep and with variable decreases in REM sleep. Increased hypoxic ventilatory responsiveness and loss of regularization of breathing during sleep contribute to the occurrence of periodicity. Conclusions: One of the immediate effects of altitude exposure is to cause a general reduction in sleep quality. The purpose of this review was to consolidate the findings of
the significant studies that examined the effects of HA on the sleep disturbances so far, so that further study in this regard can take new dimensions.”

Altitude Diseases: Night Shift Diseases

- “I would run down like a battery during several extreme night shifts atop the very high altitude summit of Mauna Kea in Hawaii.” Steven Magee CEng MIET - Q
- “Does Night Shift Work Increase Your Cancer Risk?...The strongest correlation was seen with breast cancer – for every five years a woman worked the night shift, her breast cancer risk increased by 3.3%. This population was also discovered to have an increased risk of digestive system cancer and skin cancer. Interestingly, nurses who worked night shifts also had a higher incidence of lung cancer. “It is usually considered that night shift work impairs health, but we were still surprised by the increased risks attributed to long-term night shift work when we integrated the statistics together,”” [https://www.oncnursingnews.com/web-exclusives/does-night-shift-work-increase-your-cancer-risk](https://www.oncnursingnews.com/web-exclusives/does-night-shift-work-increase-your-cancer-risk)
- “How night shifts can increase cancer risk...Working night shifts disrupts the body's circadian rhythm, which a number of studies have found may raise the risk of cancer development. Now, researchers have shed light on the mechanisms behind this association. Scientists from the Massachusetts Institute of Technology (MIT) reveal that disruption to the circadian rhythm also leads to the impairment of two tumor suppressor genes, which can spur tumor growth.” [https://www.medicalnewstoday.com/articles/312064.php](https://www.medicalnewstoday.com/articles/312064.php)
- “Why working the night shift can pose a cancer risk. New study reveals a link between circadian clock disruption and tumor growth...In humans and most other organisms, a circadian clock governed by light regulates the timing of key aspects of human physiology, by controlling cellular activities such as metabolism and division. In a study of mice, the MIT team found that two of the genes that control cells’ circadian rhythms also function as tumor suppressors. Loss of these tumor suppressors, either through gene deletion or disruption of the normal light/dark cycle, allows tumors to become more aggressive. “It doesn’t matter how you disrupt the clock — both ways, loss of it seems to drive tumorigenesis,”” [http://news.mit.edu/2016/night-shift-cancer-risk-0728](http://news.mit.edu/2016/night-shift-cancer-risk-0728)
- “Night Shifts Increase Breast Cancer Risk, Especially for Nurses...A meta-analysis of international data confirms a positive association between long-term night shift work and an increased overall risk for cancer in women, particularly breast cancer. In North America and Europe, working the night shift was associated with a 32% increased risk for breast cancer overall (odds ratio [OR], 1.316), the authors report” [https://www.medscape.com/viewarticle/891048](https://www.medscape.com/viewarticle/891048)
- “LIGHT AT NIGHT OR SHIFT WORK AND BREAST CANCER RISK...Women who routinely work overnight shifts (such as nurses and flight attendants) for many years may have a slightly increased risk of breast cancer. One possible reason is the exposure to light related to these types of jobs. Being exposed to light throughout the night affects some hormone functions in the body that may be related to breast cancer.” [https://ww5.komen.org/BreastCancer/Table13Lightatnightshiftworkandbreastcancerrisk.html](https://ww5.komen.org/BreastCancer/Table13Lightatnightshiftworkandbreastcancerrisk.html)
- “Are Women Who Work Night Shifts at a Higher Risk for Developing Breast Cancer?...When a woman is working night shifts, she might use external signals, like artificial light or caffeine, to help tell her body to stay awake. The problem is that her body still sends internal signals that it is time for sleep. These different signals disrupt her natural sleep-wake cycle. Hormones and other bodily activities do not change to match the woman’s work schedule either. Some of these hormones affect tumors, so this can allow tumors to grow.[9] One example is the melatonin
that our bodies make at night to help us sleep.[8] Melatonin helps to prevent tumor growth.[9] A woman who works in artificial light at night makes less melatonin. Another example is glucocorticoids, which our bodies make when we are stressed. People who work night shifts have higher levels of glucocorticoids that help tumors survive.”

- “Effect of night shift work on the risk of multiple primary cancers in men...a dose-response meta-analysis was conducted, which showed that cancer risk gradually increased with the accumulation of night-shift years. For every 5 years of night shift work, cancer risk increased by 24.9% (OR = 1.249; 1.146, 1.361; P< 0.05)...night shift work was associated with increased cancer risk of men in a dose-response way.”

- “Female Night Shift Workers May Have Increased Risk of Common Cancers...long-term night shift work among women increased the risk of cancer by 19 percent. When analyzing specific cancers, the researchers found that this population had an increased risk of skin (41 percent), breast (32 percent), and gastrointestinal cancer (18 percent) compared with women who did not perform long-term night shift work. After stratifying the participants by location, Ma found that an increased risk of breast cancer was only found among female night shift workers in North America and Europe.”

- “Does night-shift work increase the risk of prostate cancer? a systematic review and meta-analysis...Based on a meta-analysis, night-shift work is associated with an increased risk of prostate cancer. Because of the limited number of included studies and the large level of heterogeneity, further well-designed studies are still warranted to confirm the findings of our analysis.”

- “Shift Workers at Higher Risk for Prostate Cancer...A new meta-analysis confirms that shift workers have increased risks for developing prostate cancer (PCa) and provides some additional insight...shift workers had a significant 23% higher risk of PCa than those who had never performed shift work. The investigators found a nonlinear relationship between longer shift duration and greater PCa risk...Possible biologic mechanisms linking shift work in general to PCa include disruption of circadian rhythms, decreased melatonin (a hormone that has antioxidant, anti-mitosis, anti-angiogenesis, and immune effects that might protect from cancer), and impaired vitamin D synthesis due to reduced sunlight exposure.”

- “Night Shift Work Triples the Risk of Prostate Cancer in Men...Working night shifts raises the risk of men developing prostate cancer by almost three times compared to working only day shifts, according to a new study. Men who work night shifts are also at a significantly greater risk of a variety of other types of cancer like bowel, bladder and lung tumors.”

- “Sleep, immunity and shift workers: A review...Sleep is a vital behavioral state of living beings and probably a modulator of the immune function. Both acute and chronic deprivation are associated with immune changes. It is likely that shift workers show an increased risk for viral infections because of a possible compromise of the innate immune response and perhaps also of the immune acquired response. There is a need for more quality studies also evaluate the future risk for the onset of inflammatory or autoimmune diseases among these workers. Future research including the different subtypes of shift workers is necessary to answer many gaps in
“A Simple Way to Improve Night Shift Worker's Hammered Immune Systems...Natural Killer Cells are a type of white blood cell that play a large role in our immune system. They help destroy illness-causing cells by rejecting virally-infected cells and tumors. Because of the hormones circulating throughout the body, these immune cells peak during the day (in your wakeful hours) in order to repair damaged tissue (when the damage is most likely to occur). When you’re sleep deprived, an insufficient amount of immune cells are produced during the day, which means there’s not enough to fight off the infections and illnesses that may be entering your system.”

“Why Late Nights Are Bad for Your Immune System...Jet lag, shift work, and even late nights staring at your tablet or smartphone may be making you sick. That's because the body's internal clock is set for two 12-hour periods of light and darkness, and when this rhythm is thrown off, so is the immune system. One reason may be that the genes that set the body clock are intimately connected to certain immune cells, according to a new study.”
Altitude Diseases: High Altitude Flatus Expulsion (HAFE)

- “Flatulence is defined in the medical literature as "flatus expelled through the anus" or the "quality or state of being flatulent",[1] which is defined in turn as "marked by or affected with gases generated in the intestine or stomach; likely to cause digestive flatulence".[2] The root of these words is from the Latin flatus – "a blowing, a breaking wind".[3] Flatus is also the medical word for gas generated in the stomach or bowels.[4] Despite these standard definitions, a proportion of intestinal gas may be swallowed environmental air, and hence flatus is not totally generated in the stomach or bowels. The scientific study of this area of medicine is termed flatology... Interest in the causes of flatulence was spurred by high-altitude flight and manned spaceflight; the low atmospheric pressure, confined conditions, and stresses peculiar to those endeavours were cause for concern.[16] In the field of mountaineering, the phenomenon of high altitude flatus expulsion was first recorded over two hundred years ago.” https://en.wikipedia.org/wiki/Flatulence
- “Is High Altitude Gas a Thing? Not to be vulgar, but I get gassy whenever I go somewhere above 7,000 feet... We would like to report our observations upon a new gastrointestinal syndrome, which we shall refer to by the acronym HAFE (high altitude flatus expulsion). This phenomenon was most recently witnessed by us during an expedition to in the San Juan Mountains of southwestern Colorado, with similar experiences during excursions past. The syndrome is strictly associated with ascent, and is characterized by an increase in both the volume and the frequency of the passage of flatus, which spontaneously occurs while climbing to altitudes of 11,000 feet or greater.” https://www.outsideonline.com/1784281/high-altitude-gas-thing
- “High altitude syndromes at intermediate altitudes: a pilot study in the Australian Alps... Our hypothesis is that symptoms of high altitude syndromes are detectable even at intermediate altitudes, as commonly encountered under Australian conditions (<2500 m above sea level)... We found that the frequency of flatus production more than doubled following ascent... The frequency and severity of headaches also increased following ascent. These results support the hypothesis that high altitude symptoms can be significant issues even at the relatively lower altitudes encountered in Australian alpine regions. Increased awareness amongst clinicians of this possibility could contribute to a reduction in the disease burden from high altitude syndromes at intermediate altitudes.” https://www.ncbi.nlm.nih.gov/pubmed/?term=slaney+flatus
- “Here's Why You're So Gassy... You're on an airplane. Yes, in addition to Montezuma's revenge, there is the very real phenomenon of airplane farts. When you're on a plane cruising at a high altitude the gas in your body expands, leading to a bloated feeling and, yes, more flatulence, according to researchers writing in the New Zealand Medical Journal. In that paper, the researchers argued that airlines should consider using activated charcoal (an odor absorber) in seat cushions to help make flights more comfortable.” https://www.refinery29.com/en-us/109403
- "Aerophagia (var. aerophagy) is a condition of excessive air swallowing, which goes to the stomach. Aerophagia may also refer to an unusual condition where the primary symptom is excessive flatus, belching is not present, and the actual mechanism by which air enters the gut is obscure.[1] Aerophagia in psychiatry is sometimes attributed to nervousness or anxiety." https://en.wikipedia.org/wiki/Aerophagia
"Aerophagia Causes and Resolutions...CPAP users who experience excessive belching, stomach bloating, stomach distension and agonizing gas pains may be suffering from aerophagia. It’s the medical term for the phenomenon when air enters the esophagus, goes into the belly and causes bloating. Aerophagia can be caused by eating, drinking or even talking too fast. It can occur with hyperventilation from anxiety, from chewing gum, smoking cigarettes and even during strenuous exercising." [https://www.sleepapnea.org/treat/cpap-therapy/troubleshooting-guide-for-cpap-problems/aerophagia-causes-and-resolutions/](https://www.sleepapnea.org/treat/cpap-therapy/troubleshooting-guide-for-cpap-problems/aerophagia-causes-and-resolutions/)

"Suffering from aerophagia and mixed sleep apnea...I am a 44 year old female. I am 118 lbs and I live at 7100 feet. I lived 37 years at sea level. The last three years I have been treated for Fibromyalgia, asthma and ADHD...Suffering from aerophagia is such a common issue in CPAP users that it should be included in every CPAP manual or discussed by every sleep doctor...clinical studies demonstrated that people sleeping at high altitude have an increased risk of having central sleep apnea.... I'm not surprised you have central apnea episodes when you live over 7000 feet." [https://www.sleep-apnea-guide.com/suffering-from-aerophagia-and-mixed-sleep-apnea.html](https://www.sleep-apnea-guide.com/suffering-from-aerophagia-and-mixed-sleep-apnea.html)
Altitude Diseases: Inflammation Hazards

- “Increased systemic low-grade inflammation in high altitude native rats mediated by adrenergic receptors...RESULTS: The HA (High Altitude) native rats showed significant increases in the serum levels of inflammatory cytokines, lipid profiles, as well as a significant increase in the urinary norepinephrine with a concomitant decrease in the serum levels of Mg+2 and increased lipid peroxidation. Blockage of the beta and alpha adrenergic receptors of the HA rats caused partial or complete decreases in both inflammatory and oxidative stress mediators.
CONCLUSION: Living under HA conditions results in an increased systemic inflammatory reaction; an effect that is mediated through the sympathetic nervous system mainly via alpha-adrenergic receptors and could be attributed to low Mg+2 levels.”

- “Can High Altitude Influence Cytokines and Sleep?...4. Altitude and Inflammation. The exposure to hypoxia promotes several transcription factors, including nuclear factor-κB (NF-κB), which plays a central role in stimulating the proinflammatory cytokines TNF-α and IL-6 [27]. Similarly, several studies with rodents and humans have shown that effects-induced hypoxia can cause inflammation, including increase in transvascular leakage and oxidative stress with increased NF-κB expression in lungs followed by significant increase in proinflammatory cytokines IL-1, IL–6, and TNF-α”
https://www.hindawi.com/journals/mi/2013/279365/

- “Effects of high altitude and cold air exposure on airway inflammation in patients with asthma...Conclusions. Exposure to environmental conditions at high altitude (hypoxia, exercise, cold) was associated with a moderate loss of asthma control, increased airway obstruction and neutrophilic airway inflammation. The cold temperature is probably the most important contributing factor as 24-hour cold exposure by itself induced similar effects.”
https://thorax.bmj.com/content/68/10/906

- “New findings link estrogen and T cell immune response to autoimmune inflammation...Women are more prone to the development of autoimmune diseases. The female hormone estrogen is likely to affect the immune system. A team of scientists reported new findings related to the involvement of estrogen hormone receptor in autoimmune diseases.”
https://www.sciencedaily.com/releases/2018/05/180531131116.htm

- “The Immune System Is a Natural Target for Estrogen Action: Opposing Effects of Estrogen in Two Prototypical Autoimmune Diseases...Analogous to other physiological systems, the immune system also demonstrates remarkable sex differences. Although the reasons for sex differences in immune responses are not precisely understood, it potentially involves differences in sex hormones (estrogens, androgens, and differential sex hormone receptor-mediated events), X-chromosomes, microbiome, epigenetics among others. Overall, females tend to have more responsive and robust immune system compared to their male counterparts. It is therefore not surprising that females respond more aggressively to self-antigens and are more susceptible to autoimmune diseases. Female hormone (estrogen or 17β-estradiol) can potentially act on all cellular subsets of the immune system through estrogen receptor-dependent and -independent mechanisms. This minireview highlights differential expression of estrogen receptors on immune cells, major estrogen-mediated signaling pathways, and their effect on immune cells. Since estrogen has varied effects in female-predominant autoimmune diseases such as multiple sclerosis and systemic lupus erythematosus, we will mechanistically
postulate the potential differential role of estrogen in these chronic debilitating diseases.”
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4701921/

- “Sex Hormones Determine Immune Response...Females and males differ in the energy consumption and nutritional requirements which are based on the interactions between environmental factors and sex hormones (1). The studies in early 1940s ascertained that females have enhanced capability of producing antibodies (2, 3). This enhanced immune reactivity in females helps mount an effective resistance to infection and therefore females are less susceptible to viral infections, but can develop immune-pathogenic effects and predisposition to autoimmunity due to hyper immune responses (4, 5). Sex hormones can also control the immune response via circadian rhythm. Many hormones like cortisol, known to regulate T cell mediated inflammation, have a circadian rhythm with a maximum peak at 8:00 a.m. and progressively lower levels as the day progresses (6). Interaction between sex hormones and environmental factors like cigarette smoke and infections lead to variable responses in both genders (5, 7, 8). There is emerging evidence that sex hormones impact microbial composition and the resulting immune response via secondary metabolites binding with receptors like estrogen receptors (ERs), peroxisome proliferator-activated receptors (PPARs) etc. (9). These differences in immune response can lead to variability in disease phenotypes with autoimmunity occurring more often in females and cancers occurring more in males.”
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6119719/

- “The Autoimmune Hormone Connection... insufficient hormones can lead to mood swings, increased irritability, feeling like anything will make you cry, experiencing depression or anxiety, and make you feel susceptible to stress...One current hypothesis is that the estrogen may actually enhance the inflammatory process of the immune system, meaning it could increase the number of antibodies attacking our tissues...While the decline in estrogen accompanies a decline in immune function, there is also a level of immune dysfunction that can arise. This may be one of the reasons we see a rise in heart disease (which has a strong autoimmune component) in postmenopausal women.” https://drbrighten.com/the-autoimmune-hormone-connection/

- “Sex Hormones and Immunoregulation...The most obvious effects of sex hormones on the immune response are the effects of these hormones on the numbers of circulating immune cells. In the peripheral blood, about 65% of the leukocytes are granulocytes (90% neutrophils), 5-10% is monocytes, and 30% are lymphocytes (85-90% T lymphocytes and 10-15% B lymphocytes). Sex hormones have been shown to affect these cell numbers by affecting proliferation or apoptosis of the cells or by recruitment of new cells from the bone marrow [39,40]. Although total white blood cell counts did not differ between males and females, an increase in white blood cells counts was observed in the luteal phase (and during pregnancy) as compared with the follicular phase of the ovarian cycle [40-43]. This may be largely due to an increase in granulocyte numbers in these reproductive conditions [42,44-47]. This suggests a role for progesterone and/or estrogen in increasing the numbers of granulocytes. In addition, various studies point to a decrease of monocyte numbers in the presence of estrogen, as shown by increased numbers of monocytes in males and menopausal women as compared with women in the follicular phase of the ovarian cycle [14,48]. However, the presence of estrogen together with progesterone may increase monocyte numbers as monocyte numbers are increased in the luteal phase and during pregnancy as compared with the follicular phase. Whether sex hormones also affect B and T lymphocyte numbers remains to be established. Conflicting results have been published [41,42,46,49-56]. Treg cell numbers may be modulated by sex
hormones, since it has been shown that both estrogen [57,58] and testosterone [59] increase Treg cells numbers.”

- “Hormones and the immune response...Recent advances suggest that the immune system does not function in isolation but is influenced by other physiological systems such as the endocrine and neuroendocrine systems. This review discusses aspects of immune function altered by neuroendocrine peptides, sex hormones, and vitamin D metabolites.”

- “Hormonal Link to Autoimmune Allergies...IgE recognition of autoantigens might augment allergic inflammation in the absence of exogenous allergen exposure. Among allergy and autoimmunity, there is disproportionate representation of males before puberty and females after puberty, suggesting a role for sex hormones. Hormone allergy is an allergic reaction where the offending allergens are one's own hormones. It is an immune reaction to the hormones, which can interfere with the normal function of the hormones. It can occur perimenstrually in women along with the variation in menstrual cycle. The perimenstrual allergies are about the cyclic abundance of the hormone causing a cyclic expression of allergic symptoms. The inflammatory mechanisms of allergic reactions to hormone allergens, which are intrinsic to the body, are the same as the mechanisms of allergic reactions to external allergens.”

- “Interplay between Hormones, the Immune System, and Metabolic Disorders...Hormones are metabolic components produced by different cell types, capable of regulating body homeostasis and the cross talk among the endocrine, cardiovascular, and immune systems. In patients with compromised immune response, inflammation may last longer or may be ineffective, leading to recurrent infections or other types of systemic dysfunctions associated with chronic inflammation. In the past few years, it became evident that hormones, neurotransmitters, and dietary factors are specific modulators of cells from the immune system by fine-tuning their activation and key functions. Of note, cells from the immune system present high expression of receptors for different hormones present in the blood circulation, such as aldosterone and glucocorticoids. This in turn might also affect the vascular function leading to cardiovascular diseases. Therefore, the main scope of this edition is to contribute to knowledge in this growing and innovative area, through reviews and original articles that will help to understand the diverse mechanisms by which hormones and/or diet can influence inflammatory response and immune activation.”

- “An Overview of Endocrine Issues and Autoimmune Diseases...Endocrine disorders are diseases and conditions that affect your endocrine system. The endocrine system includes your glands, which secrete hormones that have effects on other organs in the body...Your key endocrine glands include: Thyroid gland, Pituitary gland, Pineal gland, Pancreas, Ovaries, Testes, Parathyroid, Hypothalamus, Adrenals. Some of the most common endocrine disorders include a number of thyroid-related conditions, including: Hypothyroidism, Hyperthyroidism, Hashimoto's Thyroiditis, Graves' disease, Thyroid cancer, Goiter, Thyroiditis, Thyroid nodules. Some other common endocrine disorders include: Adrenal disorders, Diabetes, Osteoporosis, Pituitary disorders, Polycystic ovary syndrome”
Altitude Diseases: Gastrointestinal

- “My coworker at very high altitude died from colon cancer and another coworker died from throat cancer.” Steven Magee CEng MIET - Q
- “High Altitude May Give Rise to IBD Flares...Traveling at high altitudes — be it a mountain vacation or an hour-long flight — may put inflammatory bowel disease (IBD) patients at risk for flares, researchers reported here. Travel at heights of at least 2,000 meters (about 6,562 feet) above sea level triggered IBD flares in patients within 4 weeks of being at the altitude, according to data presented by Stephan Vavricka, PD, of Trieml Hospital in Zurich, and colleagues here at Digestive Disease Week. There has been early evidence that hypoxia can induce inflammation in the gastrointestinal tract”  
Altitude Diseases: Bruxism

- “Occlusion time analysis in military pilots affected by bruxism...Military pilots are characterized by peculiar job conditions related to intense accelerative stresses. For this, they frequently report work-related neck and back pain and are affected by bruxism...military pilots have an importantly increase incidence of bruxism, as confirmed by a previous study that found bruxism of clinical importance in the 71% of Israel military jet pilots and only in the 27% of the non-pilots aircrew members.” [https://www.nature.com/articles/s41598-018-38166-2](https://www.nature.com/articles/s41598-018-38166-2)

- “Bruxism in military pilots and non-pilots: Tooth wear and psychological stress...Bruxism of clinical importance (i.e., with dentin exposure) was found in 69% of the aircrew members but only 27% of the non-pilot group. No difference was found between groups regarding stress levels. Military aircrews may be relatively vulnerable to deleterious bruxism as well as other signs of chronic stress. Among bruxers, pilots tended to show coping strategies that were significantly more emotional and less task-oriented than non-pilots, whereas non-bruxers showed no significant differences in coping behavior. This study suggest that integrating dental and psychological preventive intervention may be helpful.” [https://www.researchgate.net/publication/6494607_Bruxism_in_military_pilots_and_non-pilots_Tooth_wear_and_psychological_stress](https://www.researchgate.net/publication/6494607_Bruxism_in_military_pilots_and_non-pilots_Tooth_wear_and_psychological_stress)

- “7 reasons why you're tired all the time...You grind your teeth. Stressed out? You may be taking out your frustrations out in your sleep. Called bruxism, teeth grinding uses all the muscles surrounding your jaw and skull, says Tim Chase, D.M.D., a practicing partner at SmilesNY, a cosmetic dentistry practice in New York City. “Imagine how tired your arm would feel if you were doing biceps curls all night while you slept,” says Chase. No wonder you wake up tired. Bruxism can also wear down the enamel of the teeth over time. See your dentist if you suspect bruxism to discuss treatment options. Might be time for a retainer.” [https://www.today.com/health/tired-all-time-reasons-behind-fatigue-I547823](https://www.today.com/health/tired-all-time-reasons-behind-fatigue-I547823)

- “How to Stop Grinding Your Teeth at Night...teeth grinding can also cause tooth sensitivity, sore jaw muscles and headaches, especially around the temples. Damage to the teeth can also develop. Over time, the tooth enamel can become worn. Tooth fractures and chips can also occur. The exact reason why some people grind their teeth while they sleep is not understood. But it appears, in some cases, teeth grinding is associated with sleep arousals. Sleep arousals are common in people who have snoring and sleep apnea.” [https://www.sleepassociation.org/sleep-disorders/more-sleep-disorders/bruxism/stop-grinding-teeth-night/](https://www.sleepassociation.org/sleep-disorders/more-sleep-disorders/bruxism/stop-grinding-teeth-night/)

- “The Link Between Sleep Apnea and Teeth Grinding...Waking up with tired, tight jaw muscles or sensitive teeth could be a sign that you grind or clench your teeth during the night, a condition known as bruxism. If left untreated, bruxism can lead to tooth decay, headaches, and trouble sleeping.” [https://www.sleepfoundation.org/articles/link-between-sleep-apnea-and-teeth-grinding](https://www.sleepfoundation.org/articles/link-between-sleep-apnea-and-teeth-grinding)
Altitude Diseases: Malnutrition Hazards

- “By the end of 2018 it had become clear from experiments with supplements and dietary changes that I had been suffering from the long term effects of malnutrition.” Steven Magee CEng MIET - Q
- “What is malnutrition?...Malnutrition refers to deficiencies, excesses or imbalances in a person’s intake of energy and/or nutrients. The term malnutrition covers 2 broad groups of conditions. One is ‘undernutrition’—which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals). The other is overweight, obesity and diet-related noncommunicable diseases (such as heart disease, stroke, diabetes and cancer).”
  https://www.who.int/features/qa/malnutrition/en/
- “Malnutrition is a condition that results from eating a diet in which one or more nutrients are either not enough or are too much such that the diet causes health problems.[1][3] It may involve calories, protein, carbohydrates, vitamins or minerals.[1] Not enough nutrients is called undernutrition or undernourishment while too much is called overnutrition.[2] Malnutrition is often used to specifically refer to undernutrition where an individual is not getting enough calories, protein, or micronutrients.[2][12] If undernutrition occurs during pregnancy, or before two years of age, it may result in permanent problems with physical and mental development. [1] Extreme undernourishment, known as starvation, may have symptoms that include: a short height, thin body, very poor energy levels, and swollen legs and abdomen.[1][2] People also often get infections and are frequently cold.[2] The symptoms of micronutrient deficiencies depend on the micronutrient that is lacking.”
  https://en.wikipedia.org/wiki/Malnutrition
- “List of types of malnutrition or list of nutritional disorders include diseases that results from excessive or inadequate intake of food and nutrients. They come in two broad categories: undernutrition and overnutrition.”
- “Malnutrition: What you need to know...Signs and symptoms of undernutrition include: lack of appetite or interest in food or drink.  tiredness and irritability.  inability to concentrate.  always feeling cold.  loss of fat, muscle mass, and body tissue.  higher risk of getting sick and taking longer to heal.  longer healing time for wounds.  higher risk of complications after surgery.  Depression.  reduced sex drive and problems with fertility.”
  https://www.medicalnewstoday.com/articles/179316.php
- “Malnutrition...Signs of malnutrition.  The most common symptom of undernutrition is unintentional weight loss (losing 5-10% or more of your body weight over three to six months). Other signs can include: weak muscles.  feeling tired all the time.  low mood.  an increase in illnesses or infections.  The main sign of overnutrition is being overweight or obese. However, people with undernutrition can also be overweight if they eat a diet high in energy (calories), but low in other nutrients.  Signs of malnutrition in children can include failure to grow at the expected rate and changes in behaviour, such as appearing unusually irritable, sluggish or anxious.”
  https://www.nhsinform.scot/illnesses-and-conditions/nutritional/malnutrition
- “Malnutrition: Definition, Symptoms and Treatment...Preventing and treating malnutrition involves addressing the underlying causes.  Government agencies, independent organizations and schools can play a role in preventing malnutrition.  Research suggests that some of the most effective ways to prevent malnutrition include providing iron, zinc and iodine pills, food supplements and nutrition education to populations at risk of undernutrition (45). In addition,
interventions that encourage healthy food choices and physical activity for children and adults at risk of overnutrition may help prevent overweight and obesity (46, 47).”

“Sea level adapted very high altitude workers eventually end up in a state of malnutrition from exposure to abnormal environmental conditions. Long term exposure to malnutrition is known to bring on mental and physical health problems.” Steven Magee CEng MIET - Q

“THE IMPORTANCE OF NUTRITION IN MOUNTAINEERING. “The importance of adequate caloric and fluid intake must be rated as least as highly as that of oxygen” Dr Griffith Pugh...The paper tackles the following fundamental subjects: The reasons for weight loss at altitude. How to decide what food rations should be taken on expedition. The importance of experimenting by preparing/eating foods on expedition at home first. During the Expedition – How to keep properly hydrated at altitude and avoid problems concerning dehydration and diarrhea. Water retention in Acute Mountain Sickness (AMS). Micronutrient deficiencies- (vitamins and minerals). Understanding and calculating energy needs. What is Basal Metabolic Rate (BMR). How to calculate energy needs and physical activity. Diet-induced energy expenditure. Macronutrients – carbohydrates, fats, and protein – distribution at altitude.”


“A Review of the Physiology and Nutrition in Cold and in High-Altitude Environments by the Committee on Military Nutrition Research...high doses (400 mg/d) of vitamin E decreased the exhalation of pentane and the production of thiobarbituric acid-reacting substances (TBARS) by erythrocytes of subjects at high altitudes, suggest that tocopherol may have a role in inhibiting increased lipid peroxidation under such conditions. Furthermore, a high dose of vitamin E appeared to improve the rheological characteristics of blood of subjects at high altitudes...As with cold exposure, concern was expressed regarding the adequacy of current dietary recommendations for the water-soluble vitamins essential for energy production (thiamin, niacin, riboflavin, and pantothenic acid) for individuals at high altitudes...adequate iron nutriure is important for individuals working at higher elevations, because of the well-known phenomenon of altitude-induced polycythemia...urinary zinc losses were significantly elevated during exposure to the very high altitude of 27,726 ft (8,450 m) altitudes.”

“Risk of malnutrition is associated with mental health symptoms in community living elderly men and women: The Tromsø Study...Conclusions. Impaired mental health was strongly associated with the risk of malnutrition in community living elderly men and women and this association was also significant for subthreshold mental health symptoms.”

“The link between psychosis and malnutrition...First-time psychosis sufferers are far more likely to be deficient in micronutrients and protein than the general population – and more intervention studies are needed to explore strategies against this, say UK researchers.”

“Assessment of malnutrition in mental health clients: nurses’ judgement vs. a nutrition risk
tool...Results. The comparison revealed that nurses did not identify malnutrition in the same patients as the risk score, overlooking 27 (29%) at risk patients. Nurses associated malnutrition with psychotic illness, suggesting that depressed patients are more likely to be overlooked.”  

- “Malnutrition is a condition that results from eating a diet in which one or more nutrients are either not enough or are too much such that the diet causes health problems.”  
https://en.wikipedia.org/wiki/Malnutrition

- “How Malnutrition Affects the Brain...Inadequate intake of essential vitamins and nutrients has repercussions on the entire body. One of the most concerning is the effects malnutrition can have on the brain. This organ -- in charge of thinking, emotions and instigating bodily functions -- needs proper nutrition from the time you're in the womb through old age. Failure to provide the brain with nourishment can have lasting consequences.”  
Altitude Diseases: Altered Hormones

- “Hormones at high altitude...Humans cannot live at high altitudes because we cannot elicit long term physiological adaptation of the cardiorespiratory, metabolic and reproductive systems in such a hostile climate. As hormones play a key role in regulating these processes, von Wolff et al. investigated whether the endocrine system becomes significantly dysregulated at a certain altitude...Hormone concentrations correlated with altitude but not with oxygen parameters, indicating that hypoxia was not a major driver of hormonal dysregulation in this context. Adrenal, thyroid and gonadal axes were affected by altitude, characterised by activation of the adrenal and thyroid axes and inhibition of the male reproductive endocrine axis. Acclimatisation at 4844m led to normalisation of adrenal and gonadal but not thyroid hormone axes. At higher altitudes (>5000m), endocrine dysregulation was pronounced, which may contribute to the incapability of humans to live permanently at very high altitude.”

- “Endocrine responses to acute and chronic high-altitude exposure (4,300 meters): modulating effects of caloric restriction...Altitude exposure is known to stimulate neuroendocrine systems as part of the acute hypoxic and chronic adaptive acclimatization process (2). In contrast, prolonged caloric restriction (CR) tends to blunt some of the same neuroendocrine pathways that are stimulated at altitude as the body attempts to reduce basal energy expenditure (44). In this report, we describe the hormone and metabolic responses to HA as measured in three groups of subjects over the course of a 21-day dietary intervention.”

- “Sodium Regulating Hormones at High Altitude: Basal and Post-Exercise Levels...High altitude (HA)-induced diuresis is associated with marked changes in sodium and water regulating hormones, particularly the renin-angiotensin-aldosterone system (RAAS) and atrial natriuretic hormone (ANH). These hormones are also strongly stimulated by physical exercise, which is a major component of daily activity at HA...Our data show that PRA and aldosterone levels were constantly suppressed at HA and were unresponsive to exercise, whereas the ANH response was significantly stimulated during acute HA exposure, but not during chronic exposure. This suggests that hypoxia-induced chemoreceptor stimulation may cause the natriuretic phenomenon through direct suppression of the RAAS.”

- “Physiological effects of high-altitude trekking on gonadal, thyroid hormones and macrophage migration inhibitory factor (MIF) responses in young lowlander women...Altitude hypoxia is often associated with impairment of human reproduction. In this study, hormones and macrophage migration inhibitory factor (MIF, a proinflammatory cytokine with key roles in human reproduction) were determined in seven regularly menstruating, lowlander native women living at sea level participating in 14 days of trekking at moderate and high altitude. Blood and saliva samples were collected from each subject at high altitude (5050 m a.s.l. [above sea level]), and at sea level before and after the expedition. Testosterone level was lowered by high altitude and was restored after the end of the expedition, while progesterone decreased significantly in all participants at the end of the expedition, although most of the participants were in the luteal phase. The salivary concentration of MIF decreased greatly at altitude, but its levels were completely restored after the return to sea level. Our findings showed high
sensitivity and rapid changes in the determined parameters in response to the high-altitude hypoxic environment, particularly MIF.”


- “Effects of high-altitude hypoxia on the hormonal response to hypothalamic factors...Acute and chronic exposure to high altitude induces various physiological changes, including activation or inhibition of various hormonal systems. In response to activation processes, a desensitization of several pathways has been described, especially in the adrenergic system. In the present study, we aimed to assess whether the hypophyseal hormones are also subjected to a hypoxia-induced decrease in their response to hypothalamic factors. Basal levels of hormones and the responses of TSH, thyroid hormones, prolactin, sex hormones, and growth hormone to the injection of TRH, gonadotropin-releasing hormone, and growth hormone-releasing hormone (GHRH) were studied in eight men in normoxia and on prolonged exposure (3-4 days) to an altitude of 4,350 m. Thyroid hormones were elevated at altitude (+16 to +21%), while TSH levels were unchanged, and follicle-stimulating hormone and prolactin decreased, while leutinizing hormone was unchanged. Norepinephrine and cortisol levels were elevated, while no change was observed in levels of epinephrine, dopamine, growth hormone (GH), IGF-1, and IGFBP-3. The mean response to hypothalamic factors was similar in both altitudes for all studied hormones, although total T4 was lower in hypoxia during 45 to 60 min after injection. The effect of hypoxia on the hypophyseal response to hypothalamic factors was similar among subjects, except for the GH response to GHRH administration. We conclude that prolonged exposure to high-altitude hypoxia induces contrasted changes in hormonal levels, but the hypophyseal response to hypothalamic factors does not appear to be blunted.”


- “High serum testosterone levels are associated with excessive erythrocytosis of chronic mountain sickness in men...Chronic mountain sickness (CMS) is characterized by excessive erythrocytosis (EE) secondary to hypoventilation. Erythropoietin (Epo) and testosterone regulate erythrocyte production. Low thyroid hormone levels are also associated to hypoventilation. Hence, these hormones can play a role in etiopathogeny of EE...High-altitude natives present similar levels of gonadotropins and thyroid hormones but lower dehydroepiandrosterone sulphate (DHEAS) levels (P < 0.01) and greater Epo (P < 0.01), 17α-hydroxyprogesterone (P < 0.01), and testosterone levels (P < 0.01) than those at 150 m. Serum testosterone levels (524.13 ± 55.91 μg/dl vs. 328.14 ± 53.23 ng/dl, means ± SE; P < 0.05) and testosterone/DHEAS ratios are higher (7.98 ± 1.1 vs. 3.65 ± 1.1; P < 0.01) and DHEAS levels lower in the EE group (83.85 ± 14.60 μg/dl vs. 148.95 ± 19.11 ug/dl; P < 0.05), whereas Epo was not further affected. Testosterone levels were highest and DHEAS levels lowest in the EE group at all times after hCG stimulation. In conclusion, high androgen activity could be involved in the etiopathogeny of CMS.”

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2692401/

- “The Effect of High Altitude on Blood Hormones in Male Westar Rats in South Western Saudi Arabia...Living in high altitude areas results in chronic hypoxia, which induces complex metabolic and endocrine adaptations. The current study investigated the endocrine responses of male Westar rats chronically exposed to high altitude-induced hypoxia in Abha City, in Southwestern Saudi Arabia. Approach: The rats were separated in to 2 groups of 10 rats. The first group was kept at an altitude of 600 m above sea level in the King Saud University animal house in Riyadh City and designated the low altitude group; the second group of rats was transferred to the King Khalid University animal house in Abha City, which is 2800 m height
above sea level and was designated the high altitude group. All rats were housed under the same laboratory conditions and fed the same diet. Blood samples were collected from both groups of animals 45 days after transferring the high altitude group to Abha City. Results: The data revealed that the rats transferred to the high altitude area had significant decreases in serum Thyroid Stimulating Hormone (TSH) and testosterone levels and significant increases in the levels of serum cortisol, free Triiodothyronine (T3) and free Thyroxin (T4) compared to rats kept at low altitude. Conclusion: The current study demonstrates that rats chronically exposed to high altitude hypoxia experienced alterations in various hormones. These findings will contribute to a better understanding of human endocrine and metabolic physiology in hypoxic conditions.”

https://www.researchgate.net/publication/49619640_The_Effect_of_High_Altitude_on_Blood_Hormones_in_Male_Westar_Rats_in_South_Western_Saudi_Arabia

- "What Are Skin Tags (And How Do You Get Rid of Them)?...Recent studies have also linked a higher incidence of skin tags to conditions like obesity, diabetes, metabolic syndrome, and insulin resistance. Hormonal changes seem to play a role, too, since many women develop skin tags during pregnancy." https://www.msn.com/en-us/health/health-news/what-are-skin-tags-and-how-do-you-get-rid-of-them/ar-BBVj2al?ocid=spartanntp

- "A strange skin tag grew on right side of my belly in my early forties. My doctors did not pay any attention to it and it was only years later that I discovered through experimentation with supplements that I had a DHEA hormone deficiency." Steven Magee CEng MIET - Q


- "The 'male menopause'. Some men develop depression, loss of sex drive, erectile dysfunction, and other physical and emotional symptoms when they reach their late 40s to early 50s. Other symptoms common in men this age are: mood swings and irritability, loss of muscle mass and reduced ability to exercise, fat redistribution, such as developing a large belly or "man boobs" (gynaecomastia), a general lack of enthusiasm or energy, difficulty sleeping (insomnia) or increased tiredness, poor concentration and short-term memory” https://www.nhs.uk/conditions/male-menopause/

- "Test 4 Key Hormones That Help Determine a Man's Overall Well-being. This at-home test looks at four hormones that can affect mood, weight balance, sex drive, muscle mass, and energy levels...Cortisol...DHEA...Estradiol...Testosterone." https://www.everlywell.com/products/mens-health-test/?utm_source=google&utm_medium=cpc&utm_campaign=mens_health&gclid=EA1alQobChMIoPyMxbj4g1VFqrsCh2C4Ab4EAMYAyAAEgKB7vD_BwE

- “Addison's disease...Addison's disease is caused by damage to the adrenal glands, which make hormones to control multiple metabolic processes in the body, and balance body salt and water. Treatment is with hormone replacement tablets and some lifestyle adaptations to ensure patients remain well...The signs and symptoms of Addison’s disease usually appear very gradually, as it takes months or years for the adrenal cortex to be destroyed significantly enough to cause symptoms. General signs such as tiredness, weight loss, feeling faint, depression and aches in the joints, muscles and abdomen are all common signs of Addison’s disease, but could also be caused by a wide range of other diseases. Nausea, vomiting, diarrhoea and a craving for salt
may also be symptoms, developing late in the disease course.” https://www.yourhormones.info/endocrine-conditions/addisons-disease/

- “Addison's disease...Addison's disease, also called adrenal insufficiency, is an uncommon disorder that occurs when your body doesn't produce enough of certain hormones. In Addison's disease, your adrenal glands, located just above your kidneys, produce too little cortisol and, often, too little aldosterone. Addison's disease occurs in all age groups and both sexes, and can be life-threatening. Treatment involves taking hormones to replace those that are missing...See your doctor if you have common signs and symptoms of Addison's disease, such as:  Darkening areas of skin (hyperpigmentation), Severe fatigue, Unintentional weight loss, Gastrointestinal problems, such as nausea, vomiting and abdominal pain, Lightheadedness or fainting, Salt cravings, Muscle or joint pains” https://www.mayoclinic.org/diseases-conditions/addisons-disease/symptoms-causes/syc-20350293
Altitude Diseases: Gender Dysphoria

- “I became aware during my time in high altitude astronomy that some workers would develop Gender Dysphoria (GD).” Steven Magee CEng MIET – Q

- “Gender Dysphoria...Gender dysphoria (formerly known as gender identity disorder in the fourth version of the Diagnostic and Statistical Manual of Mental Disorders, or DSM) is defined by strong, persistent feelings of identification with another gender and discomfort with one’s own assigned gender and sex; in order to qualify for a diagnosis of gender dysphoria, these feelings must cause significant distress or impairment. People with gender dysphoria often desire to live in accordance with their gender identity and may dress and use mannerisms associated with the gender with which they identify in order to achieve this goal... Adults with gender dysphoria typically feel uncomfortable being regarded by others as their assigned gender and often desire to be rid of the physical sex characteristics associated with it.”
  https://www.psychologytoday.com/us/conditions/gender-dysphoria

- “Gender Dysphoria (GD) in high altitude astronomy workers was occurring as low as 2,423m (7,949ft).” Steven Magee CEng MIET - Q

- “Gender dysphoria (GD) is the distress a person feels due to their birth-assigned sex and gender not matching their gender identity. People who experience gender dysphoria are typically transgender. Evidence from studies of twins suggests that gender dysphoria not only has psychological causes, but may have biological causes as well.[4] The diagnostic label gender identity disorder (GID) was used by the DSM until its reclassification as gender dysphoria in 2013, with the release of the DSM-5. The diagnosis was reclassified to better align it with medical understanding of the condition and to remove the stigma associated with the term disorder.[5][6] The American Psychiatric Association, publisher of the DSM-5, stated that gender nonconformity is not the same thing as gender dysphoria,[7] and that "gender nonconformity is not in itself a mental disorder. The critical element of gender dysphoria is the presence of clinically significant distress associated with the condition."[1] Some transgender people and researchers support declassification of the condition because they say the diagnosis pathologizes gender variance and reinforces the binary model of gender.[5][8] Treatment for gender dysphoria may involve supporting the person through changes in gender expression. Hormone therapy or surgery may be used to assist such changes.[2] Treatment may also include counseling or psychotherapy.[2]”
  https://en.wikipedia.org/wiki/Gender_dysphoria

- “16 Facts on Gender Confusion”
  https://fwipetitions.org/fwi/16-facts-on-gender-confusion/

- “Gender dysphoria...Adults with gender dysphoria can feel trapped inside a body that doesn't match their gender identity. They may feel so unhappy about conforming to societal expectations that they live according to their anatomical sex, rather than the gender they feel themselves to be. They may also have a strong desire to change or get rid of physical signs of their biological sex, such as facial hair or breasts.”
  https://www.nhs.uk/conditions/gender-dysphoria/

- “Rapid-onset gender dysphoria...This month, a Brown University researcher published the first study to empirically describe teens and young adults who did not have symptoms of gender dysphoria during childhood but who were observed by their parents to rapidly develop gender
dysphoria symptoms over days, weeks or months during or after puberty.”

- “4,000% Explosion in Kids Identifying as Transgender, Docs Perform Double Mastectomies on Healthy Teen Girls...Gender dysphoria is also a growing problem in the United Kingdom. In the UK, young people referred for "gender treatment" has increased from 97 in 2009 to 2,510 in 2017-2018, an over 4,000 percent increase in 10 years.”

- “High altitude astronomy was the only field that I worked in where workers had changed gender during their time there. Two males became females and one female that had been previously attracted to males later became attracted to females. I had not heard of this in other fields that I had worked in.” Steven Magee CEng MIET - Q

- “While I was aware of three workers that had disclosed their gender issues during their time in high altitude astronomy, I was not aware of how many more were staying silent about it.” Steven Magee CEng MIET - Q

- “Dr. John Nash Ott...discovered ways to change the gender of plants merely by varying the light source color-temperature...Ott's experiments led him to believe that only a full spectrum of natural light (including natural amounts of infrared and ultraviolet) could promote full health in plants, animals, and humans.” http://everything.explained.today/John_Ott/

- “I though that it was strange that people were changing gender in high altitude astronomy until I read Dr. John Nash Ott's books and his discussions about how he was changing the gender of plants and animals using distinctly different spectrum's of light from commercial lighting products. The spectrum of light at high altitudes is distinctly different to that at sea level.” Steven Magee CEng MIET - Q

- “Why Autism is linked to Insufficient Deep Sleep...Over the last 10 years there has been a significant increase in gender dysphoria. This means feeling as though one’s “gender” does not match the sexual organs one was born with. Though babies are born with male or female genitalia the sexual development of the brain is dependent on the release of sex hormones during deep sleep throughout childhood. Sexualizing the brain to match the genitalia is a nightly, chemical event that is followed by the pubertal physical changes that make us recognizably male or female. My patient experience has shown that teen boys who still have a feminine body shape, once sleeping normally, can transition to a masculine body shape even after significant pubertal delay. So both the social interaction and the body shape are determined by having the right amount of deep sleep during childhood.”
https://drgominak.com/2017/12/16/repair-and-development-only-happen-during-deep-sleep/

- “During my time in high altitude astronomy, I became aware of workers having gender issues. Many years later I discovered that sex hormones were affected by high altitude exposures.” Steven Magee CEng MIET - Q

- “What Is the Recommended Dosage of DHEA?...Other possible side effects may include masculinization or feminization in women and men, respectively.” https://www.livestrong.com/article/361148-what-is-the-recommended-dosage-of-dhea/

- “I started showing depression symptoms shortly after my very high altitude coworker stated that they were experiencing gender issues.” Steven Magee CEng MIET - Q

- "Is Your Depression Linked to Low DHEA Levels? DHEA Has Potential to Relieve Depression...In my experience, low levels of DHEA are one of many important factors that may
contribute to a depressed mood. Yet, routine testing for DHEA levels and DHEA supplementation is not considered a component of traditional medical or psychiatric practice...

It is the most abundant hormone in the human body and a precursor to all of our sex hormones: estrogen, progesterone, testosterone, and the stress hormone cortisol.

https://www.psychologytoday.com/us/blog/the-breakthrough-depression-solution/201107/is-your-depression-linked-low-dhea-levels

- “Intermittent Hypoxia and Hypercapnia Reproducibly Change the Gut Microbiome and Metabolome across Rodent Model Systems... In Ldlr−/− mice, we reported significant shifts in the bacterial and chemical composition of the gut on IHH exposure. The key chemical alterations included changes in microbiome-dependent metabolites such as gut-derived estrogen-like molecules (phytoestrogens) and bile acids.” https://msystems.asm.org/content/4/2/e00058-19

- "Mercury and Toxic Metal Effects on the Kidneys, Urinary System & Fertility...Mercury accumulates in the ovaries, testes, and prostate gland. In addition to having estrogenic effects, mercury has other documented hormonal effects including effects on the reproductive system resulting in lowered sperm counts, defective sperm cells, damaged DNA, aberrant chromosome numbers rather than the normal 46, chromosome breaks, and lowered testosterone levels in males and menstrual disturbances and infertility in women." http://amalgam.org/369-2/

- “Pharmaceuticals in Our Water Supply Are Causing Bizarre Mutations to Wildlife. Federal officials are studying the effects of pharmaceuticals such as pain killers and depression medicine in our water supply...From inter-sex fish in the Potomac River to frog mutations in Wisconsin, federal officials are spending this summer studying the effects of pharmaceuticals such as pain killers and depression medicine on the environment, because the drugs have turned up in America's drinking water.”

https://www.alternet.org/story/59305/pharmaceuticals_in_our_water_supply_are_causing_bizarre_mutations_to_wildlife

- “Research Proves 'Gender-Bending' Chemicals Affect Reproduction...It is believed that phthalates have these adverse effects because they reduce testosterone synthesis by interfering with an enzyme needed to produce the male hormone. In one study, women who had higher concentrations of two types of phthalates (DEHP and DBP) also had boys who appeared more feminized in their personality while playing.”


- “I was aware of approximately 50 high altitude workers histories during my time in astronomy. For 3 of those workers to be displaying Gender Dysphoria (GD) puts the rate at 6%. The rate is probably higher, as I suspect that some workers were hiding it.” Steven Magee CEng MIET - Q

- “I have the rate of Gender Dysphoria (GD) estimated at 6% of high altitude workers that I know that disclosed the condition. I suspect the rate is higher due to some workers not disclosing it and the actual rate may be approximately 12%.” Steven Magee CEng MIET - Q

- “There appeared to be an abnormally large number of lesbian, gay, bisexual, and transgender (LGBT) people working in high altitude astronomy, which was consistent with high altitude induced sex hormone damage.” Steven Magee CEng MIET - Q

- “Why are LGBT Americans so prone to dementia?...LGBT Americans are almost 30% more likely to suffer memory loss and confusion than people who are heterosexual and identify with their birth sex. The findings were presented this month at the Alzheimer’s Association International Conference in Los Angeles.”

https://considerable.com/lgbt-americans-dementia/

- “Astronomy workers changing gender? Yes, it is a well known occurrence from the effect of...
high altitude induced alterations of the human sex hormones.” Steven Magee CEng MIET - Q
Altitude Diseases: Drug Hazards

- “Company drug use was common in very high altitude workers.” Steven Magee CEng MIET - Q
- “Specific criteria for diagnosing drug-induced lupus have not been formally established. However, symptoms often overlap with those of systemic lupus erythematosus (SLE). These include: muscle and joint pain sometimes with swelling, flu-like symptoms of fatigue and fever, serositis (inflammation around the lungs or heart that causes pain or discomfort), certain laboratory test abnormalities. While the symptoms of drug-induced lupus are similar to those of systemic lupus, only rarely will any major organs be affected.” [https://www.lupus.org/resources/about-drug-induced-lupus](https://www.lupus.org/resources/about-drug-induced-lupus)
- “What Is Drug-Induced Lupus?...Lupus is a condition that can happen when your body’s immune system attacks your healthy tissues and organs. Drug-induced lupus is when it's caused by taking certain prescription medicines for months or years at a time. While lupus may damage your kidneys or lungs, drug-induced lupus rarely affects your body’s major organs. It’s also temporary. Once you stop the medicine that causes it, symptoms usually clear up within a few weeks or months. You’re more likely to get drug-induced lupus if you’re age 50 or older.”
- “In 2019 it had emerged that I was having chronic fatigue reactions to over the counter medications and to prescription medications. I have a history of five years of regular company drug use atop the biologically toxic summit of Mauna Kea. This is called ‘Drug Intolerance’.” Steven Magee CEng MIET - Q
- “Drug intolerance or drug sensitivity refers to an inability to tolerate the adverse effects of a medication, generally at therapeutic or subtherapeutic doses. Conversely, a patient is said to be "tolerating" a drug when they can tolerate its adverse effects. It is not to be confused with a drug allergy, which is a form of drug intolerance, but requires an immune-mediated component. It is also not to be confused with drug tolerance ("drug resistance," or tachyphylaxis) which refers to a lack of adverse effects even at higher than average doses. Some instances of drug intolerance are known to result from genetic variations in drug metabolism.” [https://en.wikipedia.org/wiki/Drug_intolerance](https://en.wikipedia.org/wiki/Drug_intolerance)
- “Multiple Drug Intolerance Syndrome...Multiple drug intolerance syndrome is defined as having greater than 3 or more unrelated drug intolerances or allergies. Based on medical record data, about 2 to 5% of the population that uses health care may have multiple drug intolerance syndrome in North America and Europe, with higher rates seen in hospitalized patients. Multiple drug intolerance syndrome is more likely to occur with increasing age as the number of life-time drug exposures increases. It is more common in females and in individuals being treated for higher numbers of different specific health conditions. Multiple drug intolerance syndrome can appear in patients with true allergies as have been reported in patients allergic to penicillin and quinolones antibiotics.” [https://www.aaaai.org/conditions-and-treatments/library/allergy-library/multiple-drug-intolerance](https://www.aaaai.org/conditions-and-treatments/library/allergy-library/multiple-drug-intolerance)
- "Gluten-related disorders...Causes. When enteropathy develops in early childhood, symptomatic disease is more rapidly evident. A survey of geriatrics with celiac disease in Finland revealed that the incidence of disease was much higher than the general population.[57] Allergic disease may rise or fall with age; certain evidence points to the increased or daily use of non-steroidal anti-inflammatory factors (aspirin, ibuprofen) as an increased risk factor for urticaria or anaphylaxis, and the sensitizing dose may include low-dose aspirin therapy used in
the treatment of heart disease. NCGS may be a late-onset condition: in a prospective study performed among adults of 18 to 80 years, the median age of disease onset was found to be 55 years, with a six times higher prevalence in females than in males.[5] The pathogenesis of NCGS is not yet well understood. There is evidence that not only gliadin (the main cytotoxic antigen of gluten), but also other proteins named ATIs which are present in gluten-containing cereals (wheat, rye, barley, and their derivatives) may have a role in the development of symptoms. ATIs are potent activators of the innate immune system.[32][40] FODMAPs, especially fructans, are present in small amounts in gluten-containing grains and have been identified as a possible cause of some gastrointestinal symptoms in persons with NCGS.[32][5] [40][58] As of 2019, reviews have concluded that although FODMAPs may play a role in NCGS, they only explain certain gastrointestinal symptoms, such as bloating, but not the extra-digestive symptoms that people with NCGS may develop, such as neurological disorders, fibromyalgia, psychological disturbances, and dermatitis.[40][41][32]" https://en.wikipedia.org/wiki/Gluten-related_disorders
Altitude Diseases: Mercury Poisoning

- “I was surprised when I discovered my mercury poisoning that the astronomy team had changed its mercury handling policies years earlier and had not informed me.” Steven Magee CEng MIET - Q
- “Mercury poisoning: Symptoms and treatment...Mercury is a heavy metal that is highly toxic to humans...If mercury poisoning is related to a person's workplace or environmental exposure, doctors may suggest that the person change their environment to reduce their exposure, or that the workplace puts new safety measures in place.” [https://www.medicalnewstoday.com/articles/320563.php](https://www.medicalnewstoday.com/articles/320563.php)
- “Mercury Exposure and Children’s Health...Acute or chronic mercury exposure can cause adverse effects during any period of development. Mercury is a highly toxic element; there is no known safe level of exposure. Ideally, neither children nor adults should have any mercury in their bodies because it provides no physiological benefit. Prenatal and postnatal mercury exposures occur frequently in many different ways. Pediatricians, nurses, and other health care providers should understand the scope of mercury exposures and health problems among children and be prepared to handle mercury exposures in medical practice. Prevention is the key to reducing mercury poisoning. Mercury exists in different chemical forms: elemental (or metallic), inorganic, and organic (methylmercury and ethyl mercury). Mercury exposure can cause acute and chronic intoxication at low levels of exposure. Mercury is neuro-, nephro-, and immunotoxic. The development of the child in utero and early in life is at particular risk. Mercury is ubiquitous and persistent. Mercury is a global pollutant, bio-accumulating, mainly through the aquatic food chain, resulting in a serious health hazard for children. This article provides an extensive review of mercury exposure and children’s health.” [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3096006/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3096006/)
- “Understanding Mercury Poisoning...Mercury poisoning can also disrupt fetal and early childhood development. Infants and young children who’ve been exposed to high levels of mercury may have delays in: cognition, fine motor skills, speech and language development, visual-spatial awareness...High amounts of mercury can lead to long-term and sometimes permanent neurological changes. The dangers are especially notable in young children who are still developing. Mercury exposure can lead to developmental problems in the brain, which can also affect physical functions such as motor skills. Some children who are exposed to mercury at a young age may develop learning disabilities...Adults with mercury poisoning may have permanent brain and kidney damage. Circulatory failure is another possible type of complication.” [https://www.healthline.com/health/mercury-poisoning#complications](https://www.healthline.com/health/mercury-poisoning#complications)
- “Mercury & Food Intolerances: Connections with Ulcerative Colitis, IBS, Crohn’s, Skin Conditions, & More...Mercury and food intolerances are linked as a common causes of chronic conditions related to leaky gut and intestinal dysfunction, such as ulcerative colitis, IBS, Crohn’s, eczema, psoriasis, food allergies, arthritis, ADHD, and autoimmune disease; treatments that improve these conditions...Brain inflammation or hypoglycemia related to toxic metal exposures, food intolerances, etc. have been found to be common causes of ADHD, impulsivity, juvenile delinquency, criminality, and violence. Detoxification, diet measures, and supplementation for deficient vitamins and minerals have been found to usually improve such conditions.” [http://amalgam.org/education/scientific-evidenceresearch/mercury-food-intolerances-connections-ulcerative-colitis-ibs-crohns-skin-conditions/](http://amalgam.org/education/scientific-evidenceresearch/mercury-food-intolerances-connections-ulcerative-colitis-ibs-crohns-skin-conditions/)
“Could Mercury Toxicity Be Causing Your Symptoms?...Mercury levels can build up in your body, causing immune dysfunction, fatigue, anxiety, depression, cardiovascular disease, and many other complaints...we often see patients with complex medical histories and symptoms that don’t fit inside the usual diagnostic categories of the conventional medical world. As a result, they are often given a prescription for an antidepressant and assured that they are perfectly healthy, or they are otherwise left unaided after multiple physicians just don’t know the cause of their seemingly mysterious complaints...In searching for the underlying cause of chronic illness, I’m often surprised by how frequently we find high levels of toxic metals, especially mercury. Mercury is a common environmental contaminant, and many of us are unknowingly predisposed to mercury toxicity.” [https://chriskresser.com/could-mercury-toxicity-be-causing-your-symptoms/]

“Mercury: Get This Heavy-Metal Poison Out of Your Body...mercury is the most alarming, disease-causing source of environmental toxicity that I see daily in my practice. Many of patients have toxic levels of mercury—and they’re not alone...I felt weak, tired, and couldn’t think. I had muscle pain and twitches, insomnia, digestive problems, food allergies, depression, and anxiety. And it was only by discovering high levels of mercury in my hair and urine — and slowly detoxifying myself — that I was able to get better. I have seen this over and over in my patients, too. From chronic fatigue and fibromyalgia, to depression, anxiety, obesity, dementia, Parkinson’s disease, cancer, heart failure, and heart disease, the message is clear …We are being poisoned!” [https://drhyman.com/blog/2010/05/20/mercury-get-this-poison-out-of-your-body/]

“Multiple Chemical Sensitivity After Being Mercury Poisoned...I had no problems with chemical sensitivities until AFTER I was mercury poisoned...Nine days later my head had a burning sensation that felt like my brain was "on fire." I developed electrical surges throughout my body for a few seconds and my brain felt like it was vibrating inside my skull...I had severe memory loss, vertigo, floaters in my eyes, food allergies, muscles aches, chronic fatigue, numbness and tingling throughout my body after being exposed to the mercury...To recover from multiple chemical sensitivities, one needs to remove all sources of toxicities to the body and use chelation drugs/ supplements/ sauna to detox the body.” [https://www.bmj.com/rapid-response/2011/10/30/re-multiple-chemical-sensitivity-after-being-mercury-poisoned]

“Could You Have Heavy Metal Poisoning and Not Know It?...I first tried a normal dose of the zeolite in each glass of water...And my urine smelled. Like metal. For over 2 months....There are many things that have been used to support the body to excrete heavy metals includes: antioxidants. Taurine. NAC. lipoic acid. liposomal glutathione. EDTA. DMSA. Sweating.” [https://wholenewmom.com/health-concerns/could-you-have-heavy-metal-poisoning-and-not-know-it-part-one/]

“Just Another Story of Chronic Mercury Poisoning...After a ten-year quest to understand my twenty years of health issues -- vision problems, increasing fatigue, intolerance to fragrances and fumes, digestive problems, and daily spells of acute physical and cognitive dysfunction -- I read Amalgam Illness: Diagnosis and Treatment, a technical book on chronic mercury poisoning by Andrew Cutler, an independent chemical engineer...After more than a year on the Cutler protocol, many of my symptoms are gone, others are vastly reduced, and I'm looking forward to a full recovery.” [http://mercuryandmore.weebly.com/mercury-story---illness.html]

“Mercury Toxicity: Associated Symptoms and Conditions...Up to 80% of inhaled mercury vapour is absorbed through the lungs. From here it travels to all the other tissues and organs of the body in the circulation, but particularly concentrates within the kidney, liver and brain…There are a wide range of illnesses that have been linked with mercury poisoning including:

“Cleaning Up a Small Mercury Spill...Mercury health effects. Breathing small amounts of mercury vapor can harm the nervous system of unborn babies, nursing infants and children. Breathing larger amounts of mercury vapor can cause irritability, tremors, or memory loss; shortness of breath; respiratory & eye irritation; chest pain; high blood pressure; kidney damage.”

“Urine Changes...What causes changes in urine?...Reddish urine could also be a sign of lead or mercury poisoning.”

“Mercury and Toxic Metal Effects on the Kidneys, Urinary System & Fertility...Mercury has been found to be nephrotoxic (toxic to kidneys)... The government’s toxic level for mercury in urine is 30 mcg/L, but adverse effects have been seen at lower levels and low levels in urine often mean high mercury retention and chronic toxicity problems. For this reason, urine tests are not a reliable measure of mercury toxicity...chronic exposure to mercury vapor and anesthetics found increased health problems compared to controls, including significantly higher liver, kidney, and neurological diseases.”

“Urinary Tract Infection or Mercury Poisoning?...MERCURY POISONING IN DISGUISE. While the frequency of UTIs is very real, especially among American adults, the symptoms mirror those of a urinary system that has been poisoned by mercury. Dr. J. Trowbridge, author of the Yeast Syndrome, is on the forefront of researching the possible correlation between UTIs and mercury poison. In his book, he states that several doctors report that 98% of patients with chronic UTI also exhibit high levels of mercury toxicity. This alarmingly high percentage of UTI patients begs the question: do these individuals have a UTI, or are they experiencing similar symptoms that are brought about by mercury poisoning?”

“I had a mysterious prolonged UTI of unknown cause in 2007 that all medical UTI testing proved negative. A year later in 2008 my doctor was stating ‘He has a plethora of multi-system complaints with no specificity.’ I had been working at an astronomical facility that used a large amount of mercury and had been handling rubber filled mercury systems with no personal protective equipment, such as gloves and respirators. The Kitt Peak National Observatory (KPNO) where I worked provided no industry recognized training in the safe handling of mercury.”

“The endocrine effects of mercury in humans and wildlife...Mercury (Hg) is well studied and research continues as our knowledge of its health risks increases. One expanding area of research not well emphasized to date is the endocrine effects of Hg. This review summarizes the existing literature on the effects of Hg on the endocrine system and identifies gaps in the
knowledge. It focuses on the thyroid, adrenal, and reproductive systems, including the accumulation of Hg in the endocrine system, sex differences that are manifested with Hg exposure, reproductive effects in male and female animals including humans, and Hg effects on the thyroid and adrenal systems. We concluded that there are five main endocrine-related mechanisms of Hg across these systems: (a) accumulation in the endocrine system; (b) specific cytotoxicity in endocrine tissues; (c) changes in hormone concentrations; (d) interactions with sex hormones; and (e) up-regulation or down-regulation of enzymes within the steroidogenesis pathway. Recommendations for key areas of research to better understand how the endocrine effects of Hg affect human and wildlife health were developed, and include increasing the amount of basic biological information available about Hg and wildlife species, exploring the role of Hg in the presence of other stressors and chemicals, understanding sublethal and indirect effects of Hg on adverse outcomes, developing better methods to extrapolate effects across species, and understanding the effects of Hg on multiple organ systems following exposure of an animal. Greater inclusion of endocrine endpoints in epidemiological and field studies on humans and wildlife will also advance the research in this area.”

- “Environmental Mercury and Its Toxic Effects...Mercury has profound cellular, cardiovascular, hematological, pulmonary, renal, immunological, neurological, endocrine, reproductive, and embryonic toxicological effects...Mercury exposure has been associated with the induction of over 250 symptoms which can complicate accurate diagnosis.”

- “How I Recovered from Mercury Poisoning...I struggled for many years feeling badly-so I was used to being tired. I was used to being unable to keep my house clean. And I was used to staying home because I could never “catch up”. But, I wasn't used to the debilitating headaches, insomnia, and generally feeling awful that rendered me unable to function... It all seemed to point to mercury poisoning–adrenal fatigue, hormonal dysfunction, anxiety, insomnia, liver problems, thyroid-type symptoms, candida, and chronic fatigue.”

- “Getting the Mercury Out...At the age of 30, Aine Ni Cheallaigh began to develop mysterious symptoms. Her health was eroding and she felt that she was aging faster than everyone around her. Suspecting that toxins were to blame, she had her mercury fillings removed. But restoring her health wasn't going to be that simple. Over the following months, she found herself catapulted into a nightmare of mental and physical illness. Getting the Mercury Out follows this ordinary woman's quest to solve her health mystery. Can she cure a disease that the medical establishment won't even admit is real? Can she find a treatment that will restore her to health and sanity? Sometimes funny, often heart-wrenching, this book is a deeply engaging story of personal struggle and endurance. It's an eye-opener for those who are curious about mercury poisoning, and an absolute must-read for anyone grappling with the desperate search for healing.”

- “Mercury Poisoning: The Undiagnosed Epidemic: How to detox...It is impossible to avoid exposure to toxic heavy metals in today’s world. This book explains how to diagnose mercury poisoning and shows how to safely remove mercury, lead, arsenic and other toxic metals from your body. The case histories in this book demonstrate how exposure to these heavy metals can...”
lead to allergies, anxiety, chronic fatigue, fibromyalgia, colitis, autism, ADHD, multiple sclerosis, Parkinson’s disease, amyotrophic lateral sclerosis and mental illnesses such as bipolar disorder and schizophrenia. The Environmental Protection Agency’s limit for mercury is an intake of 7 micrograms per day for a 70 kg person. If you have dental amalgams (these silver colored fillings are actually 50% mercury) the World Health Organization estimates you are exposed to 4 to 21 micrograms per day. Over decades this adds up to hundreds of milligrams of the element that toxicologists consider the most toxic non-radioactive element. If you eat 100 grams (3.5 ounces) of tuna, you take in another 35 micrograms, or 5 times the daily limit for the average adult. We are also exposed to mercury through some vaccines and pharmaceutical products. At home there are mercury containing CFL light bulbs and fructose syrup. At the same time, the environment is contaminated with several hundred times the level of lead that our pre-industrial ancestors were exposed to. In animal experiments, mercury increased the toxicity of lead by a factor of 14. It is no wonder that so many people are experiencing chronic health problems. Perhaps mercury or another heavy metal is the source of your health problems.”

“HEAVY METALS DETOX: The fast-track to a healthier version of YOU!...Depression, fatigue, insomnia, anxiety, brain fog, weakness, it doesn't matter what your doctor calls it, it ALWAYS involves toxicity — Dr. Sherry Rogers. Rest assured, this book contains everything you need to keep your health on track. Inside, we'll cover what heavy metals are, how they get inside us, and what you can do to remove them. When aluminum, mercury, lead, arsenic, cadmium, and chromium are gently purged from the body, a stronger, clearer-thinking version of YOU comes to the surface. As an added bonus, detoxification helps protect against accelerated aging and sickness. Secure your copy by clicking the button now! In 1974 the World Health Organization reported that 82% of all chronic degenerative disease was caused by toxic metal poisoning! Since then, heavy metals have continued to find their way into our food, our water, and even the air we breathe!”
Altitude Diseases: Industrial Gas Hazards

- “When discharging industrial gas into the indoor environment in high altitude astronomy, we never wore protective breathing respirators that fed us oxygenated air at above the legally required 19.5% oxygen levels.” Steven Magee CEng MIET - Q
- “Industrial liquid gas containers were left open and venting gas into the indoor environment in high altitude astronomy. On reflection, I realized that I routinely observed mental and physical effects that match those of a low oxygen environment in staff that I supervised.” Steven Magee CEng MIET - Q
- “The toxicity of medical and industrial gas to the human depends on where it is used. A gas that is regarded as safe in a well ventilated environment at sea level may be a toxic gas in an indoor environment at high altitude.” Steven Magee CEng MIET - Q
- “An open flask of industrial liquid gas that is venting into the indoor environment should be thought of as the same as a smoldering fire, as they both create a dangerous oxygen deficient environment for the human.” Steven Magee CEng MIET - Q
- “During my time in high altitude astronomy, I routinely witnessed workers breathing medical oxygen, industrial carbon dioxide, nitrogen and helium gas as part of their daily indoor work routine.” Steven Magee CEng MIET - Q
- “When I worked in high altitude astronomy, the worst sickness that I experienced was not at the 13,796 feet very high altitude summit of Mauna Kea Observatory (MKO) in Hawaii, it was at Kitt Peak National Observatory (KPNO) in Arizona at the much lower altitude of 6,875 feet. Due to my very high altitude experiences, I knew that this strange sickness was not primarily caused by altitude sickness and was most likely Sick Building Syndrome (SBS). After reporting various behavioral problems in all of the staff to the upper management team, my contract was not renewed, I was unable to legally protect the health and safety of the workers that I was responsible for, troubleshooting of this environmental problem stopped and I left in a sickened state for my next position before I could find the root cause.” Steven Magee CEng MIET - Q
- “Asphyxiation Hazard: When cryogenic liquids form a gas, the gas is very cold and usually heavier than air. This cold, heavy gas does not disperse very well and can accumulate near the floor. Even if the gas is non-toxic, it displaces air. When there is not enough air or oxygen, asphyxiation and death can occur. Oxygen deficiency is a serious hazard in enclosed or confined spaces. Small amounts of liquid can evaporate into very large volumes of gas. Toxic Hazards: Each gas can cause specific health effects.”
  http://www.hsc.wvu.edu/safety/Laboratory-Safety/Cryogenic-Liquids.aspx
- “Asphyxiation Hazard...Small amounts of liquid can evaporate into very large volumes of gas. For example, one litre of liquid nitrogen vapourizes to 695 litres of nitrogen gas when warmed to room temperature (21°C). Toxic Hazards: Each gas can cause specific health effects. For example, liquid carbon monoxide can release large quantities of carbon monoxide gas, which can cause death almost immediately.”
  https://www.ccohs.ca/oshanswers/chemicals/cryogenic/cryogen1.html
- “Asphyxiation - nitrogen, argon and helium: Releasing nitrogen, argon or helium may produce local oxygen-deficient atmospheres, which will produce asphyxia if inhaled....BOC recommend that, as a precaution, oxygen deficiency monitors should be used....Asphyxiation - carbon
dioxide: Carbon dioxide is essentially an asphyxiant gas but also has mild toxic properties. The Health and Safety Executive's guidance note EH40 indicates that the recommended exposure limit for carbon dioxide is 5,000 ppm (0.5%) by volume - calculated as an eight hour time-weighted average concentration in air - or 15,000 ppm (1.5%) for a 15 minute period. For these reasons, a carbon dioxide monitor should be used when there is a risk of CO2 exposure, rather than an oxygen deficiency monitor.”

- “When humans breathe in an asphyxiant gas, such as pure nitrogen, helium, neon, argon, sulfur hexafluoride, methane, or any other physiologically inert gas(es), they exhale carbon dioxide without re-supplying oxygen. Physiologically inert gases (those that have no toxic effect, but merely dilute oxygen) are generally free of odor and taste. As such, the human subject detects little abnormal sensation as the oxygen level falls. This leads to asphyxiation (death from lack of oxygen) without the painful and traumatic feeling of suffocation (the hypercapnic alarm response, which in humans arises mostly from carbon dioxide levels rising), or the side effects of poisoning. In scuba diving rebreather accidents, there is often little sensation but euphoria—however, a slow decrease in oxygen breathing gas content has effects which are quite variable. By contrast, suddenly breathing pure inert gas causes oxygen levels in the blood to fall precipitously, and may lead to unconsciousness in only a few breaths, with no symptoms at all.”

- “HYPOXIA: If the bag has a device that will remove CO2 repeated breaths would deplete the oxygen, but no CO2 would accumulate. The person would be unlikely to experience severe dyspnoea, and might not be aware of the shortage of oxygen until too late (unconsciousness occurs), but the respiratory minute volume (RMV) would begin to increase due to hypoxia. In about the same time he would become unconscious and eventually die from hypoxia. There would be very little discomfort and he might feel rather euphoric and unconcerned about the situation; euphoria is a typical and characteristically dangerous aspect of hypoxia.”

- “Dangers of oxygen-deficient atmospheres: Effects of exposure to low oxygen concentrations can include giddiness, mental confusion, loss of judgment, loss of coordination, weakness, nausea, fainting, loss of consciousness and death.”

- “I have memories from my time in high altitude astronomy of being euphoric and giddy after discharging large amounts of industrial gas into the indoor environment. The effects would last hours and resembled being drunk and intoxicated.” Steven Magee CEng MIET - Q

- “Euphoric: Psychology. in a state of happy and confident well-being sometimes exaggerated in pathological states as mania.”

- “Giddy: 1. affected with vertigo; dizzy. 2. attended with or causing dizziness: a giddy climb. 3. frivolous and lighthearted; impulsive; flighty.”

- “Some of the typical long-term effects of hypoxic ischemic encephalopathy (HIE) include the following: Cerebral palsy; Epilepsy, seizure disorders; Severe hearing impairments; Blindness or severe vision impairments; Problems learning, thinking and speaking. These are called cognitive developmental problems and are often accompanied by a low mental development index (MDI) score; Problems with walking and coordination, also called motor and behavioral developmental problems. These result in a low psychomotor development index (PDI) score.”
What Happens After A Lack of Oxygen to the Brain? Common long-term effects of oxygen deprivation can include: Damage to specific brain regions deprived of oxygen...Changes in mood or personality...Difficulty with memory...Changes in motor skills...Chronic pain...The inability to feel pain, or to correctly respond to pain signals...Difficulties with impulse control...Symptoms of mental illnesses such as depression or anxiety....Dementia-like symptoms, including confusion, memory difficulties, and signs of rapid brain aging.”

“Risk Factors For Oxygen Deprivation: Cerebral hypoxia has a variety of potential causes—anything that interferes with the body's ability to process and distribute oxygen could lead to deprivation in the brain. This could include: Severe asthma attacks; Chronic work in a nitrogen-rich environment; Extremely high altitude without a pressurization mechanism; Choking or strangulation; Drowning; Chronic smoke inhalation; Crushing of the trachea. Any situation in which you are unable to breathe normally can lead to cerebral hypoxia and eventual brain damage, which in turn can increase your risk for developing a form of dementia.”

“The Dangers of Industrial Gas Abuse”

“5 Most Common OSHA Violations”

“1910.134(a)(1) In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to this section.”

“Employee exposure means exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.”

“Immediately dangerous to life or health (IDLH) means an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.”

“Oxygen deficient atmosphere means an atmosphere with an oxygen content below 19.5% by volume.”

“The Air check O2 Deficiency Monitor is used in restaurants where CO2 and nitrogen are used to dispense beverages, Tire sales and repair centers to protect employees when filling tires with nitrogen, MRI facilities to protect against helium leaks used to cool the magnets, and Food processing facilities to alert personnel of nitrogen leaks from freezer tunnels. PureAire’s Air check O2 continuous monitor can provide comfort in protecting your employees from entering potentially hazardous situations if a leak occurs.”
• “Drugs Associated with the Development of Interstitial Lung Disease...Aspirin, Oxygen, Radiation” http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/pulmonary/interstitial-lung-disease/

• “Low-level continuous or intermittent exposure to irritant gases or chemical vapors may lead to chronic bronchitis” http://www.merckmanuals.com/professional/pulmonary-disorders/environmental-pulmonary-diseases/irritant-gas-inhalation-injury

• “At the age of 46 I was diagnosed with lung issues.” Steven Magee CEng MIET - Q  http://environmentalradiation.com/High%20Resolution%20CT%20Radiation%20Scan%20Experience.pdf

• “During almost a decade of working in high altitude astronomy with liquid cryogenics and industrial gas, I have no recollection of ever being sent on an industry recognized training course in the safe handling and use of them.”  Steven Magee CEng MIET - Q

• “One of my astronomy managers used to tell me that liquid nitrogen was harmless and was just liquid air. He would pour it onto his bare hands to demonstrate how safe he thought it was. I was later to realize that incompetence was a feature of high altitude astronomy.”  Steven Magee CEng MIET - Q

• “Toxic gases...An overview of the widespread use of gases and some volatile solvents in modern society is given. The usual circumstances in which undue exposure may occur are described. The most prominent symptoms and general principles of diagnosis and treatment are given and are followed by more specific information on the commoner, more toxic materials. While acute poisonings constitute the greater part of the paper, some indication of chronic disorders arising from repeated or prolonged exposure is also given.” www.pmj.bmj.com/content/postgradmedj/65/762/224.full.pdf


• “We routinely worked with a variety of solvents at very high altitude atop Mauna Kea in Hawaii.”  Steven Magee CEng MIET - Q

• “We never used any form of respiratory protection when working with solvents at very high altitude atop Mauna Kea in Hawaii.”  Steven Magee CEng MIET - Q

• “Inhalation of solvents in a 40% oxygen deficient atmosphere at very high altitudes is probably not a good idea.”  Steven Magee CEng MIET - Q

• “Dirty air can harm your brain and stress the body. Studies show pollution can alter brain function in students and disrupt hormones...Yet even today, air pollution sickens and kills people. Lots of people. A 2016 study reported that breathing dirty air is now the fourth-leading cause of deaths worldwide.”  https://www.sciencenewsforstudents.org/article/dirty-air-can-harm-your-brain-and-stress-body

• “The air we breathe could be changing our behaviour in ways we are only just beginning to understand...It’s also clear that exposure to various pollutants can cause inflammation in the brain and can damage brain structure and neural connections. “So what could be happening is that these air pollutants are damaging the pre-frontal lobe,” says Younan. This is the very area important for controlling our impulses, our executive function and self-control.”
http://www.bbc.com/future/story/20190415-how-air-pollution-is-doing-more-than-killing-us

Altitude Diseases: Ethnicity

- “Thyroid hormone changes and psychological response to high altitude stress: effect of ethnicity…The objective of this study was to examine: i) the effect of ethnicity on cortisol, thyroid hormones and psychological performance during high-altitude exposure in lowlanders as compared to sea-level, and with high-altitude-natives (HAN) at high-altitude; ii) if there is any relation between psychological variables and hormones at high-altitude in the Indian population…In lowlanders, there was a significant change in loneliness, fear-of-death; thyroid hormones at high-altitude. Interactive effect between high-altitude×ethnicity was observed for psychological and hormone variables (except hopelessness, freeT3). Significant variation in hormones and psychological variables was observed between lowlanders and HAN at high-altitude (except memory, loneliness, TSH). Significant correlation was observed between fear-of-death/loneliness for Caucasoids (r=0.55) and Mongoloids (r=0.49); loneliness/freeT4 (r=−0.37) and fear-of-death/freeT4 (r=−0.36) for Mongoloids.”

[https://www.endocrine-abstracts.org/e0025/e0025p344](https://www.endocrine-abstracts.org/e0025/e0025p344)
Altitude Diseases: Altered Lifespan

- “My observations of high altitude observatory workers is that they seem to have elevated levels of behavioral problems that eventually progresses into ill health, disease and premature death for some.” Steven Magee CEng MIET - Q
- “Effects of Living at Higher Altitudes on Mortality: A Narrative Review... mortality from COPD and probably also from lower respiratory tract infections is rather elevated…Whereas living at higher elevations may frequently protect from development of diseases, it could adversely affect mortality when diseases progress.” https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4113517/
- “How Living At Altitude Can Help -- Or Hurt -- Your Life Span...He and his colleagues have found that people living at higher altitude in mountain states like Colorado experience no net increase or decrease in life expectancy, though living at altitude may decrease a person's chances of getting heart disease.” http://www.cpr.org/news/story/how-living-altitude-can-help-or-hurt-your-life-span
- “High-altitude living can prolong your life. Except when it doesn’t...Altitude can protect against heart disease but can also damage the lungs and aggravate pre-existing conditions. And those who have not lived at high altitude long-term may want to think twice before retiring in mountain towns...Aging at high altitude can prolong life and provide a host of other benefits, but only for those accustomed to the conditions, such as long-time residents or natives...Respiratory diseases, on the other hand, are more prevalent at high altitudes” https://denverite.com/2016/07/27/coloradans-age-better/
- “High Altitudes and Health...They found that the 10 million Americans residing in counties above 4,900 feet live one to three years longer on average than those living near sea level. The higher the altitude, the greater the longevity benefit...The “thinner air” (that is, lower oxygen levels) at higher altitudes may improve cardiac efficiency, have beneficial vascular effects and be cardioprotective in other ways, the researchers speculated. At the same time, even modestly lower oxygen levels can be hazardous for people with already-impaired breathing, as in COPD.” http://www.berkeleywellness.com/fitness/active-lifestyle/article/high-altitudes-and-health
- “DO WOMEN AGE FASTER AT HIGH ALTITUDES?...Women living in high altitude areas like the Rocky Mountains die younger and are more susceptible to disease, and new research conducted in Peru suggests they age faster, too. A recent study found lower concentrations of the hormones DHEA and DHEAS, important for both physical and mental wellness, in women age 60 to 70 living above 13,000 feet in the Peruvian Andes. While levels of the hormones naturally decline as women age, scientists found that the Peruvian women in high altitude areas never produced concentration levels as high as those living in areas just 500 feet above sea level. DHEA and DHEAS are steroid hormones produced by the adrenal gland. They are naturally found in the bloodstream and brain tissue of all healthy people. Scientists said the study might indicate that women age earlier in high altitude areas, including the Rockies, Andes, Alps and Himalayas. Other studies on DHEA have shown that besides affecting the aging process, it has a role in countering obesity and cancer.” http://www.denvernursingstar.com/newsletter/newsletter_view.asp?newsid=226&catid=39&active=0&mode=current
- “High altitude 'speeds up ageing'...Women who live at high altitudes are likely to age faster,
research suggests. Scientists drew their conclusions after finding lower concentrations of hormones, which are important for maintaining health and youthfulness, in women living in the mountainous areas of Peru...They found DHEA levels in mountain-living women aged between 60 and 70 were only at about 40% of the levels found in the control group...Other studies have shown the importance of DHEA and DHEAS in the ageing process. One found that when DHEA was fed to mice it increased their life expectancy by a third. The treated mice seemed younger and had a lower incidence of the typical diseases of ageing, including diabetes and cardiovascular complications...If you give synthetic DHEA to people who are deficient, their energy levels improve, their bones get a little thicker and their libido sometimes improves.”

http://news.bbc.co.uk/2/hi/health/1940046.stm

- “Effect of aging on blood pressure in Leh, Ladakh, a high-altitude (3524 m) community, by comparison with a Japanese town...The effect of aging on blood pressure (BP) and heart rate (HR) was investigated in a cross-sectional study in the high-altitude community of Leh, Ladakh (altitude: 3524 m) and a Japanese community in U town, Hokkaido (altitude: 25 m). BP and HR were obtained in a sitting position from 332 subjects 13–81 years of age in Ladakh, and from 216 Japanese citizens, 24–79 years of age. Measurements were taken after a 2-min rest, using a semi-automated BP device (UA-767 PC, A&D Co. LTD, Tokyo). High-altitude people showed higher diastolic BP and HR values than lowland people (83.2 vs. 76.9 mmHg and 78.6 vs. 69.2 bpm, P < 0.001), but no difference in systolic BP. Highland people also showed a steeper BP increase with age than the lowland people (systolic BP: 0.7476 vs. 0.3179 mmHg/year, P < 0.0005; diastolic BP: 0.3196 vs. 0.0750 mmHg/year, P < 0.001). This chronologic investigation in Ladakh examined the circulation as a physiological system at high-altitude. Our data indicate the need for a more comprehensive cardiovascular assessment for a better diagnosis and a more fruitful treatment. Longitudinal observations of effects of socio-ecologic factors on the cardiovascular system should help prevent strokes and other cardiovascular events, especially at high altitude.”


- “Aging, High Altitude, and Blood Pressure: A Complex Relationship...Both aging and high altitude exposure may induce important changes in BP regulation, leading to significant increases in BP levels. By inducing atherosclerotic changes, stiffening of large arteries, renal dysfunction, and arterial baroreflex impairment, advancing age may induce progressive increases in systolic BP levels, promoting development and progression of arterial hypertension. It is also known, although mainly from studies in young or middle-aged subjects, that exposure to high altitude may influence different mechanisms involved in BP regulation (i.e., neural central and reflex control of sympathetic activity), leading to important increases in BP levels. The evidence is less clear, however, on whether and to what extent advancing age may influence the BP response to acute or chronic high altitude exposure. This is a question not only of scientific interest but also of practical relevance given the consistent number of elderly individuals who are exposed for short time periods (either for leisure or work) or live permanently at high altitude, in whom arterial hypertension is frequently observed. This article will review the evidence available on the relationship between aging and blood pressure levels at high altitude, the pathophysiological mechanisms behind this complex association, as well as some questions of practical interest regarding antihypertensive treatment in elderly subjects, and the effects of antihypertensive drugs on blood pressure response during high altitude exposure.”

Altitude Diseases: Dementia

- “The amnestic disorders are a group of disorders that involve loss of memories previously established, loss of the ability to create new memories, or loss of the ability to learn new information. As defined by the mental health professional's handbook, the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision (2000), also known as DSM-IV-TR, the amnestic disorders result from two basic causes: general medical conditions that produce memory disturbances; and exposure to a chemical (drug of abuse, medication, or environmental toxin).” [http://www.minddisorders.com/A-Br/Amnestic-disorders.html](http://www.minddisorders.com/A-Br/Amnestic-disorders.html)
- "Dementia from oxygen deprivation is not always treatable, because it usually stems from some form of permanent brain damage. If a person facing low levels of oxygen is restored to adequate levels fast enough, the damage may be minimal or reversible. But if the damage is long-term and causes the onset of dementia, there is little that can be done short of managing the symptoms." [https://www.dementia.org/oxygen-deprivation-dementia](https://www.dementia.org/oxygen-deprivation-dementia)
Altitude Diseases: Mental Health

- “A person exhibiting confusion at high altitude will commonly forget to take oxygen to alleviate it.” Steven Magee CEng MIET - Q
- “I am at one with crazy.” Steven Magee CEng MIET - Q
- “Am I mentally ill or am I just a mad scientist?” Steven Magee CEng MIET - Q
- “Living at Higher Altitudes Could Be Bad for Mental Health...people who live at higher altitudes are somewhat less likely to die from coronary artery disease or stroke. But increased elevation may also enhance psychological problems, such as panic attacks...One reasonable explanation could be the effects of hypoxia, or a deficiency in the amount of oxygen reaching the tissues. This can influence the body’s metabolism of serotonin, one of the neurotransmitters related to aggressive behavior and suicide. Several studies suggest that chronic hypoxia increases mood disturbances, especially in patients with emotional instability.”
- "My Brother Tom’s Schizophrenia...He had been a skier, a camper, a mountain climber. He was strong and fit, with a wide-ranging intellect and a practical mind, and, in his early twenties, when he was still a student at the University of Colorado (5,345 feet), he had done things like bike through Europe and climb a forbidding Alaskan mountain called the Moose’s Tooth. (10,300 ft)...His symptoms were as bad as they had ever been—“both auditory and visual hallucinations, pacing, and some symptoms of mania, including not sleeping for periods up to 24 hours,” read the doctor’s notes." [https://www.newyorker.com/culture/personal-history/my-brother-toms-schizophrenia?utm_source=pocket-newtab]
- "The Moose's Tooth (or simply Moose's Tooth, Mooses Tooth) is a rock peak on the east side of the Ruth Gorge in the Central Alaska Range, 15 miles (24 km) southeast of Denali. Despite its relatively low elevation, it is a difficult climb. It is notable for its many large rock faces and its long ice couloirs, which are famous in mountaineering circles, and have seen a number of highly technical ascents." [https://en.wikipedia.org/wiki/The_Moose%27s_Tooth]
- "At CU, Altitude Is The Buffs' Best Friend...BOULDER — Wherever athletic endeavors are contested on the University of Colorado campus, the number 5,345 feet is clearly evident. That number is CU's elevation — and it's an intimidating number for visiting athletes...So without preparing and getting ready, a visit to Boulder can turn ugly for an athlete competing in any sport, not just in endurance sports." [https://cubuffs.com/news/2016/3/24/210829487.aspx]
Altitude Diseases: Social Isolation Hazards

- “High altitude observatories are commonly on remote mountain tops that isolate workers from society.” Steven Magee CEng MIET - Q
- “Extreme night shift work was lone working for up to eighteen hours per night for several nights on the very high altitude summit of Mauna Kea.“ Steven Magee CEng MIET - Q
- “High altitude workers are typically recruited from all over the world and relocated to the remote astronomical observatory area. The downside to this is that it isolates them from their existing friends and family.” Steven Magee CEng MIET - Q
- “Social isolation is a risk factor for mental illness including dementia, depression and anxiety. Precisely how social isolation affects mental wellbeing is an emerging field of study, although early indications suggest that persistent loneliness may lead to changes in self-perception and behaviour, creating a self-reinforcing negative loop. Perceived lack of social support is another factor which appears to impact on mental health.”
- “What message can we take from these stories of endurance and despair? The obvious one is that we are, as a rule, considerably diminished when disengaged from others. Isolation may very often be the “sum total of wretchedness”, as the writer Thomas Carlyle put it. However, a more upbeat assessment seems equally valid: it is possible to connect, to find solace beyond ourselves, even when we are alone. It helps to be prepared, and to be mentally resilient. But we shouldn’t underestimate the power of our imagination to knock over prison walls, penetrate icy caves or provide make-believe companions to walk with us.”
- “Even Americans of a few generations ago used to benefit from a richness of community life that has all but disappeared, as we've witnessed a long, slow retreat into the hermetically sealed comfort of our fortress-like homes . . . deep friendships replaced by screens, gadgets, and exhausted couch-potato stupor. The toll? Increased vulnerability to mental illness. Social isolation is a huge risk factor for the onset of major depression, which has more than doubled in prevalence over the past decade. And there's growing evidence that isolation increases vulnerability to various forms of addiction, as well.”
  https://www.psychologytoday.com/blog/the-depression-cure/200907/social-isolation-modern-plague
- “Mental illness is a hard condition to deal with. If you do not have the correct support system behind you the results can be unimaginable. Recent studies have shown the direct correlation between social isolation and mental illness. Social interaction is a necessity of life. Now, I am not talking social interaction as being in a relationship with someone at all times, but interaction in general. This interaction could be going to the movies with a friend, talking to your cousin on the phone, or going to a restaurant with your mother.”
  https://www.interventionservicesinc.com/socai-isolation-and-mental-illness/
- “Could Working Remotely Be As Bad For Your Health As Smoking? Some psychologists believe that social isolation could be the cause for a lot of health problems.”
  https://www.fastcompany.com/3069124/could-working-remotely-be-as-bad-for-your-health-as-smoking
- “In 1973 the US sociologist Robert Weiss divided loneliness into two categories: emotional and
social isolation. While these two forms of isolation sometimes overlap, it’s not always the case. One individual might feel inner loneliness despite having a good social network, or being married, while another might feel lonely because of not belonging to a social group. But whether a sense of isolation is emotional or social, its harmful effects on our health are the same, according to evidence.”
https://www.mentalhealth.org.uk/sites/default/files/the_lonely_society_report.pdf

- “People experience social isolation for a variety of reasons such as discrimination, lack of employment, being homeless or generally being in situations where they feel like their ideas and opinions are not valued. Social isolation can lead to very serious mental and physical health risks.” https://www.qld.gov.au/community/getting-support-health-social-issue/avoiding-social-isolation

- “Overworked and isolated - work pressure fuels mental illness in academia ...Heavy workloads, lack of support and isolation are the key factors contributing to mental illness, according to respondents, who range from PhD students to vice-chancellors...Just under half of respondents say they feel isolated, and others raise concerns around a "bullying culture", job insecurity and a culture of long working hours.” https://www.theguardian.com/higher-education-network/blog/2014/may/08/work-pressure-fuels-academic-mental-illness-guardian-study-health

- “Antarctic Researcher Stabs Colleague At Remote Outpost...An Antarctic researcher at a remote Russian science station has been charged with attempted murder after stabbing his colleague in a sudden outburst of violence. According to Russia’s Interfax news agency, Sergey Savitsky attacked his fellow scientist on October 9, possibly after suffering an emotional breakdown, stabbing him at least once.” https://www.msn.com/en-us/news/world/antarctic-researcher-stabs-colleague-at-remote-outpost/ar-BBOOZM4?ocid=spartanntp
Altitude Diseases: Mental Response to High Altitudes

- “A Review of the Physiology and Nutrition in Cold and in High-Altitude Environments by the Committee on Military Nutrition Research...Mental Response to High Altitudes. A hypoxic person often experiences personality changes, beginning with euphoria and then depression, with compromised ability to make decisions, especially when severe cold is a confounding factor (Nelson, 1982; Shukitt and Banderet, 1988; Tune, 1964). As noted by Schoene (see Chapter 17 in this volume), high altitudes "dull the spirit and engender a loss of spontaneity." He also noted, "the higher you go, the slower you go." As hypoxia worsens, there is increasing sensory and mental impairment, with the potential for paranoia and hostility. Patterns of mental response differ with individuals and the time course of acclimatization. Affect and emotions are altered at 14,000 ft (4,267 m) and above to the extent that cohesive groups, such as small military units, may experience a social breakup or dysfunction (Nelson, 1982; Shukitt and Banderet, 1988; Tune, 1964). There may also be decreased ability to perform small motor tasks which may persist after acclimatization. Sleep is disturbed at altitudes of 14,000 ft (4,267 m) and above. Sleep becomes periodic, often with Cheyne-Stokes breathing4 and periodic awakening accompanied by gasping for breath. There may be as much as a 50 percent reduction in total sleeping time, and a decrease in REM sleep (Anholm et al., 1992; Goldenberg et al., 1992; Normand et al., 1990; Sutton et al., 1979; Weil, 1985; White et al., 1987). This disturbed sleep pattern usually corrects within 3 to 5 days, but in some individuals may last for weeks. The general and REM sleep deprivation may contribute to personality changes.”

- “A Review of the Physiology and Nutrition in Cold and in High-Altitude Environments by the Committee on Military Nutrition Research...The Effect of Altitude on Cognitive Performance and Mood States. Physiological changes associated with exposure to altitudes above 10,000 ft (3,048 m) are often accompanied by changes in mood, performance, and appetite (see Chapters 17 and 22 in this volume). The limited available data are based on self-evaluation and suggest that there is mood impairment at high altitudes, including unfriendliness, impaired thinking, and dizziness (Bahrke and Shukitt-Hale, 1993; Van Liere and Stickney, 1963). Other data indicated fatigue, which may have been exacerbated by physical exertion and increased oxygen demand (Shukitt and Banderet, 1988; Shukitt-Hale et al., 1990). In an altitude chamber, subjects exhibited significant mood deterioration with increases in hypoxic conditions and duration of exposure (Lieberman et al., 1991). Available data thus are suggestive of mood deficits, but more studies are needed. Data on cognitive performance under hypoxic conditions are also limited. Some results indicate impairment at high altitudes (10,000 ft [3,048 m]), including deficits in reaction time, vigilance, memory, and reasoning ability (Lieberman et al., 1991). Complex task performance also deteriorates, with increased error rate and slowing of performance (Lieberman et al., 1991). Simulation studies in altitude chambers (hypoxic conditions) suggest that such adverse changes increase in severity with greater hypoxia and duration of exposure (Lieberman et al., 1991). There appears to be individual variability in susceptibility to these effects of altitude/hypoxia. Moreover, rate of ascent (onset of hypoxia) influences onset and severity of symptoms (Hansen et al., 1967; Shukitt-Hale et al., 1991a).”

- “Human behaviour and development under high-altitude conditions...Although we are far from a universally accepted pattern of impaired function at altitude, there is evidence indicating
motor, perceptual, memory and behavioural deficits in adults. Even relatively low altitudes (2500 m) may delay reaction time, and impair motor function. Extreme altitude exposure (>5000 m) may result in more pronounced impairment that can persist after returning to the lowlands. Research into the effects of altitude exposure earlier in development is lacking by comparison. Un-acclimatized children can suffer from acute mountain sickness, and, in native populations born at altitude, subtle cognitive and behavioural deficits suggest incomplete adaptation to hypoxia. The study of neurobehavioural functioning at altitude may provide important information about the effects of clinical hypoxia on the human brain and behavioural development." http://hera.ugr.es/doi/16657470.pdf
Altitude Diseases: Cognition

- “There were numerous times that I was trying and failing to shut down the world’s largest telescopes at the end of the extreme night shift. I would eventually have to leave it to the day shift, as my confusion from prolonged exposure to abnormal environmental conditions was too severe to complete the task.” Steven Magee CEng MIET - Q
- “Telescope coordinates are 12 numbers long. After a couple of years working extreme night shifts on the very high altitude summit of Mauna Kea, I could no longer remember the numbers that were read out to me by astronomers.” Steven Magee CEng MIET - Q
- “Long-term exposure to high altitude attenuates verbal and spatial working memory: Evidence from an event-related potential study...This study aimed to determine the neurocognitive basis underlying the effects of long-term high-altitude (HA) exposure on working memory (WM)...These results suggest that HA impairs the matching (P2) process in spatial WM tasks and the maintenance (LPP) process in both verbal and spatial WM tasks, indicating that HA had a different effect on verbal and spatial 2-back task performance...Oxygen is essential for maintaining normal human brain function; therefore, the most important and influential aspect of living in high-altitude (HA) areas is hypoxia. Chronic exposure to HA leads to deficits in cognition such as in attention, memory, and executive function.”
- “Cognitive performance in high-altitude Andean residents compared with low-altitude populations: From childhood to older age...To assess cognition in populations born and living at high altitude (HA; 3,700 m) and low altitude (LA; 500 m) in Bolivia, who were similar for both socioeconomic status and genetic ancestry. To determine whether HA hypoxia influences cognitive decline across the life span. Method: In total, 191 healthy participants aged 4 to 85 years were assessed at HA (N = 94; 33; 35% male) and LA (N = 97; 46, 47% male) on a battery of cognitive tasks: fluid intelligence, attention, short- and long-term memory, and psychomotor speed. Saliva samples were obtained for evaluation of genetic ancestry. Results: HA participants were significantly slower on measures of processing speed and speed of attention than individuals born and living at LA. HA participants had slightly higher percentage of native Andean ancestry than LA participants, but this was not associated with cognitive performance. Conclusions: This is the first study of HA residence and neurocognition across the life span. Given the physiological challenges of HA living, the impact on cognition appears to be subtle and related only to the speed of more complex cognitive operations, rather than to their accuracy. Moreover, the impact on cognition does not appear to differ with increasing age or for different degrees of genetic admixture. Further studies recruiting HA participants with a broader range of native Andean ancestry will help to address the issue of to what extent Amerindian ancestry provides neuroprotection to chronic hypoxia in those living at HA.”
  https://psycnet.apa.org/record/2014-18275-001
- “Effects on Cognitive Functioning of Acute, Subacute and Repeated Exposures to High Altitude...Neurocognitive functions are affected by high altitude, however the altitude effects of acclimatization and repeated exposures are unclear. We investigated the effects of acute, subacute and repeated exposure to 5,050 m on cognition among altitude-naïve participants compared to control subjects tested at low altitude...Selective and sustained attention are impaired at altitude and improves with acclimatization. The observed changes are associated, in part, with AMS score and SpO2. The gains in cognition with acclimatization during a first
exposure are not carried over to repeated exposures...High altitude exposure has a detrimental effect on cognitive functions with slower reaction times and reduced psychomotor vigilance i.e., slower reaction times as a measure of reduced sustained attention (high altitude, 1,500–3,500 m); impaired learning, spatial and working memory (very high altitude, 3,500–5,500 m) and impaired memory retrieval (extreme altitude, >5,500 m)”


• “How do acute, subacute and repeated exposures to high altitude affect cognition?...During the acute high altitude exposure i.e. first day at ALMA Observatory (5050m), the cognitive functions were adversely affected by the altitude exposure. The most affected cognitive abilities were the ones involved in tasks that need focus and a high level of precision, such as sustained attention...Ultimately, these results will be helpful to devise schedules that will ensure safety, reduce health hazards, as well as optimize the performance of the ALMA Observatory workers...The concerned government bodies, associated organizations and industrial partners may also use these findings as evidence to change policies concerning the health and safety of high altitude workers.”

https://www.cambridgecognition.com/blog/entry/how-do-exposures-to-high-altitude-affect-cognition
Altitude Diseases: Isolated High Altitude Psychosis

- “Isolated psychosis during exposure to very high and extreme altitude - characterisation of a new medical entity...CONCLUSIONS: Episodes of psychosis during exposure to high altitude are frequently reported, but have not been specifically examined or assigned to medical diagnoses. In addition to the risk of suffering from somatic mountain illnesses, climbers and workers at high altitude should be aware of the potential occurrence of psychotic episodes, the associated risks and respective coping strategies.”

- “Isolated psychosis drives mountaineers to madness, finds science...“In our study we found that there was a group of symptoms which are purely psychotic; that is to say, that although they are indeed linked to altitude, they cannot be ascribed to a high-altitude cerebral edema, nor to other organic factors such as fluid loss, infections or organic diseases,” Brugger, who is also the President of International Society for Mountain Medicine, explained.”

- “High-Altitude Psychosis Seen as Distinct from Altitude Sickness...After much scientific scrutiny, the researchers concluded the condition is a new medical entity: isolated high-altitude psychosis. Until now, doctors had attributed these acoustic, optical, and olfactory hallucinations to organic causes. This may be because they frequently occur with symptoms such as severe headaches, dizziness, and impaired balance — side effects of a high-altitude cerebral edema, or swelling due to injury or inflammation.”

- “'Mountain Madness' Found to Be a Real Psychosis...The "madness" mountain climbers often experience isn't a type of altitude sickness, as once thought, but rather an actual psychotic disorder, a new study suggests.”
https://consumer.healthday.com/fitness-information-14/climbing-health-news-244/mountain-madness-found-to-be-a-real-psychosis-729380.html

- “Mountain Madness. Why Climbers Hallucinate at High Altitudes...Headaches, dizziness, and muscle aches are expected, but some extreme climbers also suffer from hallucinations, going temporarily mad on the mountain, according to research from Cambridge University. And it’s not a side effect of altitude sickness...symptoms, like hearing voices, hallucinations, delusions, disorganized speech, impaired cognition, depression, and mania.”
https://www.mensjournal.com/adventure/why-some-climbers-have-hallucinations-at-high-altitudes/
Altitude Diseases: Invisible Friend

- “After I started working extreme night shifts, I began to think that someone was in the telescope control room with me. I would look for the person many times and would never find them. I eventually stopped looking for the person and accepted that it was my oxygen starved mind playing tricks on me in a very abnormal environment.” Steven Magee CEng MIET - Q
- “Hallucinations are a known aspect of working at very high altitudes.” Steven Magee CEng MIET - Q
- “The Third Man Factor is an extraordinary account of how people at the very edge of death experience the sense of an unseen presence beside them who encourages them to make one final effort to survive. This incorporeal being offered them a feeling of hope, protection, and guidance, and left the person convinced he or she was not alone. There is a name for this phenomenon: It's called the Third Man Factor. If only a handful of people had ever encountered the Third Man, it might be dismissed as an unusual delusion shared by a few overstressed minds. But over the years, the experience has occurred again and again, to 9/11 survivors, mountaineers, divers, polar explorers, prisoners of war, sailors, shipwreck survivors, aviators, and astronauts. All have escaped traumatic events only to tell strikingly similar stories of having sensed the close presence of a helper or guardian. The force has been explained as everything from hallucination to divine intervention. Recent neurological research suggests something else.” The Third Man Factor: Surviving the Impossible by John Geiger http://a.co/hxOYB9E
- “Imaginary friends (also known as pretend friends or invisible friends) are a psychological and social phenomenon where a friendship or other interpersonal relationship takes place in the imagination rather than external physical reality.” https://en.wikipedia.org/wiki/Imaginary_friend
- “Why People Hear Voices When Climbing Mount Everest...At extreme altitudes, mountaineers often mention experiencing psychosis — that is, a mental disorder where a person becomes out of touch with reality. Symptoms of psychotic episodes include hallucinations and delusions… Alone in the Himalayas at an altitude of more than 5.1 miles (8.2 kilometers), Windsor hallucinated a man called Jimmy, who accompanied him all day long, spoke encouraging words to him and then vanished without a trace.” https://www.livescience.com/61220-altitude-climbing-can-cause-psychosis.html
- “Mountain climbers experience mysterious hallucinations that doctors are calling a new condition...Although these high-altitude visions remain mysterious, oxygen deprivation is certainly a more reassuring explanation than that given by Peter Habeler, one of the first two people to climb Everest without supplemental oxygen. "There is a saying that whoever is killed up on the mountain wanders forever after his death," Habeler wrote in his 1979 book " Everest: Impossible Victory," "and guides the living mountaineers during their last meters to the summit."” https://www.businessinsider.com/high-altitude-climbers-psychosis-hallucinations-2018-1
- “For many years my best friend was an invisible presence that would go everywhere with me.” Steven Magee CEng MIET - Q
Altitude Diseases: Depression

- “I started showing depression symptoms shortly after my very high altitude coworker stated that they were experiencing gender issues.” Steven Magee CEng MIET
- "Is Your Depression Linked to Low DHEA Levels? DHEA Has Potential to Relieve Depression...In my experience, low levels of DHEA are one of many important factors that may contribute to a depressed mood. Yet, routine testing for DHEA levels and DHEA supplementation is not considered a component of traditional medical or psychiatric practice...It is the most abundant hormone in the human body and a precursor to all of our sex hormones: estrogen, progesterone, testosterone, and the stress hormone cortisol." [https://www.psychologytoday.com/us/blog/the-breakthrough-depression-solution/201107/is-your-depression-linked-low-dhea-levels]
- “How high altitudes could raise risk of depression, suicide...A new systematic review, now published in the Harvard Review of Psychiatry, found that people living in high-altitude areas of the United States, such as intermountain states, have higher-than-average rates of suicide and depression...Major depressive disorder occurs when someone has at least 2 weeks of low mood, self-esteem, and energy across most situations.” [https://www.medicalnewstoday.com/articles/321219.php]
- “Research shows high altitude increases depression and suicide, especially for women...people who live at higher altitudes can become more depressed than people who live closer to sea level. The effect, they say, is especially noticeable in women...Kanekar has studied the negative effects of altitude for years. Her research has shown that men and women don’t feel the effects of typical antidepressants at higher elevations. Experiments also seem to indicate that women go through a chemical change in their brain when exposed to anything at or above “moderate” elevation, even for a relatively short period of time” [https://fox13now.com/2019/04/01/research-shows-high-altitude-increases-depression-and-suicide-especially-for-women/]
- “High Altitudes Increase Suicide, Depression Risks: Study...Researchers analyzed 12 studies, including population-based data on the relationship between altitude and suicide or depression. Most studies concluded that areas in higher altitudes had greater risks of suicide and depression...Kious and his colleagues suggest two pathways by which hypobaric hypoxia might increase the risks of suicide and depression: by altering the metabolism of the neurotransmitter serotonin and/or through its effects on brain bioenergetics...possible treatments to alleviate the effects of altitude on depression and suicide risk: supplemental 5-hydroxytryptophan (a serotonin precursor) to increase serotonin levels, or creatinine to influence brain bioenergetics.” [https://www.newsmax.com/Health/health-news/high-altitudes-depression-suicide/2018/03/12/id/848122/]
- “Can Living at Altitude Lead to Depression?...high altitude — despite its risky virtues — can mess with your brain chemistry...Despite being ranked America’s happiest state with ski resorts, stargazing, and mountain trails galore, Utah also has the country’s highest suicide rates. One neuroscientist is calling it the “Utah Paradox” and thinks he has a hunch on why: high altitude — despite its risky virtues — can mess with your brain chemistry. Perry Renshaw’s research was recently featured in a Mic Article and we spoke to the man himself on why sadness might run so rampant at such great heights.” [https://www.mensjournal.com/health-fitness/can-living-at-altitude-lead-to-depression-20141204/]

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Altitude Diseases: Acute Hypoxic Physiological Anxiety (AHPA)

- “High altitudes, anxiety, and panic attacks: Is there a relationship?...People exposed to high altitudes often experience somatic symptoms triggered by hypoxia, such as breathlessness, palpitations, dizziness, headache, and insomnia. Most of the symptoms are identical to those reported in panic attacks or severe anxiety. Potential causal links between adaptation to altitude and anxiety are apparent in all three leading models of panic, namely, hyperventilation (hypoxia leads to hypocapnia), suffocation false alarms (hypoxia counteracted to some extent by hypocapnia), and cognitive misinterpretations (symptoms from hypoxia and hypocapnia interpreted as dangerous). Furthermore, exposure to high altitudes produces respiratory disturbances during sleep in normals similar to those in panic disorder at low altitudes. In spite of these connections and their clinical importance, evidence for precipitation of panic attacks or more gradual increases in anxiety during altitude exposure is meager. We suggest some improvements that could be made in the design of future studies, possible tests of some of the theoretical causal links, and possible treatment applications, such as systematic exposure of panic patients to high altitude.” https://www.ncbi.nlm.nih.gov/pubmed/12219335

- “The Effect of Altitude on Cognitive Performance and Mood States...Observed behaviors and personal anecdotes suggest that the initial mood experienced at altitude is euphoria, followed by depression. With time, individuals may also become quarrelsome, irritable, anxious, and apathetic (Van Liere and Stickney, 1963). Unfortunately, although disturbances in emotional control have been noticed at altitude for decades, there are few quantitative studies assessing mood changes at altitude.” https://www.ncbi.nlm.nih.gov/books/NBK232882/

- “New-Onset Anxiety Disorders at High Altitude...We describe a series of patients with new-onset anxiety disorders at high altitude treated at the Himalayan Rescue Association (HRA) clinic in Pheriche, Nepal (4240 m) in the spring season of 2006...We describe 3 types of anxiety-related disorders: limited-symptom panic attacks induced by nocturnal periodic breathing, excessive health-related anxiety, and excessive emotionality.” https://www.wemjournal.org/article/S1080-6032(07)70261-2/fulltext

- “The relationship between anxiety and acute mountain sickness...Whilst the link between physical factors and risk of high altitude (HA)-related illness and acute mountain sickness (AMS) have been extensively explored, the influence of psychological factors has been less well examined. In this study we aimed to investigate the relationship between anxiety and AMS risk during a progressive ascent to very HA...Trait anxiety at low altitude was an independent predictor of future severe AMS development at HA. State anxiety at HA was independently associated with AMS and its severity.” https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0197147

- “Syndrome of Acute Anxiety Among Marines After Recent Arrival at High Altitude...Management of mental health is critical for maintenance of readiness in austere military environments. Emerging evidence implicates hypoxia as an environmental trigger of anxiety spectrum symptomatology. One thousand thirty-six unacclimatized infantry Marines ascended from sea level to the Marine Corps Mountain Warfare Training Center (2,061–3,383 m) for a 30-day exercise. Within the first 6 days of training, 7 servicemen presented with severe, acute anxiety/panic with typical accompanying signs of sympathetic activation and no classic symptoms of acute mountain sickness (including headache). Four had a history of well-controlled psychiatric diagnoses. Invariably, cardiopulmonary and neurological evaluations
were unrevealing, and acute cardiopulmonary events were excluded within limits of expeditionary diagnostic capabilities. All patients responded clinically to oxygen, rest, and benzodiazepines, returning to baseline function the same day. The unexpected onset of 7 cases of acute anxiety symptomatology coincident with recent arrival at moderate-to-high altitudes represents a highly unusual incidence and temporal distribution, suggestive of hypobaric hypoxemia as the proximal cause. We propose acute hypoxic physiological anxiety (AHPA) as a unique member of the spectrum of altitude-associated neurological disorders. Recognition of AHPA is particularly relevant in a military population; warfighters with anxiety spectrum diagnoses may have a recognizable and possibly preventable vulnerability.”
Altitude Diseases: Suicide

- The Surprising Connection Between Altitude and Suicide...Previous studies have reported a significant association between suicide and altitude. One study showed a strong positive relationship between average state altitude and suicide rate. For example, in Utah, the average geographic altitude is about 6,000 feet and the rate of suicide is 70 percent higher than average...We found that for every increase of 100 meters in altitude, suicide rates increase by 0.4 per 100,000.” [https://www.adventure-journal.com/2019/04/the-surprising-connection-between-altitude-and-suicide/]

- "Is altitude causing suicide in the West? Researchers find that high elevations may affect our emotions in both good and bad ways...Western states are among the national leaders in alcohol abuse and depression rates, and rank low for mental health...Renshaw told her that he believes altitude messes with our bodies’ levels of dopamine and serotonin, chemicals that regulate our sense of happiness. Hypoxia, he says, causes serotonin to go down in our brains (which usually results in depression) and dopamine to increase (which usually creates a sense of euphoria, e.g. “runner’s high”)." [https://www.hcn.org/articles/is-altitude-causing-suicide-in-the-west]

- "Positive Association between Altitude and Suicide in 2584 U.S. Counties...Controlling for percent of age >50 yr, percent male, percent white, median household income, and population density of each county, the higher-altitude counties had significantly higher suicide rates than the lower-altitude counties. Similar findings were observed for both firearm-related suicides (59% of suicides) and nonfirearm-related suicides. We conclude that altitude may be a novel risk factor for suicide in the contiguous United States." [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3114154/]

- "My Crazy Brother. A personal look at the West's suicidal tendencies...Westerners lead the nation in suicide rates. No other measurement of mental illness distinguishes the West so clearly - not rates of depression and "serious psychological distress," not the shortages of money for treatment...He pulled the trigger in the springtime, the season of suicide..."The Arizona system is not particularly good," says Bob Hess, director of the National Alliance on Mental Illness' Arizona chapter. "But as a nation we're not good - basically everyone stinks together."

- "The Suicide Crisis. The number of suicides in America is growing, particularly in the West, but the issue rarely garners attention from most policymakers...the Suicide Belt, a region stretching from Idaho down to Arizona and New Mexico where self-inflicted deaths are more prevalent...About half of suicides nationally are committed with firearms...women about three times more likely than men to attempt suicide." [https://www.governing.com/topics/health-human-services/gov-suicide-deaths-spike-in-rural-western-states.html#data]

- "There's a Suicide Epidemic in Utah — And One Neuroscientist Thinks He Knows Why...Utah has disproportionately high rates of suicide and associated mood disorders compared to the rest of the country. In fact, it's the No. 1 state for antidepressant use...Renshaw thinks he's identified a more likely cause for the Utah blues: altitude...For people who don't have any serotonin — perhaps because hypoxia decreased their already-low supply — SSRIs are probably no more effective than prescription-plan tic tacs." [https://www.mic.com/articles/104096/there-s-a-suicide-epidemic-in-utah-and-one-neuroscientist-thinks-he-knows-why]

- "The curious relationship between altitude and suicide...Suicide is one of the top 10 causes of death in the U.S. In the next 20 years, it’s expected to cause more than 2 million deaths per year"
worldwide, ranking 14th in the world as a cause of death...One reasonable explanation could be the effects of hypoxia, or a deficiency in the amount of oxygen reaching the tissues. This can influence the body’s metabolism of serotonin, one of the neurotransmitters related to aggressive behavior and suicide. Several studies suggest that chronic hypoxia increases mood disturbances, especially in patients with emotional instability." [http://theconversation.com/the-curious-relationship-between-altitude-and-suicide-85716](http://theconversation.com/the-curious-relationship-between-altitude-and-suicide-85716)

- "Is Suicide Linked to Living at High Altitude?...A research review discovers high-altitude areas have increased rates of suicide and depression. In the United States, intermountain states were found to have the highest suicide rate with investigators positing that blood oxygen levels due to low atmospheric pressure may play a factor...The highest suicide rates were clustered in the intermountain states: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming. (Alaska and Virginia also had high suicide rates.)" [https://psychcentral.com/news/2018/03/12/is-suicide-linked-to-living-at-high-altitude/133637.html](https://psychcentral.com/news/2018/03/12/is-suicide-linked-to-living-at-high-altitude/133637.html)
Altitude Diseases: Death

- “Effects of high altitude on humans...Mountain medicine recognizes three altitude regions that reflect the lowered amount of oxygen in the atmosphere: High altitude = 1,500–3,500 metres (4,900–11,500 ft). Very high altitude = 3,500–5,500 metres (11,500–18,000 ft). Extreme altitude = above 5,500 metres (18,000 ft). Travel to each of these altitude regions can lead to medical problems, from the mild symptoms of acute mountain sickness to the potentially fatal high-altitude pulmonary edema (HAPE) and high-altitude cerebral edema (HACE). The higher the altitude, the greater the risk. Research also indicates elevated risk of permanent brain damage in people climbing to extreme altitudes. Expedition doctors commonly stock a supply of dexamethasone, or "dex," to treat these conditions on site. Humans have survived for two years at 5,950 m (19,520 ft, 475 millibars of atmospheric pressure), which is the highest recorded permanently tolerable altitude; the highest permanent settlement known, La Rinconada, is at 5,100 m (16,700 ft).[13] At extreme altitudes, above 7,500 m (24,600 ft, 383 millibars of atmospheric pressure), sleeping becomes very difficult, digesting food is near-impossible, and the risk of HAPE or HACE increases greatly.”

- “List of Mount Everest death statistics...One of the people claimed by Everest mountaineering was the U.S. astronaut Karl Gordon Henize. He was on a mission to study radiation but came down with a fatal case of HAPE in October 1993 and died at north base camp. At the time he was the oldest astronaut to have flown in space and also had a doctorate in astronomy.”

- “List of people who died climbing Mount Everest...Most deaths have been attributed to avalanches, injury from fall, serac collapse, exposure, frostbite, or health problems related to conditions on the mountain...Many deaths in high-altitude mountaineering have been caused by the effects of the death zone, either directly (loss of vital functions) or indirectly (unwise decisions made under stress or physical weakening leading to accidents). In the death zone, the human body cannot acclimatize, as it uses oxygen faster than it can be replenished. An extended stay in the zone without supplementary oxygen will result in deterioration of bodily functions, loss of consciousness and, ultimately, death.”

- “List of deaths on eight-thousanders...The eight-thousanders are the 14 mountains that rise more than 8,000 metres (26,247 ft) above sea level; they are all in the Himalayan and Karakoram mountain ranges.”

- “HAPE: The Number One Cause of Death at High Altitude...Ascending to high altitudes is common amongst outdoor enthusiasts. Too rapid of an ascent or inability to acclimate to higher altitudes leads to illnesses. The three most common of which are acute mountain sickness (AMS), high altitude cerebral edema (HACE) and high altitude pulmonary edema (HAPE). Of the three, HAPE is the most common cause of death related to high altitude.”

- “High-Altitude Illness Death Investigation...High altitude illness (HAI) is the current accepted clinical term for a group of disorders including acute mountain sickness (AMS), high-altitude cerebral edema (HACE), and high-altitude pulmonary edema (HAPE), which occur in travelers visiting high-altitude locations. High-altitude illness is due to hypobaric hypoxia, is not associated with age or physical conditioning, and mild forms are easily treated. High-altitude
cerebral edema and HAPE are medical emergencies that are fatal if not promptly treated and fortunately are uncommon. The cause of most high-altitude fatalities is not related to HAI and can be easily distinguished from HACE and HAPE; however, other causes of death may have symptoms and physical findings that overlap with HAI, making postmortem diagnosis challenging. Fatalities due to HAPE and HACE are diagnoses of exclusion. Medical examiners and coroners who work in jurisdictions with high-altitude locations should be aware of the risk factors, physiology, pathology, differential diagnosis, and classification of HAI to accurately recognize HAI as a cause of death. Medical examiners who do not work in jurisdictions with high-altitude locations may be asked to evaluate deaths that occur overseas associated with high-altitude trekking and mountaineering activities.”


- “Why altitude sickness kills people...Altitude sickness is one of the great dangers of climbing — and the most erratic. Its effects can range from a slight headache to losing the power of speech to slipping into a coma while you sleep...The headache is the result of brain swelling. In an attempt to get more oxygen to brain cells, the blood vessels dilate, swelling up. The capillaries in the lungs also develop problems, specifically leaking fluid into the lungs. As the sickness gets worse, more of the vascular system is taken out. Blood clots start forming inside the blood vessels. Tissues start hemorrhaging. Generally, though, it's the fluid in the brain or the fluid in the lungs that kills people.” https://io9.gizmodo.com/how-altitude-kills-people-1139481972

- “Can altitude sickness cause death?...People with pre-existing heart or lung problems are more prone to experience a serious form of altitude sickness than healthy people. Another risk factor for a potentially fatal case of altitude sickness is ascending to high altitudes too quickly. If you have symptoms of acute mountain sickness at lower altitudes, you have to wait until your body adjusts before continuing to ascend.” https://health.howstuffworks.com/diseases-conditions/respiratory/can-altitude-sickness-cause-death.htm

- “Anoxæmic Changes in the Liver, with regard to the 'High-Altitude Death' of Airmen...IN recent papers Büchner1 and his disciples Pichotka2, Müller and Rotter3, as well as Hesse4, have described peculiar histological findings in livers of airmen who died under the effect of atmospheric conditions at a high altitude. The pictures under consideration consist in the formation of big, round or polyhedric vacuoles in liver cells nearest the acinus centres; these vacuoles do not contain either fat or glycogen; they appear as optically empty spaces, including here and there a crescent-like hem of slightly acidophil, homogeneous material, probably serous liquid.” https://www.nature.com/articles/151558a0

- “Living at high altitude and risk of sudden infant death syndrome...This study identified altitude of residence as a significant risk predictor of SIDS, primarily in combination with the prone sleeping position. Respiratory disturbances, reduced oxygen saturation, and lower temperatures at high altitude might explain this association.” https://adc.bmj.com/content/79/6/506

- “When Should I Worry About Altitude Sickness? I just read about how two climbers died on Aconcagua from altitude sickness. I have plans to go to Everest Base Camp this year. Altitude sickness isn’t a concern there, is it?..Yes it is a concern...about 20 percent of people who ascend above 8,000 feet will suffer from some form of altitude sickness, and 40 percent of those who go to 10,000 feet will. In the Himalaya, altitude sickness is the leading cause of death among climbers. Even sherpas fall victim to its fatal effects.” https://www.outsideonline.com/1783446/when-should-i-worry-about-altitude-sickness
“Emphysema Mortality is Increased in Colorado Residents at High Altitude... Emphysema mortality is higher in Colorado than in the nation as a whole despite the younger age of Colorado's population. Colorado death records from 1959 to 1976 were examined to determine if emphysema mortality increases with altitude within the state and if altitude adversely affects survival from chronic lung disease. Because the proportion of persons older than 65 yr of age in Colorado decreases with altitude (r = −0.6, p < 0.01), emphysema mortality was age-standardized. The age-standardized rate increases with altitude among males (r = 0.9, p < 0.01; y = 0.003(x) + 42.1). Emphysema deaths at higher altitudes in Colorado (≥ 7,000 ft) occur at a younger age (68.1 ± 0.6 yr (mean ± SEM) versus 70.1 ± 0.6 yr at lower altitudes), after a shorter duration of illness, and more commonly from cor pulmonale than at lower altitudes (≤ 4,500 ft) where pneumonia is more common as the immediate cause of death. The mechanism by which high altitude residence interacts unfavorably with survival is not known but may stem from augmented pulmonary hypertension caused by the hypoxia of lung disease added to the hypoxia Of high altitude.” https://www.atsjournals.org/doi/abs/10.1164/arrd.1982.126.2.225?journalCode=arrd

“Death at High Altitude in the Hypobaric Chamber... A small number of accidental and suicidal deaths have occurred in the hypobaric, or high altitude, chamber. A case of an unusual suicide in a hypobaric chamber is presented. The changes that resulted from decompression and hypoxia are discussed.” https://www.astm.org/DIGITAL_LIBRARY/JOURNALS/FORENSIC/PAGES/JFS10988J.htm

“The Paradox of Doping in Mountain Climbing. In alpinism, supplemental oxygen is a matter of safety—but some say it’s doping... The only problem is that, for most, climbing without supplemental O2 dramatically increases the risk of death... While its causes are not fully understood, cerebral swelling, vasodilation, and alteration of the blood-brain barrier may all be involved. Effects of AMS can be felt as low as 8,000 feet. Untreated, the symptoms of AMS will progress, ultimately resulting in conditions like high altitude pulmonary edema, in which fluid accumulates in the lungs, or high altitude cerebral edema, in which the brain swells and pushes against the skull, causing a loss of coordination, coma, and eventually death.” http://nautil.us/issue/39/sport/the-paradox-of-doping-in-mountain-climbing

Altitude Diseases: Bovine High-Mountain Disease (BHMD)

- “Overview of Bovine High-Mountain Disease...Bovine high-mountain disease (BHMD) is characterized by a noncontagious swelling of edematous fluid in the ventral parasternal muscles (brisket region), the ventral aspect of the body including the abdomen, and the submandibular region in cattle raised in high-altitude regions (>5,000 ft [1,524 m]) in the western USA most commonly and substantially affecting Colorado, Wyoming, New Mexico, and Utah. It also affects cattle in mountainous ranges of the world, most commonly at elevations >6,500 ft (1,981 m) in western Canada and South America. BHMD affects cattle of all ages and breeds, but not necessarily equally.”

- "Getting to the Heart of Brisket Disease...bovine pulmonary hypertension (BPH), also known as high-mountain disease or brisket disease...At high elevations, low oxygen levels lead to hypoxia and constriction of the pulmonary artery, resulting in high PAP. High PAP ultimately leads to right-sided congestive heart failure, clinical “brisket disease” and death, unless affected cattle are quickly moved to lower elevations. Cattle have small lung capacity relative to their body mass, making them more susceptible to this condition than most other mammals. Researchers suspect that high growth rate and heavy finished weights can lead to a similar disease process in genetically susceptible feedyard cattle at lower elevations."
  https://www.drovers.com/article/getting-heart-brisket-disease

- "High-altitude pulmonary hypertension in cattle (brisket disease): Candidate genes and gene expression profiling of peripheral blood mononuclear cells...High-altitude pulmonary hypertension (HAPH) is a consequence of chronic alveolar hypoxia, leading to hypoxic vasoconstriction and remodeling of the pulmonary circulation. Brisket disease in cattle is a naturally occurring animal model of hypoxic pulmonary hypertension. Genetically susceptible cattle develop severe pulmonary hypertension and right heart failure at altitudes >7,000 ft. No information currently exists regarding the identity of the pathways and gene(s) responsible for HAPH or influencing severity. We hypothesized that initial insights into the pathogenesis of the disease could be discovered by a strategy of (1) sequencing of functional candidates revealed by single nucleotide polymorphism (SNP) analysis and (2) gene expression profiling of affected cattle compared with altitude-matched normal controls, with gene set enrichment analysis (GSEA) and Ingenuity pathway analysis (IPA). We isolated blood from a single herd of Black Angus cattle of both genders, aged 12-18 months, by jugular vein puncture. Mean pulmonary arterial pressures were 85.6±13 mmHg STD in the 10 affected and 35.3±1.2 mmHg STD in the 10 resistant cattle, P<0.001. From peripheral blood mononuclear cells, DNA was hybridized to an Affymetrix 10K Gene Chip SNP, and RNA was used to probe an Affymetrix Bovine genome array. SNP loci were remapped using the Btau 4.0 bovine genome assembly. mRNA data was analyzed by the Partek software package to identify sets of genes with an expression that was statistically different between the two groups. GSEA and IPA were conducted on the refined expression data to identify key cellular pathways and to generate networks and conduct functional analyses of the pathways and networks. Ten SNPs were identified by allelic association and four candidate genes were sequenced in the cohort. Neither endothelial nitric oxide synthetase, NADH dehydrogenase, TG-interacting factor-2 nor BMPR2 were different among affected and resistant cattle. A 60-gene mRNA signature was identified that differentiated affected from unaffected cattle. Forty-six genes were overexpressed in the
affected and 14 genes were downregulated in the affected cattle by at least 20%. GSEA and Ingenuity analysis identified respiratory diseases, inflammatory diseases and pathways as the top diseases and disorders (P<5.14×10^{-14}), cell development and cell signaling as the top cellular functions (P<1.20×10^{-08}), and IL6, TREM, PPAR, NFKB cell signaling (P<8.69×10^{-09}) as the top canonical pathways associated with this gene signature. This study provides insights into differences in RNA expression in HAPH at a molecular level, and eliminates four functional gene candidates. Further studies are needed to validate and refine these preliminary findings and to determine the role of transcribed genes in the development of HAPH."
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3329076/
Altitude Diseases: Biological Limits

- “The spectrum of life reduces as altitude increases until 13,796 feet where there is hardly any biological life at all.” Steven Magee CEng MIET - Q
- “Altitude and house dust mites...The effects of altitude on house dust mites (one of the allergenic components of house dust) and the synthesis of anti-acari IgE antibodies were studied. Flotation extraction, counting, and identification of mites were performed each season for 1 yr on 218 mattress-dust samples taken from the Briançon region in the Alps, 900 to 3170 meters in altitude. Of the total dust samples, 41 were repeatedly positive and 177 repeatedly negative. The percentage of positive samples and the concentration of mites varied inversely with the altitude (40% positive with seven mites per 100 mg of dust at 900 to 1100 m, 14% and 4/100 mg at 1200 to 1350 m, 6% and 2/100 mg at 1400 to 1600 m, and 0% at higher altitudes). Species did not vary with altitude (Dermatophagoides pteronyssinus 17%, Euroglyphus maynei 51%). In contrast, on the plain we found 80% of 77 dust samples positive (88 mites/100 mg of dust, 65% D. pteronyssinus), with the peak in autumn. Total and specific IgE were measured initially and every 3 mo in 42 asthmatic children with positive skin tests to D. pteronyssinus and subjected to a 9-mo stay in Briançon (the highest city in Europe, 1365 m altitude). Geometric mean of initial total IgE (1047 U/ml) dropped to 40% (p≤0.001); specific IgE to D. pteronyssinus also fell. The value of climate change as a therapeutic modality in asthma is not supported by convincing data but may be attributed in some cases to removal of antigenic stimulation. The decrease in the number of mites and in IgE levels at higher altitudes supports this hypothesis.”  

https://www.jacionline.org/article/S0091-6749(82)80006-7/abstract
High Altitude Disease Disability Codes

- “2019 ICD-10-CM Diagnosis Code T70 Effects of air pressure and water pressure”
  [https://www.icd10data.com/ICD10CM/Codes/S00-T88/T66-T78/T70-/T70](https://www.icd10data.com/ICD10CM/Codes/S00-T88/T66-T78/T70-/T70)
- “2019 ICD-10-CM Diagnosis Code T70.20 Unspecified effects of high altitude”
  [https://www.icd10data.com/ICD10CM/Codes/S00-T88/T66-T78/T70-/T70.20](https://www.icd10data.com/ICD10CM/Codes/S00-T88/T66-T78/T70-/T70.20)
- “2018 ICD-10-CM Diagnosis Code T70.29 Other effects of high altitude...Applicable To Alpine sickness...Anoxia due to high altitude...Barotrauma NOS...Hypobaropathy...Mountain sickness...Clinical Information. A general term applied to any clinical syndrome caused by difference between the surrounding atmospheric pressure and the total gas pressure in the various tissues, fluids and cavities of the body. A morbid condition of anoxia caused by the reduced available oxygen at high altitudes. Barotrauma means injury to your body because of changes in barometric (air) or water pressure. One common type happens to your ear. A change in altitude may cause your ears to hurt. This can happen if you are flying in an airplane, driving in the mountains, or scuba diving. Divers can also get decompression sickness, which affects the whole body. common symptoms of ear barotrauma include pain, a feeling that your ears are stuffed, hearing loss, dizziness, treatments for ear barotrauma include chewing gum and yawning to relieve the pressure. Medications such as decongestants may also help. Injury following pressure changes; includes injury to the eustachian tube, ear drum, lung and stomach.”
  [http://www.icd10data.com/ICD10CM/Codes/S00-T88/T66-T78/T70-/T70.29](http://www.icd10data.com/ICD10CM/Codes/S00-T88/T66-T78/T70-/T70.29)
- “2019 ICD-10-CM Diagnosis Code G47 Sleep disorders”
- “2018 ICD-10-CM Diagnosis Code G47.32 High altitude periodic breathing...Approximate Synonyms; Central sleep apnea due to high altitude; Central sleep apnea, high-altitude periodic breath. Clinical Information. A disorder characterized by recurrent apneas during sleep despite persistent respiratory efforts. It is due to upper airway obstruction. The respiratory pauses may induce hypercapnia or hypoxia. Cardiac arrhythmias and elevation of systemic and pulmonary arterial pressures may occur. Frequent partial arousals occur throughout sleep, resulting in relative sleep deprivation and daytime tiredness. Associated conditions include obesity; acromegaly; myxedema; micrognathia; myotonic dystrophy; adenotonsilar dystrophy; and neuromuscular diseases. (from Adams et al., Principles of Neurology, 6th ed, p395)”
  [http://www.icd10data.com/ICD10CM/Codes/G00-G99/G40-G47/G47-/G47.32](http://www.icd10data.com/ICD10CM/Codes/G00-G99/G40-G47/G47-/G47.32)
- “2011 ICD-9-CM Diagnosis Code 993.2 Other and unspecified effects of high altitude...Approximate Synonyms: Acute mountain sickness, Aerodontalgia, Altitude edema, Andes disease, Anoxia due to high altitude, Barotrauma of ascent, Barotrauma of descent, Chronic mountain sickness, Diving barotrauma, Ebullism, Effects of high altitude, Erythrocytosis due to low atmospheric pressure, High altitude cerebral edema, High altitude pulmonary edema, High altitude pulmonary hypertension, High altitude retinopathy, Local pressure effects, Subacute mountain sickness, Suit squeeze. Applies To: Alpine sickness, Andes disease, Anoxia due to high altitude, Hypobaropathy, Mountain sickness”
- “2019 ICD-10-CM Diagnosis Code W94 Exposure to high and low air pressure and changes in air pressure”
- “Non-specific code 993 Effects of air pressure. Specific code 993.0 Barotrauma otitic...Specific code 993.1 Barotrauma sinus...Specific code 993.2 Other and unspecified effects of high
altitude....Specific code 993.3 Caisson disease...Specific code 993.4 Effects of air pressure caused by explosion....Specific code 993.8 Other specified effects of air pressure...Specific code 993.9 Unspecified effect of air pressure.” http://www.icd9data.com/2011/Volume1/800-999/990-995/993/default.htm

- "Toxic effect of other gases, fumes and vapors T59" [link]
- "2019 ICD-10-CM Diagnosis Code D75 Other and unspecified diseases of blood and blood-forming organs" [link]
- "2019 ICD-10-CM Diagnosis Code D75.1 Secondary polycythemia" [link]
- "2019 ICD-10-CM Diagnosis Code L58 Radiodermatitis" [link]
- "ICD-10-CM Diagnosis Code K52.0 [convert to ICD-9-CM] Gastroenteritis and colitis due to radiation" [link]
- "2019 ICD-10-CM Diagnosis Code L57 Skin changes due to chronic exposure to nonionizing radiation" [link]
- "2019 ICD-10-CM Diagnosis Code T66 Radiation sickness, unspecified" [link]
- “2019 ICD-10-CM Diagnosis Code W90.2 Exposure to laser radiation” [link]
- “ICD-10-CM Diagnosis Code W90.0 Exposure to radiofrequency” [link]
- “ICD-10-CM Diagnosis Code W90.1 Exposure to infrared radiation” [link]
- “2019 ICD-10-CM Diagnosis Code W90.8XXA Exposure to other nonionizing radiation, initial encounter” [link]
Chronic Mountain Sickness (CMS) - Monge's disease

- “Chronic mountain sickness (CMS or Monge's disease) is a disease in which the proportion of blood volume that is occupied by red blood cells increases (polycythaemia) and there is an abnormally low level of oxygen in the blood (hypoxaemia). CMS typically develops after extended time living at high altitude (over 2,500 metres (8,200 ft)). It is most common amongst native populations of high altitude nations.[1] The most frequent symptoms of CMS are headache, dizziness, tinnitus, breathlessness, palpitations, sleep disturbance, fatigue, loss of appetite, confusion, cyanosis, and dilation of veins.[2]. CMS was first described in 1925 by Carlos Monge Medrano, a Peruvian doctor who specialised in diseases of high altitude.[3] While acute mountain sickness is experienced shortly after ascent to high altitude, chronic mountain sickness may develop only after many years of living at high altitude. In medicine, high altitude is defined as over 2,500 metres (8,200 ft), but most cases of CMS occur at over 3,000 metres (9,800 ft). It has recently been correlated with increased expression of the genes ANP32D and SENP1.[4][5]”

- “Neurological Complications of High Altitude...Chronic mountain sickness (CMS) is found in all populations that have lived at altitude for many years. With the exception of Han Chinese immigrants in Tibet, it is not a disease of lowlanders. It was first recognized in 1925 in Peru by Carlos Monge and is also known as Monge's disease. Its incidence increases with altitude and age. It is characterized by excessive erythrocytosis with hematocrits exceeding 80% (CMS), which predominates in the Andes, and in some cases high-altitude pulmonary hypertension, which is more common in Asia. It improves with descent to lower altitudes.”

- “Age as a cause of chronic mountain sickness (Monge's disease)...Chronic mountain sickness (CMS) or Monge's disease is a clinical entity observed among residents at altitude characterized by polycythaemia increased above the physiological level due to altitude adaptation. From correlation studies of haematocrit with ventilation rate of healthy and diseased native high altitude residents (4,540 m) it was found that CMS is a clinical manifestation of aging. The higher the altitude the sooner the symptoms of excessive polycythaemia will become evident.”

- “Chronic Mountain Sickness: Clinical Aspects, Etiology, Management, and Treatment...Millions of people worldwide live at a high altitude, and a significant number are at risk of developing Chronic Mountain Sickness (CMS), a progressive incapacitating syndrome caused by lifelong exposure to hypoxia. CMS is characterized by severe symptomatic excessive erythrocytosis (EE; Hb ≥19 g/dL for women and Hb ≥21 g/dL for men) and accentuated hypoxemia, which are frequently associated with pulmonary hypertension. In advanced cases, the condition may evolve to cor pulmonale and congestive heart failure.”

- “New Insights into the Genetic Basis of Monge's Disease and Adaptation to High-Altitude...Human high-altitude (HA) adaptation or mal-adaptation is explored to understand the physiology, pathophysiology, and molecular mechanisms that underlie long-term exposure to hypoxia. Here, we report the results of an analysis of the largest whole-genome-sequencing of Chronic Mountain Sickness (CMS) and nonCMS individuals, identified candidate genes and functionally validated these candidates in a genetic model system (Drosophila). We used PreCIOSS algorithm that uses Haplotype Allele Frequency score to separate haplotypes
carrying the favored allele from the noncarriers and accordingly, prioritize genes associated with the CMS or nonCMS phenotype. Haplotypes in eleven candidate regions, with SNPs mostly in nonexonic regions, were significantly different between CMS and nonCMS subjects. Closer examination of individual genes in these regions revealed the involvement of previously identified candidates (e.g., SENP1) and also unreported ones SGK3, COPS5, PRDM1, and IFT122 in CMS. Remarkably, in addition to genes like SENP1, SGK3, and COPS5 which are HIF-dependent, our study reveals for the first time HIF-independent gene PRDM1, indicating an involvement of wider, nonHIF pathways in HA adaptation. Finally, we observed that down-regulating orthologs of these genes in Drosophila significantly enhanced their hypoxia tolerance. Taken together, the PreCIOSS algorithm, applied on a large number of genomes, identifies the involvement of both new and previously reported genes in selection sweeps, highlighting the involvement of multiple hypoxia response systems. Since the overwhelming majority of SNPs are in nonexonic (and possibly regulatory) regions, we speculate that adaptation to HA necessitates greater genetic flexibility allowing for transcript variability in response to graded levels of hypoxia.”

- “A case of “chronic mountain sickness” in the United States. Clinical, physiologic and electrocardiographic observations...1. A case of chronic mountain sickness is described in a resident of the Colorado Rocky Mountains. Clinical, electrocardiographic and cardiopulmonary physiologic studies are presented. Signs, symptoms and electrocardiographic abnormalities disappeared when the patient moved to sea level. However, evidence of persistent intrinsic, mild pulmonary disease could still be identified after he had resided at sea level for more than two years. 2. It is proposed that some cases of chronic mountain sickness may result from disturbances in respiratory gas exchange and altered ventilation-perfusion ratios on the basis of intrinsic pulmonary disease, too mild to cause signs or symptoms at sea level.”

- “After a decade in high altitude astronomy, I appear to have a variation of Monge’s disease, as I always feel better at sea level than at altitude in Tucson, Arizona, USA.” Steven Magee CEng MIET
Magee's Disease

- “There appears to be a form of chronic mountain sickness that comes from years of repeated frequent malacclimitization to very high altitudes by the sea level adapted human living at sea level. It eventually shows up as sleep apnea, bruxism, erratic low blood oxygenation, fatigue, forgetfulness, confusion, gastrointestinal issues, nutritional deficiencies, hormone problems, radiation sickness and failure to acclimatize to any altitude. Left untreated it progresses onto include nerve pains throughout the body, food intolerance, heart arrhythmia’s, headaches, irritability, depression, disease and premature death. I call it ‘Magee's Disease’.” Steven Magee CEng MIET - Q
- “Magee’s Disease was discovered by Chartered Electrical Engineer Steven Magee as he used his biomedical training to work through an array of strange health conditions that showed up during and after his time in very high altitude astronomy atop the biologically toxic summit of Mauna Kea, Hawaii, USA.” Steven Magee CEng MIET - Q
- “Magee's Disease is a chronic lifelong condition that may lead to permanent disability. It presents as permanent altitude sickness, regardless of the altitude that the person is at. There is no known cure, only treatment options. Avoidance of very high altitudes by the sea level adapted human may prevent the development of the condition in healthy people.” Steven Magee CEng MIET - Q

- Symptoms of Magee’s disease:
  - Fatigue.
  - Malaise.
  - Sleepiness.
  - Insomnia.
  - Headaches.
  - Forgetfulness.
  - Confusion.
  - Irritability.
  - Aggressiveness.
  - Lower blood oxygen levels than the healthy local population.
  - Erratic day and night blood oxygen levels.
  - Poisoning may be causing urinary tract infection (UTI) like symptoms from urinating the poison out as the kidneys filter it from the blood.
  - May be getting poor performance warnings at work (If working).
  - May be exhausted.
  - May be randomly falling asleep during the daytime.
  - May be falling asleep while driving.
  - May have sleep disorders.
  - May have dizziness.
  - May have eye problems, such as halos and starbursts in their night time vision.
  - May be experiencing visions or hallucinations.
  - May feel like there is a presence in the room with them.
  - May have gastrointestinal problems.
  - May have loose stools.
  - May have depression.
May have aches and pains throughout the body.
May feel like their skin is itchy, hot or sunburned.
May be taking daily baths to calm down their hot and painful skin sensations.
May have skin crawling sensations or random nerve tingling.
May be experiencing random muscle twitches.
May have sensitive teeth.
May be experiencing random muscle twitches.
May have triggering of the human mating cycle from abnormal environmental exposures.
May be developing gender issues (Gender Dysphoria).

• **Diagnosis of Magee’s Disease:**
  - 24 hours of blood oxygen readings taken at different altitudes: 0’, 2,000’, 4,000’, 6,000’, 8,000’, 10,000’.
  - Sleep studies performed at different altitudes: 0’, 2,000’, 4,000’, 6,000’, 8,000’, 10,000’.
  - Do not perform any high altitude tests above 10,000 feet on sea level adapted humans due to the long term damage it may cause.
  - Holter monitor for seven days.
  - Mental State Examination.
  - Mini-Mental State Examination (MMSE).
  - Complete blood tests including all electrolytes, vitamins, metals and minerals.
  - Test for thickened blood.
  - Test for correct Melatonin levels during sleep.
  - Test for correct Dehydroepiandrosterone (DHEA) levels.
  - Test all sex hormones.
  - Test for Addison's disease, also called adrenal insufficiency.
  - Test for heavy metals.
  - Test for mercury poisoning.
  - Endoscopy.
  - Colonoscopy.
  - Test for Multiple Chemical Sensitivity (MCS).
  - Test for sensitization to a variety of abnormal air environments:
    - Test for sensitization to low pressure environments.
    - Test for sensitization to carbon dioxide gas.
    - Test for sensitization to nitrogen gas.
    - Test for sensitization to helium gas.
    - Test for sensitization to oxygen gas.
    - Test for sensitization to all solvents exposed to.

• **Treatment of Magee’s Disease:**
  - Radiation detoxification: Hibernation for six months avoiding sunlight.
  - Treatment of brain damage: Large dose of X-ray radiation to the brain if needed from a CT scanner. Brain supplements if needed (CoQ10, Selenium, Ginko Biloba, Vincepotine, amino acids, and so on).
  - Treatment of sleep disorders: Annual sleep studies with Continuous Positive Airway Pressure (CPAP) and melatonin if needed. Advise to sleep with the window slightly open (install window locks for security) and a sound machine for ambient noise.
  - Treatment of Bruxism: Oral appliance and chin strap worn during the night.
  - Treatment of skin damage: May need to take vitamins C, D and E. Full inspection of the skin for growths. May have hormonal skin tags that need to be removed. May have fungal
infections from a depressed immune system.

- Treatment of lung damage: High resolution imaging of lungs. Inhalers and/or oxygen if needed.
- Treatment of heart damage: Echo-cardiogram of heart with bubble study looking for holes. Seven day Holter test looking for heart rhythm issues. Prescription heart medication if needed.
- Treatment of gastrointestinal damage: Restricted diet free of gluten, fructose, lactose and corn. Endoscopy and colonoscopy and removal of gastrointestinal growths if needed. May have Bruxism that is introducing air into the gastrointestinal tract causing intestinal pains, loose stools and excessive gas.
- Treatment of hormone dysfunction: Hormone supplementation as needed.
- Treatment of malnutrition and cholesterol problems: Restoration of depleted minerals, metals, electrolytes and vitamins using appropriate supplements. Plant protein and amino acids based anti-radiation diet. Keep vitamins B12 and D in the middle of the range.
- Treatment of blood disorders: Possible anemia from low oxygen and radiation exposures and systemic organ damage may be present. May need to treat for Pernicious Anemia due to industrial gas & solvent exposures in a low pressure and low oxygen environment. May need to place on blood thinners if blood is thickened. May have undetectable blood clots (micro-clots) throughout body.
- Treatment of air pressure damage: May have Cassion’s Disease, Monge’s Disease and/or Barotrauma damage from frequently changing from high to low pressure environments and vice-versa.
- Treatment of toxicity: Chelation therapy based on known toxins exposed to. Patient may have a variation of Aerotoxic Syndrome. Mercury, lead and vaporized gold, silver and aluminum are common exposures to metals. Ask for a complete list of chemicals that the worker has been exposed to and see if their symptoms match well with chemical poisoning.
- Treatment of organ damage: May need to do liver and kidney cleanses.
- Treatment of gas sensitivities: Workers are commonly exposed to carbon dioxide, helium, nitrogen and oxygen gasses and a variety of solvents. Ask for a list of all gas and solvent exposures and see if their symptoms match well with the known adverse effects. Advise patient to spend as much time outside as they can and when indoors to be in a well ventilated low carbon dioxide environment. They should sleep in their bedroom with the window slightly open (install window locks for security) and have a carbon dioxide meter to monitor their air quality. Indoor carbon dioxide levels to be maintained below 1,000 ppm. Patient should have a carbon dioxide meter in their workplace, if working.
- Treatment of ultraviolet (UV) damage: May need to take DHEA (Dehydroepiandrosterone).
- Treatment of anxiety & depression: May need to take Creatine and 5-HTP.
- Treatment of chronic fatigue: May have to take a large dose of caffeine in the morning and exercise in the afternoon.
- Advise worker to live at sea level.
- Put on disability for permanent and disabling chronic altitude sickness.

- “When diagnosing sickened high altitude workers, you must remember that altitude diseases are just part of the equation and the various toxic occupational exposures must be factored in.”
  Steven Magee CEng MIET - Q
- “Steven Magee’s body behaves as if it is permanently above 10,000 feet and causes chronic daily altitude sickness, even though he lives in Tucson, Arizona, USA.”

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“Part of Magee’s disease comes from the long term damage that oxygen starvation, industrial gas and unnatural radiation exposures cause to the brain, heart, lungs, skin, organs, blood, hormones, gastrointestinal tract and immune system.” Steven Magee CEng MIET – Q

“Magee’s Disease is also known as High Altitude Observatory Disease (HAOD) and is a form of High Altitude Disease (HAD).” Steven Magee CEng MIET - Q

“Magee’s disease is a high altitude commuting disease.” Steven Magee CEng MIET – Q

“The greatest scientific achievement of the Mauna Kea Observatories (MKO) in Hawaii is the medical diagnosis and treatment of High Altitude Observatory Disease (HAOD) in their sickened summit workers.” Steven Magee CEng MIET – Q

“Progress in the science of High Altitude Disease (HAD) has been lost due to the professional astronomy cover-up of their sickened observatory workers.” Steven Magee CEng MIET – Q
Other High Altitude Activities

- Pilots, Air Cabin Crew & Frequent Fliers
  - “Ask an Airline Pilot: Why Do I Feel So Worn Out After a Flight?”

- Skydivers
  - “What Actually Happens To Your Body When You Sky Dive 13,000 Feet...During your descent from a height of 13,000 feet, you’ll also experience rapid changes in atmospheric pressure, which can have a huge impact on your ears and your sinuses. In a review in Current Sports Medicine Reports, researchers investigating the impact of extreme pressure changes inherent in activities like scuba diving and skydiving found that the pressure in the sinus and ears decreases during the flight up, forcing air in through a “reverse sneeze.” But during free fall, pressure increases, squeezing air out of the ear and sinus. These sudden changes in pressure can give you ear and sinus pain as well as vertigo, headache, and nausea.”
    https://www.inverse.com/article/35684-skydiving-impact-on-your-body
  - “The dangers of skydiving...skydivers typically can make up to 10 jumps a day, which increases the odds of an accident...Skydiving injuries often involve dislocations of limbs, and bone fractures during high impact landings, on both land and water. Parachute or lifejacket malfunctions can also hugely increase injury risk. Spinal cord injuries, paralysis and traumatic brain injuries have also been recorded.”
  - “High or Hypoxic?...Just ten minutes above 12,000 feet is all it takes before the onset of hypoxia is a serious probability...some metabolic disorders and infections can cause problems with red blood cells, so anybody experiencing problems at altitude, or unexplained tiredness at other times should seek professional advice, explain their concerns and ask for appropriate tests. And of course, perfect blood won’t carry enough oxygen if you have a defect with, say, a heart valve, or a reduced pumping capacity.”
    http://www.skydivemag.com/article/20130816-high-or-hypoxic?fwd=1
  - “What are the effects of skydiving on the body?...the effects on the body are mainly long-term as in being hungover and having a really bad headache or just not wanting to do anything the next day”
    http://www.answers.com/Q/What_are_the_effects_of_skydiving_on_the_body
  - “Skydiving accident kills visitor, instructor...Hawaii’s tight-knit skydiving community is mourning the death of a veteran instructor and his young student on Sunday. Tandem parachute instructor Greg Hunter, 44, and 18-year-old Margaret Jean Thomas of Papillion, Neb. were killed after falling 9,000 feet into a back yard on the North Shore. A longtime skydiver, Hunter was also a commercial diver, boat captain, and scuba instructor.”
  - “I did a tandem free fall skydive from 10,000 feet with Greg Hunter the day before he was killed. After the jump he informed me that the parachute had tangled after deployment and he had to untangle it. He said it had been tangling frequently.”
    Steven Magee CEng MIET - Q
  - “There really should be a legal requirement for skydiving customers to be fully informed...
about the age and failure history of the parachute that they are using prior to the jump.”

Steven Magee CEng MIET - Q

“It is important that skydivers and BASE jumpers realize that they may be accumulating hypoxic brain damage and should not be repacking parachutes due to the errors it may cause.” Steven Magee CEng MIET - Q

“Falling. Can you parachute twenty-five miles and survive?...Above ten thousand feet, pilots without air tanks begin to suffer hypoxia: their brains get so little oxygen that they start to speak gibberish and make foolish errors.”

https://www.newyorker.com/magazine/2007/08/13/falling-4

"Authorities Raise Death Toll To 11 In Hawaii Skydiving Plane Crash..."In my 40 years as a firefighter here in Hawaii, this is the most tragic aircraft incident that we had,"...Oahu Parachute Center’s website advertises jumps from either 10,000 feet or 14,000 feet using a King Air 90, "the fastest skydiving plane in Hawaii."


- BASE Jumpers
  - “Why Are So Many BASE Jumpers Dying?...In researching 2016’s dramatic rise in BASE jumping deaths, I was almost unable to keep up with the pace with which people were dying.”

- Skiers
  - “Is Skiing Harmful To Health?”

- Mountain Climbers
  - “Are the Mountains Killing Your Brain? Alarming new science shows that thin air can wreck brain cells—at lower altitudes than you'd think... ENLARGED VIRCHOW-ROBIN (VR) SPACES. Widening of spaces surrounding blood vessels in the brain. They are caused by brain swelling or atrophy and are associated with age-related cognitive decline, dementia, and various brain diseases. CORTICAL ATROPHY. Loss of neurons in the cerebral cortex—the surface layer of the brain, which carries out conscious thought, physical perception, and higher-level control of body movements. SUBCORTICAL LESION. Damage to the white matter beneath the cerebral cortex. In a climber's brain, the damage is often caused by small strokes—clots that form in the thickened blood, starving the surrounding tissue of oxygen. White matter is the network that transfers signals between parts of the brain, so damage causes widespread and irreversible problems.”
    https://www.outsideonline.com/1884846/are-mountains-killing-your-brain
  - “Climbers Face Lasting Effects if Brain Swells”
    https://www.medpagetoday.com/meetingcoverage/rsna/36195
  - “High altitude sickness can lead to long-term brain damage...German researchers have used MRI to get a closer look at the potentially devastating neurological impact of high altitude sickness. In research presented at last week's RSNA congress in Chicago, they showed that mountain climbers can have traces of bleeding in the brain years after the initial incident.”
  - “Mountain Climbing Can Actually Cause Psychosis, And We Don't Know Why. It's not the same as altitude sickness…HP Lovecraft may be a polarising figure nowadays, but he was right about one thing: there's madness in them thar mountains. And now researchers have determined a new medical entity, discrete from altitude sickness, that causes it. They're
calling it high-altitude psychosis, and it occurs at altitudes of over 7,000 metres (23,000 feet) - often manifesting as extreme hallucinations. There have been many documented cases of mountaineers experiencing psychotic episodes at extreme altitudes.”

- **Hikers**
  - “Hazards of mountain climbing and hiking...Abstract. At elevations above 1500 m, even a healthy person undergoes acclimatization. To avoid problems such as acute mountain sickness (AMS), high altitude cerebral edema (HACE) or high altitude pulmonary edema (HAPE), the speed of ascent and the daily sleeping elevation are of primary importance. Mild symptoms and peripheral swelling are usually harmless. However, when the severity of altitude sickness progresses, rapid therapy and immediate transport to lower elevations can be life-saving under certain conditions. A sojourn in the mountains requires effective preparation and prophylaxis against oxygen deficiency, increased UV radiation, as well as against the possibility of hypothermia and frostbite.”

- **Military**
  - “Military applications of hypoxic training for high-altitude operations...Rapid deployment of unacclimatized soldiers to high mountainous environments causes debilitating effects on operational capabilities (physical work performance), and force health (altitude sickness).”
  - “Army studies high-altitude health effects...At 4,000 ft. above sea level you first start seeing a lack of physical performance. 8,000 ft. is usually the altitude at which cognitive performance is affected. And we’ve found that 10,000 ft. is the threshold where judgment starts to become impaired”
    - [https://www.army.mil/article/32487/army_studies_high_altitude_health_effects](https://www.army.mil/article/32487/army_studies_high_altitude_health_effects)
  - “USARIEM is an internationally recognized center of excellence for Warfighter health and performance. Our research studies are conducted by scientists from our four research divisions, working in concert with one another, as well as other world-class scientists from government, industry and academia.”
Radiation Hazards

- “High altitude sites are also above most of atmosphere's water vapor, making them ideal for infrared astronomy and submillimeter astronomy as those wavelengths are strongly absorbed by water vapor...At the far end of the spectrum, for the extremely short wavelengths of x-ray and gamma ray astronomy, along with high-energy cosmic rays, high altitude observations once again offers significant advantages.”
- “Very high altitude workers that have sea level adapted genetics are radiation workers.” Steven Magee CEng MIET - Q
- "A few years after working on Mauna Kea, I discovered that I had radiation sickness.” Steven Magee CEng MIET – Q http://amzn.com/1500896241
- “The closer you get to the Sun, the higher the levels of radiation become.” Steven Magee CEng MIET - Q
- “One of the nice features of working the astronomy night shift atop Mauna Kea was that I would get to watch the beautiful Hawaiian sunset daily. I was later to realize that watching sunsets at 13,796 feet was undesirable for the biological health of sea level adapted humans.” Steven Magee CEng MIET - Q
- “When I worked in high altitude astronomy, I was never screened annually by a doctor that was expert in low level radiation sickness (LLRS) and high altitude disease (HAD).” Steven Magee CEng MIET - Q
- "Ionizing radiation...Its most common impact is the stochastic induction of cancer with a latent period of years or decades after exposure. The mechanism by which this occurs is well understood, but quantitative models predicting the level of risk remain controversial. The most widely accepted model posits that the incidence of cancers due to ionizing radiation increases linearly with effective radiation dose at a rate of 5.5% per sievert. If this linear model is correct, then natural background radiation is the most hazardous source of radiation to general public health, followed by medical imaging as a close second. Other stochastic effects of ionizing radiation are teratogenesis, cognitive decline, and heart disease.”
- “Teratology is the study of abnormalities of physiological development. It is often thought of as the study of human congenital abnormalities, but it is broader than that, taking into account other non-birth developmental stages, including puberty; and other non-human life forms, including plants. The related term developmental toxicity includes all manifestations of abnormal development that are caused by environmental insult. These may include growth retardation, delayed mental development or other congenital disorders without any structural malformations.”
  https://en.wikipedia.org/wiki/Teratology
- "I was on the Big Island of Hawaii in 2015 and managed to characterize the ionizing radiation levels in the south of the island. Mauna Kea was the radiation hot zone with approximately a doubling of radiation levels at the Mauna Kea Visitors Center at 9,200 feet as compared to sea level. I did not venture to the summit due to the known biologically harmful environmental conditions to the sea level adapted human that exist at 13,796 feet.” Steven Magee CEng MIET - Q http://www.environmentalradiation.com/hawaii_radiation_readings.pdf
“Ionizing Radiation Readings At Kitt Peak National Observatory (KPNO)”
https://youtu.be/cNNGSaBh63o

“workers who were exposed to radiation for a median of 10 years had: 2.8 times higher odds of having skin lesion: 7.1 times higher odds of having orthopedic (back/neck/knee) problems; and 6.3 times higher odds of having cataracts.”

“experimental evidence supported low-dose ionizing radiation exposure causes a significant long-term alterations in lipid metabolisms and endothelial function”
http://info.cfimedical.com/blog/hypertension-and-high-cholesterol-linked-to-radiation-exposure

“A mathematical model constructed by researchers at Imperial College London predicts the risk of cardiovascular disease (heart attacks, stroke) associated with low background levels of radiation. The model shows that the risk would vary almost in proportion with dose.”

“The effects of radiation on the long-term trends of the total serum cholesterol levels of the Hiroshima and Nagasaki atomic bomb survivors were examined using data collected in the Adult Health Study over a 28-year period (1958-1986)...We showed that the mean growth curve of cholesterol levels for the irradiated subjects were significantly higher than that for the unirradiated subjects, and that the increase was greater for women than for men...This increase may also partially explain the increased rate of coronary heart disease seen in the atomic bomb survivors.”

“At the age of 46 I was placed onto cholesterol lowering RX-Only prescription medication.”
Steven Magee CEng MIET - Q

“All the endocrine glands are susceptible to damage by radiation exposure; however, pituitary, thyroid and gonads are most likely to be affected. In addition to the endocrine effects, the rates of birth defects and carcinomas may also be increased in the population exposed to excessive radiation.”
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3125012/

“studies have associated chronic radiation exposure with poor long-term heart health.”
http://www.medicalnewstoday.com/articles/308881.php

“Very high altitude workers at astronomical observatories are well on their way into Space without the radiation protective pressurized Space suit.”
Steven Magee CEng MIET - Q

“Space suit”
https://en.wikipedia.org/wiki/Space_suit

“Scientists Find 'Radiation Clouds' In Upper Atmosphere...Researchers detected small pockets in our atmosphere with almost double the surrounding level of radiation.”

“Earth's Atmospheric Layers”

“Solar radiation reaching the Earth’s surface. At the top of the atmosphere most of the solar radiation is still present. By the time the radiation reaches the Earth’s (sea level) surface, radiation in most spectral regions has been removed by the Earth’s atmosphere.”
https://www.ucar.edu/communications/gcip/m7ssystem/m7pdfc3.pdf

“Distribution of 90Sr and 144Ce in the stratosphere has been investigated by analyzing high-altitude air filter samples collected in 1962 and 1963. The highest concentrations of 90Sr (5.4 dis/min/SCF) and 144Ce (122 dis/min/SCF) were observed in April 1963 at 64–70°N and at an altitude of 16.7 km. The 144Ce/90Sr ratio in the northern stratosphere was fairly constant (about 20, as of January 1963). The distribution patterns of 90Sr and 144Ce were quite different
“The only difference between a very high altitude worker and a radiation worker is that there is a government compensation program in place for sickened radiation workers.” Steven Magee CEng MIET - Q

“The Energy Employees Occupational Illness Compensation Program (EEOICP) was passed in 2000 and is designed to compensate individuals who worked in nuclear weapons production and as a result of occupational exposures contracted certain illnesses. The law was signed into law by President Bill Clinton on December 7, 2000.”

“By 14 August 2010, the (EEOICP) program had already identified 45,799 civilians who lost their health (including 18,942 who developed cancer) due to exposure to radiation and toxic substances while producing nuclear weapons for the United States.”

“Adverse radiation exposures are cumulative and the longer you receive them, the more likely it is to make you sick.” Steven Magee CEng MIET - Q

“Sea level adapted humans are radiation workers when working at very high altitudes.” Steven Magee CEng MIET - Q

“The very high altitude summit of Mauna Kea is a bad place to be during a solar radiation storm.” Steven Magee CEng MIET - Q
Cosmic-Ray Hazards

- "Cosmic rays are high-energy radiation, mainly originating outside the Solar System[1] and even from distant galaxies.[2] Upon impact with the Earth's atmosphere, cosmic rays can produce showers of secondary particles that sometimes reach the surface. Composed primarily of high-energy protons and atomic nuclei, they are originated either from the sun or from outside of our solar system. Data from the Fermi Space Telescope (2013)[3] have been interpreted as evidence that a significant fraction of primary cosmic rays originate from the supernova explosions of stars.[4] Active galactic nuclei also appear to produce cosmic rays, based on observations of neutrinos and gamma rays from blazar TXS 0506+056 in 2018...Cosmic rays ionize the nitrogen and oxygen molecules in the atmosphere, which leads to a number of chemical reactions. Cosmic rays are also responsible for the continuous production of a number of unstable isotopes in the Earth's atmosphere, such as carbon-14...Cosmic rays kept the level of carbon-14[81] in the atmosphere roughly constant (70 tons) for at least the past 100,000 years,[citation needed] until the beginning of above-ground nuclear weapons testing in the early 1950s. This is an important fact used in radiocarbon dating used in archaeology.”
https://en.wikipedia.org/wiki/Cosmic_ray
- "Cosmic rays are very hard to detect at sea level, you have to go to high altitudes to reliably observe them.” Steven Magee CEng MIET - Q
- “A cosmic-ray observatory is a scientific installation built to detect high-energy-particles coming from space called cosmic rays. This typically includes photons (high-energy light), electrons, protons, and some heavier nuclei, as well as antimatter particles. About 90% of cosmic rays are protons, 9% are alpha particles, and the remaining ~1% are other particles.”
https://en.wikipedia.org/wiki/Cosmic-ray_observatory
- “Huge Chinese cosmic-ray observatory begins operation...One of the world’s largest and most sensitive cosmic-ray facilities has begun operation with its first set of detectors. Located about 4410 m above sea level”
https://physicsworld.com/a/huge-chinese-cosmic-ray-observatory-begins-operation/
- “MAGIC (Major Atmospheric Gamma Imaging Cherenkov Telescopes) is a system of two Imaging Atmospheric Cherenkov telescopes situated at the Roque de los Muchachos Observatory on La Palma, one of the Canary Islands, at about 2200 m above sea level. MAGIC detects particle showers released by gamma rays, using the Cherenkov radiation, i.e., faint light radiated by the charged particles in the showers. With a diameter of 17 meters for the reflecting surface, it was the largest in the world before the construction of H.E.S.S. I”
- “High Energy Stereoscopic System (H.E.S.S.) is a system of Imaging Atmospheric Cherenkov Telescopes (IACT) for the investigation of cosmic gamma rays in the photon energy range of 0.03 to 100 TeV. The acronym was chosen in honour of Victor Hess, who was the first to observe cosmic rays....Altitude 1,800 m (5,900 ft)”
- “We would see the effects of cosmic rays in images from the telescope electronic camera’s.” Steven Magee CEng MIET - Q
Diseases Associated With Ionizing Radiation Exposure

- “Diseases Associated with Ionizing Radiation Exposure...Cancers of the bile ducts, bone, brain, breast, colon, esophagus, gall bladder, liver (primary site, but not if cirrhosis or hepatitis B is indicated), lung (including bronchiolo-alveolar cancer), pancreas, pharynx, ovary, salivary gland, small intestine, stomach, thyroid, urinary tract (kidney/renal, pelvis, urinary bladder, and urethra). Leukemia (except chronic lymphocytic leukemia). Lymphomas (except Hodgkin’s disease). Multiple myeloma (cancer of plasma cells)...Other diseases associated with radiation exposure...All cancers. Non-malignant thyroid nodular disease. Parathyroid adenoma. Posterior subcapsular cataracts. Tumors of the brain and central nervous system.”


- “Spaceflight radiation carcinogenesis... The largest risks for adults who have been studied include several types of leukemia, including myeloid leukemia [8] and acute lymphatic lymphoma [8] as well as tumors of the lung, breast, stomach, colon, bladder and liver. Inter-gender variations are very likely due to the differences in the natural incidence of cancer in males and females. Another variable is the additional risk for cancer of the breast, ovaries and lungs in females.”  [https://en.wikipedia.org/wiki/Spaceflight_radiation_carcinogenesis](https://en.wikipedia.org/wiki/Spaceflight_radiation_carcinogenesis)

- “Central nervous system effects from radiation exposure during spaceflight...Acute and late CNS risks from space radiation are of concern for Exploration missions to the moon or Mars. Acute CNS risks include: altered cognitive function, reduced motor function, and behavioral changes, all of which may affect performance and human health. Late CNS risks are possible neurological disorders such as Alzheimer’s disease, dementia, or premature aging...CNS behavioral changes such as chronic fatigue and depression occur in patients who are undergoing irradiation for cancer therapy.[18] Neurocognitive effects, especially in children, are observed at lower radiation doses.[19][20] A recent review on intelligence and the academic achievement of children after treatment for brain tumors indicates that radiation exposure is related to a decline in intelligence and academic achievement, including low intelligence quotient (IQ) scores, verbal abilities, and performance IQ; academic achievement in reading, spelling, and mathematics; and attention functioning.[21] Mental retardation was observed in the children of the atomic-bomb survivors in Japan who were exposed to radiation prenatally at moderate doses (<2 Gy) at 8 to 15 weeks post-conception, but not at earlier or later prenatal times.[20] Radiotherapy for the treatment of several tumors with protons and other charged particle beams provides ancillary data for considering radiation effects for the CNS. NCRP Report No. 153 [4] notes charge particle usage “for treatment of pituitary tumors,[22][23] hormone-responsive metastatic mammary carcinoma,[24] brain tumors,[25][26] and intracranial arteriovenous malformations and other cerebrovascular diseases.[27][28][29][30][31][32]” In these studies are found associations with neurological complications such as impairments in cognitive functioning, language acquisition, visual spatial ability, and memory and executive functioning, as well as changes in social behaviors. Similar effects did not appear in patients who were treated with chemotherapy. In all of these examples, the patients were treated with extremely high doses that were below the threshold for necrosis.[33][34] Since cognitive functioning and memory are closely associated with the cerebral white volume of the prefrontal/frontal lobe and
cingulate gyrus, defects in neurogenesis may play a critical role in neurocognitive problems in irradiated patients.[4]

https://en.wikipedia.org/wiki/Central_nervous_system_effects_from_radiation_exposure_during_spaceflight

- “Health threat from cosmic rays...The potential acute and chronic health effects of space radiation, as with other ionizing radiation exposures, involve both direct damage to DNA, indirect effects due to generation of reactive oxygen species, and changes to the biochemistry of cells and tissues, which can alter gene transcription and the tissue microenvironment along with producing DNA mutations. Acute (or early radiation) effects result from high radiation doses, and these are most likely to occur after solar particle events (SPEs).[24] Likely chronic effects of space radiation exposure include both stochastic events such as radiation carcinogenesis[25] and deterministic degenerative tissue effects...A review of CNS space radiobiology by Cucinotta, Alp, Sulzman, and Wang (Life Sciences in Space Research, 2014) summarizes research studies in small animals of changes to cognition and memory, neuro-inflammation, neuron morphology, and impaired neurogenesis in the hippocampus. Studies using simulated space radiation in small animals suggest temporary or long-term cognitive detriments could occur during a long-term space mission. Changes to neuron morphology in mouse hippocampus and pre-frontal cortex occur for heavy ions at low doses (<0.3 Gy). Studies in mice and rats of chronic neuro-inflammation and behavioral changes show variable results at low doses (~0.1 Gy or lower).”

https://en.wikipedia.org/wiki/Health_threat_from_cosmic_rays

- “Cosmic radiation may leave astronauts with long-term cases of ‘space brain,’ study says...Scientists studying the effects of radiation in rodents say that astronauts exposed to galactic cosmic rays could face a host of cognitive problems, including chronic dementia...It's well-known that radiation can damage neural tissue and hurt cognitive function; cancer patients with brain tumors who need radiotherapy end up with what the study authors called "severe and progressive cognitive deficits."...The scientists found that even six months after radiation exposure, the rodents still were suffering from brain inflammation and neural damage. Neurons sported fewer dendrites and spines, which meant their neural networks were less interconnected than in a healthy brain.”


- “‘Unexpected Potential Problems’ Predicted for Travelers to Mars and Beyond. One in five astronauts could experience "severe deficits."...Using a new “low-dose” radiation facility at Colorado State University, a team of scientists observed that when mice spent months exposed to radiation similar to that found in deep space, they started acting strangely. The mice in the study displayed “severe impairments” in learning and memory, and they became extremely anxious. These symptoms may sound unsurprising since the mice had just spent six months as part of an experiment, but the team also found physical changes in their brains that may explain the changes.”


- “NASA Twin Study Shows Some Long-Term Changes in Astronaut Scott Kelly...Scott’s telomeres had gotten significantly longer during his time in space. Telomeres protect DNA from unraveling by capping the ends of chromosomes, and normally shrink with age. But while on board the International Space Station, Scott’s genes were also expressed differently. Like a volume knob, the information from his genes was turned up in some cases and down in others. This resulted in changes in proteins and metabolites that indicated oxygen deprivation stress in Scott’s body, as well as increased inflammation and variations in his nutrient levels.”
“Moon disease: Apollo astronauts more likely to die of heart problems...Worrying research from the US has found that astronauts who travelled into deep space on lunar missions were five times more likely to have died from cardiovascular disease than those who went into low orbit, or never left Earth...We know very little about the effects of deep space radiation on human health, particularly on the cardiovascular system....We know the immune system is compromised in space and that viruses and bacterial are more infectious.”

“Is radiation beneficial?  Everything in moderation — even radioactivity...It may already have cost some astronauts their lives. Five of the original space pioneers have died of cancer. Alan Shepard publicly wondered if his Apollo radiation exposure had given him the leukemia that ultimately killed him. And studies show that radiation is particularly bad for the heart.”

“Mars Astronauts Will Face a Frighteningly High Risk of Cancer...researchers determined that exposure to the very high rates of ionization in the atoms that comprise cosmic rays damaged the cells in astronauts’ bodies, making them vulnerable to a range of health problems, including acute radiation syndromes, cancer, cataracts, central nervous system issues, and circulatory diseases.”

“Prolonged Spaceflight Could Weaken Astronauts’ Immune Systems.  Astronauts who embarked on spaceflights lasting longer than six months experienced a decrease in the functionality of NK cells, which serve an important role in the immune system by killing cancerous cells and preventing viruses from reactivating.”

“Most of us have viruses sleeping inside us, and spaceflight wakes them up...A new study published last month in Frontiers in Microbiology reports that herpes viruses lying dormant inside the body become reactivated in more than half of all astronauts sent into space, potentially exacerbating what is already a high-risk environment. While we’ve yet to run into any kind of worrisome situation resulting from this phenomenon, those concerns loom larger as we set our sights on longer duration missions in orbit and seek to send astronauts back to the moon and on to Mars.”

“How Scott Kelly’s year in space changed his poop...relatively small but significant change in Scott Kelly’s gut microbiome.  The gut microbiome is the community of bacteria, fungi and viruses that live inside an animal’s intestines and can be detected in their bodily waste. In the past decade or so, the human gut microbiome has been implicated in everything from the obvious — digestion and metabolism — to the unexpected — cancer, Parkinson’s disease and depression.”

“Pelvic radiation therapy: Between delight and disaster...In the last few decades radiotherapy was established as one of the best and most widely used treatment modalities for certain tumours. Unfortunately that came with a price. As more people with cancer survive longer an ever increasing number of patients are living with the complications of radiotherapy and have become, in certain cases, difficult to manage. Pelvic radiation disease (PRD) can result from ionising radiation-induced damage to surrounding non-cancerous tissues resulting in disruption
of normal physiological functions and symptoms such as diarrhoea, tenesmus, incontinence and rectal bleeding.”  

- “Pelvic Radiation Disease Association”  
- “Adult Celiac Disease and Its Malignant Complications...A diagnosis of celiac disease is more readily established prior to lymphoma treatment (since chemotherapy or radiation may induce small intestinal changes). Concomitant recognition of underlying celiac disease may also have important nutritional implications”  
- “Celiac Disease And Chemotherapy...My husband was diagnosed with lung cancer in Sept. 2007. He ended his chemo and radiation treatments in December 2007 and is now cancer free. In February he began to have celiac disease symptoms (bloating, vomiting, etc.) even though we had no idea what was causing these symptoms.”  
- “Tips for Managing Diarrhea after Radiation Therapy for Rectal Cancer...Chronic radiation enteritis is the technical term for the long-term damage that can result after radiation therapy for rectal cancer. It can lead to chronic diarrhea, incontinence, and bowel urgency. This can occur after treatment of other cancers that require radiation therapy to the abdominal area as well. These side effects can occur months, or even years, after therapy is completed.”  
- “Diet and late bowel effects...Sometimes radiotherapy to the pelvis can make you intolerant to certain foods. You may become lactose, fructose or gluten intolerant, which means you may feel bloated or have more wind after eating dairy, fruit or foods with wheat in them.”  
- “FOOD INTOLERANCE DEFINITION.  A food intolerance, or a food sensitivity occurs when a person has difficulty digesting a particular food. This can lead to symptoms such as intestinal gas, abdominal pain or diarrhea. A food intolerance is sometimes confused with or mislabeled as a food allergy. Food intolerances involve the digestive system. Food allergies involve the immune system. With a food allergy, even a microscopic amount of the food has the potential to lead to a serious or life-threatening reaction called anaphylaxis.”  
- “Allergy might kill you, but intolerance kills you slowly…Allergy and intolerance are different, but they’re also very similar. Both are caused by an immune reaction, but the difference is in the timing. Allergy is immediate and intolerance is delayed, making it harder to pinpoint the
offending food. Allergic reactions release histamine, which is why they show up on skin-prick tests, while intolerances don’t. But the cause is similar – a food protein (allergy) or a food chemical (intolerance) and so are the symptoms – a rash, stomach complaints, breathing difficulties etc. However, allergy can be life-threatening, so I’m sure we all agree it cannot be ignored. Intolerance, on the other hand, may lead to life-long illness, so maybe it’s about time we paid it some more attention!”

“The Food Intolerance Institute of Australia...Food intolerance makes you sick: Symptoms of food sensitivity tend to be those we 'put up with' on a daily basis: itching skin, mild diarrhea, coughing, tiredness, mouth ulcers, stomach bloating, stiff joints or back ache and headache. By the time food sensitivity is properly diagnosed - the health can be compromised, with a much greater risk of serious disease. But with corrected diet symptoms evaporate and pre-disease conditions can heal.”

“Food sensitivities on rise...More people than ever are claiming to suffer from food sensitivities. We all have one: the friend who makes you cringe when they quiz cafe staff about the menu because of their wheat, dairy or gluten intolerance. Food intolerances, it seems, are on the rise. Allergy UK estimates that 45 per cent of people in the UK have food sensitivities.”

“2016 Why food allergies are on the rise: Are we too clean?...Nearly 15 million Americans have food allergies, with an estimated 1 in 13 children under the age of 18 affected by them, according to the Centers for Disease Control and Prevention. Some argue that the nearly 50 percent rise in food allergic kids between 1997 and 2011 is a problem caused by Americans being too clean. Others argue we’re weakening children’s immune systems by delaying foods linked to allergies when babies start eating. Unfortunately, the science really isn’t clear when it comes to the cause of food allergies — it could be a combination of genetics and the environment —but there are many things we do know.”

“Do You Have Celiac Disease?  Adults are less likely to have digestive symptoms, with only one-third experiencing diarrhea.  Adults are more likely to have: unexplained iron-deficiency anemia.  Fatigue.  bone or joint pain.  Arthritis.  osteoporosis or osteopenia (bone loss).  liver and biliary tract disorders (transaminitis, fatty liver, primary sclerosing cholangitis, etc.).  depression or anxiety.  peripheral neuropathy ( tingling, numbness or pain in the hands and feet).  seizures or migraines.  missed menstrual periods.  infertility or recurrent miscarriage.  canker sores inside the mouth.  dermatitis herpetiformis (itchy skin rash)”
The inability to absorb carbohydrates and fats may cause weight loss (or failure to thrive/stunted growth in children) and fatigue or lack of energy. Anaemia may develop in several ways: iron malabsorption may cause iron deficiency anaemia, and folic acid and vitamin B12 malabsorption may give rise to megaloblastic anaemia. Calcium and vitamin D malabsorption (and compensatory secondary hyperparathyroidism) may cause osteopenia (decreased mineral content of the bone) or osteoporosis (bone weakening and risk of fragility fractures). Selenium malabsorption in coeliac disease, combined with low selenium content in many gluten-free foods, confers a risk of selenium deficiency.[42] Copper and zinc deficiencies have also been associated with coeliac disease.[42] A small proportion have abnormal coagulation due to vitamin K deficiency and are slightly at risk for abnormal bleeding.…Coeliac disease is associated with a number of other medical conditions, many of which are autoimmune disorders: diabetes mellitus type 1, hypothyroidism, primary biliary cholangitis, microscopic colitis, gluten ataxia, psoriasis, vitiligo, autoimmune hepatitis, dermatitis herpetiformis, primary sclerosing cholangitis, and more. A more controversial area is a group of diseases in which antigliadin antibodies (an older and nonspecific test for coeliac disease) are sometimes detected but no small bowel disease can be demonstrated. Sometimes these conditions improve by removing gluten from the diet. This includes cerebellar ataxia, peripheral neuropathy, schizophrenia, and autism.”

“Complications of Celiac Disease...In adults, the digestive symptoms may be less common and the signs or symptoms of celiac disease may be related to the long-term effects of poor absorption. Some of the more common complications include: Malnutrition...Bone loss…Lactose intolerance…Irritability and depression…Lymphoma and bowel cancer….Low birth-weight babies….Dental defects.”

“The broad spectrum of celiac disease and gluten sensitive enteropathy...The classical symptoms include gastrointestinal-related symptoms such as diarrhea, steatorrhea and weight loss due to malabsorption. About 50% of CD patients present extra intestinal or atypical symptoms, such as anemia, osteoporosis, dermatitis herpetiformis, neurological problems and dental enamel hypoplasia.”

“Enamel Hypoplasia...Some of the signs of enamel hypoplasia are obvious, but others are more difficult to detect and may not be noticeable until they cause major dental problems. Having thin tooth enamel can lead to: pits, tiny groves, depressions, and fissures; white spots; yellowish-brown stains (where the underlying layer of dentin is exposed); sensitivity to heat and cold; lack of tooth contact, irregular wearing of teeth; susceptibility to acids in food and drink; retention of harmful bacteria; increased vulnerability to tooth decay and cavities.”

“Celiac disease is also known as coeliac disease, celiac sprue, non-tropical sprue, and gluten sensitive enteropathy.”

“What’s really behind ‘gluten sensitivity’?...The patients weren't crazy—Knut Lundin was sure of that. But their ailment was a mystery. They were convinced gluten was making them sick. Yet they didn't have celiac disease, an autoimmune reaction to that often-villainized tangle of proteins in wheat, barley, and rye. And they tested negative for a wheat allergy. They occupied a medical no man's land.”
“3 Reasons Gluten Intolerance May Be More Serious Than Celiac Disease...Recent news stories have downplayed the significance of non-celiac gluten sensitivity, even going as far as suggesting that it doesn’t exist. But a growing body of evidence has proven that gluten intolerance is not only real, but is potentially a much larger problem than celiac disease.”
https://chriskresser.com/3-reasons-gluten-intolerance-may-be-more-serious-than-celiac-disease/

https://www.healthline.com/nutrition/signs-you-are-gluten-intolerant

“Gluten intolerance: Dangerous gut-wrenching experience for some...Owing to these destructive responses of gluten, it may cause cancer or mutations. Sometimes, this protein can also lead to neurological disorders, epilepsy or schizophrenia...It can also lead to height shortening, affects normal growth of the body and overall cognition difficulties”

“Gluten troubles were once thought to be a problem primarily for those with celiac disease. But recent research indicates that gluten-related disorders extend to a far broader population, and affect far more than the digestive system....In her 20s, she was plagued by debilitating headaches, joint pain and fatigue. “I could hardly get out of bed in the morning,” she says. “I was 25 but felt 85.”...Within two weeks of going gluten-free, her stomach stopped hurting after meals — a first. Within a few short months, her fatigue, joint pain and headaches all vanished. Testing confirmed her suspicion — gluten was the guilty party. But Stevens doesn’t have celiac disease; she has an intolerance to gluten, an increasingly common diagnosis.”
https://experiencelife.com/article/gluten-the-whole-story/

“Gluten can devastate brain and nervous system...For most people the intolerance manifests in the skin, the joints, the thyroid, etc. In fact, the tissues most commonly affected by gluten are brain and nervous tissue. Studies have found associations between gluten sensitivity and disorders in every major part of the nervous system, including the brain, the spinal cord, and the nerves that extend into the arms and feet.”
http://brainhealthbook.com/gluten-can-devastate-brain-nervous-system/

“Gluten affects brain development and function...If your brain is not working or if you have a neurological disease you must be properly tested for the entire spectrum of gluten sensitivity and not just for the limited markers for celiac disease.”
http://brainhealthbook.com/gluten-affects-brain-development-function/

“Gluten Triggers Strange Delusions in Woman with Celiac Disease...The 37-year-old woman, whose case was described in the report, was studying for her Ph.D. when she started having delusions...celiac disease can manifest itself in many different ways in the brain and nervous system, Fasano said. Complications can range from mild problems, such as short-term memory loss, to severe consequences, such as seizures.”

“So Sleepy After Eating Pizza.........It very well could be a gluten reaction. Since you handle whole wheat tortillas fine then it could be blood sugar related or related to the dairy or nightshades in the pizza.”

“After that cheat meal, I felt absolutely HORRIBLE. Lethargic, major brain fog, grumpy,
splitting headache. I woke up in the night with terrible diarrhea, and the next morning, I had what felt like a migraine. My head hurt so badly that I didn't want to move, and I was extremely sensitive to light. My stomach also felt turbulent, and I continued to have diarrhea throughout the day. I was so sick that I had to miss work that day. From that point on, I was committed to NOT let myself eat wheat anymore.”

- “3 Ways To Tell if You Have a Gluten Sensitivity...The symptoms of gluten sensitivity can show up basically anywhere in the body depending on your susceptibility...Researchers only recently (in 2011) named gluten sensitivity and have not yet determined a standard test for diagnosing it. It is not diagnosed with the same tests that are used to diagnose Celiac disease.”
- “Can Gluten Intolerance Cause Damage to Your Heart?…Allergic Reactions...can cause irreversible heart damage, and can starve your heart and other major organs of oxygen…Vitamin and Mineral Deficiencies... The nutritional deficiencies and the additional workload can cause heart damage and heart failure…Edema...If too much fluid builds up in your body and your heart isn't able to compensate, it's known as congestive heart failure…. diabetes increases your risk of heart disease and makes you more likely to have a heart attack or stroke. You're also more likely to develop thyroid function problems, which can cause heart palpitations and high blood pressure.”
- “Celiac disease is linked to pericardial arrhythmia in several ways. Because the villi in the small intestine are under attack, the body isn't absorbing all the vitamins and minerals it needs to maintain proper cardiac function. Damage to the intestine walls also makes it easier for infection-causing bacteria and fungi to pass from your stomach into the bloodstream, where they can reach the pericardium.”
- “Cardiac Issues Associated with Celiac Disease and Gluten Intolerance EP023...Given the choice between a heart transplant and a gluten-free diet, the vast majority – if not all – of us would quickly opt for the diet! Yet the medical community continues to ignore celiac disease as a potential cause of cardiac complications, despite documented connections between the two conditions.”
- “Wheat And Atrial Fibrillation? A Look At the Correlation...Why might wheat elimination yield a reduction in A Fib? As there are no formal explorations of this phenomenon, I can only speculate. Could it work through some reduction in inflammatory signals or reduction in glycation? Is it a consequence of blood-borne wheat germ agglutinin? Might gliadin-derived opiate peptides play a role?”
- “Raised Heart-Trouble Risk Seen in Celiac Patients...People with celiac disease have a nearly twofold increased risk of heart disease compared to those without the chronic digestive disorder, according to a new study.”
- “Cardiovascular involvement in celiac disease...Based on the published research, it can be concluded that many types of cardiovascular issues can occur in untreated CD patients, but that most tend to resolve on a GFD, often in conjunction with the healing of small intestinal villous atrophy. However, in some cases the alterations are irreversible, underscoring the need for CD..."
screening and treatment when cardiovascular issues arise of unknown etiology.”
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5583538/

- “Could Lung Inflammation Be Related To Celiac?...Gluten Sensitivity can definitely cause inflammation in the lungs. My husband suffered from Asthma since he was 8 years old (32 now) and after 6 months gluten free he can now run without dying. Very, very cool. Gluten causes inflammation as the body attacks itself. If it attacks the villi in the small intestine we call it Celiac. If it attacks the thyroid we call it Hypo/Hyperthyroidism. If it attacks the lungs we call it asthma or likely one of those other names previously mentioned. If it is inflamed there is a better than good chance gluten is your culprit. Try going gluten-free for a month and see how you feel. Better then any biopsy or blood test.” https://www.celiac.com/forums/topic/76963-could-lung-inflammation-be-related-to-celiac/

- “The Relationship Between the Respiratory System and Celiac Disease EP028...Today Nadine explores the relationship between the lungs and celiac disease, offering anecdotal evidence as well as explaining the way that inflammation can lead to a number of respiratory problems. Because 70-90% of your immune system is housed in your intestines, it is no surprise that a leaky gut could make you more vulnerable to respiratory tract infections.” https://glutenfreern.com/the-relationship-between-the-respiratory-system-and-celiac-disease-ep028/

- “Hungry for Air...I watched him struggle with air hunger many times on the court. He didn’t call it that. His camp attributed it to asthma...His on-court breathing problems disappeared, and he began winning major tournaments. Lots of them, and he quickly ascended to number one in the world. The following year he revealed that he’d learned he had a severe sensitivity to gluten, and that purging his body of the protein had a profound and positive effect on his breathing.” https://www.youshareproject.com/hungry-for-air/

- “Anaemia can lead to oxygen ‘starvation’...Iron deficiency anaemia can also occur if there is insufficient dietary iron, which is more likely in vegetarians, or when the body cannot absorb iron in the food, such as in gluten allergy or after surgical removal of part or all of the stomach (gastrectomy).” https://www.star2.com/health/wellness/2017/01/15/anaemia-can-lead-to-oxygen-starvation/

- “Celiac Disease and Anemia... In people with celiac disease, vitamin B12 deficiency is usually due to damage to the lower part of the small intestine, which is one of the places vitamin B12 is absorbed...Symptoms you may experience: Fatigue, weakness, irritability, pale skin, headaches, brittle nails, decreased appetite, increased susceptibility to infections, and a decreased attention span in kids... It is important to give the gluten-free diet time to have its effect: it may take between 2-18 months until nutritional deficiencies are corrected.” https://www.gluten.org/resources/health-wellness/celiac-disease-and-anemia/

- “Insomnia: 12 Reasons Why You May Not Be Sleeping at Night...REASON 8: Gluten and other food sensitivities.  Sleep issues are common in patients with celiac disease as well as those with non-celiac gluten sensitivity, even if they are following a gluten-free diet. I find that many patients with multiple food sensitivities and with leaky gut tend not to sleep well, and that when they eliminate foods based on an IgG and IgA food panel, they report improved sleep. It may seem hard to believe that the gut and brain are so interconnected, but research is now proving the link referred to as the “gut-brain axis.”” https://doctordoni.com/2014/10/12-causes-of-insomnia/

- “What role does a gluten-free or lactose-free diet play in reducing cancer risk?...A: For people who have celiac disease, closely following a gluten-free diet is vital. Gluten is a protein in
wheat, rye and barley that poses no risk to most people, but for people with this condition, it damages the intestines and that could increase risk of cancer.” [http://www.aicr.org/press/health-features/health-talk/2013/04apr2013/gluten-free-diet-cancer.html]

- “Celiac Disease and Cancer. What Types of Cancer are Associated with Celiac Disease? There are 3 types of cancer associated with celiac disease: enteropathy-associated T-cell lymphoma (EATL), non-Hodgkin’s lymphoma, and adenocarcinoma of the small intestine.” [https://www.beyonceliac.org/celiac-disease/related-conditions/cancer/]

- “Nadine Grzeskowiak, RN, BSN, CEN began her nursing career in 1992 working in emergency, trauma and critical care at hospitals throughout Oregon. In 2006, she was diagnosed with celiac disease, a disease she had never heard of before, even as a nurse. At the time of diagnosis, at the age of 40, she expected to be dead within 6 months due to multi-system organ failure. Within two weeks of beginning a gluten free diet her health began to improve markedly which led to a life and career-changing shift. Nadine found three nursing businesses shortly thereafter: RN On Call, Inc. in February 2007, Gluten Free RN in March 2007 followed by Celiac Nurse Consulting.” [http://a.co/hsOZFGN]

- “Is Celiac Disease On the Rise?...Celiac disease only started being diagnosed in the first years of this century, making it difficult to track long-term increases. Yet one Minnesota study compared blood samples taken from young adults in the Air Force in the fifties with a similar age group starting in 1995 and found an .8 percent increase, from .2 percent to the national average of 1 percent. It appears that rates are indeed increasing.” [https://bigthink.com/21st-century-spirituality/is-ceeliac-disease-on-the-rise]

- “Doctor Horror Stories...You know what the average time is for a celiac diagnosis? 10 years...So over 16 years after me presenting with the very scary symptoms, and making plans to gradually leave work due to sickness (at the age of 34), I finally got diagnosed...It took 30 years to figure out what was wrong. In that time I saw 60-70 different doctors, got tested for a ton of stuff (can we say the majority of these were intrusive and uncomfortable, if not downright painful) and had more drugs thrown at me than you can shake a stick at.” [https://glutendude.com/doctor-horror-stories/]

- “Is Being Gluten-Intolerant an American Problem? One reader asks why gluten-intolerance is so prevalent in America, but not in Europe... A quick Google search turned up many similar stories of those in the United States who believed they were gluten-intolerant but had no trouble eating wheat in Europe.” [https://www.motherearthnews.com/real-food/gluten-intolerant-zm0z13aszmar]

- “New study shows gluten and dairy cause brain autoimmunity...a significant portion of the US population not only reacts to gluten and dairy but also that this reaction causes the immune system to destroy brain and nervous tissue in a scenario called neurological autoimmunity (as evidenced by positive tissue antibodies). With the explosion of Alzheimer’s, Parkinson’s, autism, childhood development disorders, and other brain disorders happening today, these findings confirm what many clinicians have already seen in their practice: removing gluten and dairy from the diet has a profoundly positive impact on brain health in many people.” [http://brainhealthbook.com/new-study-shows-gluten-dairy-cause-brain-autoimmunity/]


- “Symptoms and Treatment of fructose malabsorption...bloating. Flatulence. diarrhoea or soft
stool (often smelly) / constipation. Nausea. stomach ache. abdominal cramps….Dizziness. Reflux. Heartburn. Tiredness. Depressive moods. Headache (to the point of migraine)"


- “Fructose Malabsorption. Is it the cause of my tummy troubles?...The symptoms of celiac disease and non-celiac gluten sensitivity (NCGS) can be very similar to the symptoms of fructose malabsorption . Thus, the diagnoses’ may often be confused. Fructose malabsorption can also mimic lactose/milk intolerance- a common diagnosis amongst celiac and NCGS patients. Fructose malabsorption (FM) may also be seen with celiac disease or NCGS and should be considered in these patients who are already on a gluten free diet, yet have ongoing symptoms.” http://theceliacmd.com/2013/02/fructose-malabsorption-is-is-the-cause-of-my-tummy-troubles/

- “10 Fructose Malabsorption Symptoms...1. Bloating. 2. Flatulence. 3. Reflux. 4. Stomach pain. 5. Nausea/Vomiting. 6. Diarrhea/Constipation. 7. Fatigue. 8. Mental depression. 9. Headaches/Brain Fog. 10. Mood changes…Fructose malabsorption will thus lead to many nutrient deficiencies, specifically of folic acid, iron, tryptophan, and zinc, and vitamins C, D, and E. All of these nutrients are vital for different operating systems in the body, and especially are related to healthy brain function.” http://www.fructosemalabsorptionhq.com/fructose-malabsorption-symptoms/

- “Fructose malabsorption...There is no known cure, but an appropriate diet and the enzyme xylose isomerase can help.[4] The ingestion of glucose simultaneously with fructose improves fructose absorption and may prevent the development of symptoms. For example, people may tolerate fruits such as grapefruits or bananas, which contain similar amounts of fructose and glucose, but apples are not tolerated because they contain high levels of fructose and lower levels of glucose.” https://en.wikipedia.org/wiki/Fructose_malabsorption

- “Fructose Malabsorption and Hypoglycemia...I have read somewhere but don't remember where, that Fructose Malabsorption might cause Reactive Hypoglycemia or at least exacerbate it. What I have noticed is that tend to reach more negatively to fruits than to starches, even if starches have an high GL and GI.” https://ehealthforum.com/health/fructose-malabsorption-and-hypoglycemia-t186057.html

- “Idiopathic postprandial syndrome. Idiopathic postprandial syndrome, colloquially but incorrectly known by some as hypoglycemia, describes a collection of clinical signs and symptoms similar to medical hypoglycemia but without the demonstrably low blood glucose levels which characterise said condition. People with this condition suffer from recurrent episodes of altered mood and cognitive efficiency, often accompanied by weakness and adrenergic symptoms such as shakiness. The episodes typically occur a few hours after a meal, rather than after many hours of fasting. The principal treatments recommended are extra small meals or snacks and avoidance of excessive simple sugars.” https://en.m.wikipedia.org/wiki/Idiopathic_postprandial_syndrome

- “Is There A Connection Between Hypoglycemia and Thyroid Conditions? Hypoglycemia is a common condition where the blood sugar levels are low. Reactive hypoglycemia is due to the excessive secretion of insulin, usually after someone eats a meal. On the other hand, spontaneous or functional hypoglycemia usually occurs in between meals, and both types of hypoglycemia can develop due to insulin resistance, hypothyroidism, weak adrenals, as well as other conditions.” https://www.naturalendocrinesolutions.com/archives/is-there-a-connection-between-hypoglycemia-and-thyroid-conditions/
“Functional Hypoglycemia: Facts and Fancies. When blood glucose decreases below a given threshold, symptoms of cerebral dysfunction and/or adrenergic hyperactivity appear. If this occurs postprandially in otherwise normal subjects, a diagnosis of reactive or functional hypoglycemia may be proposed.”  

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2153490/

“Reactive hypoglycemia, postprandial hypoglycemia, or sugar crash is a term describing recurrent episodes of symptomatic hypoglycemia occurring within four hours[1] after a high carbohydrate meal in people both with and without diabetes.[2] The term is not a diagnosis per se since it requires an evaluation to determine the cause of the hypoglycemia.[3] The condition is related to homeostatic systems utilised by the body to control the blood sugar level. It is described as a sense of tiredness, lethargy, irritation, or hangover, although the effects can be lessened if a lot of physical activity is undertaken in the first few hours after food consumption.”  

https://en.m.wikipedia.org/wiki/Reactive_hypoglycemia

“In 2018 I became aware through dietary changes that I was Gluten, Fructose and Lactose intolerant and was experiencing several hours of chronic fatigue after eating certain foods, which is consistent with Reactive or Functional Hypoglycemia.”  

Steven Magee CEng MIET - Q

“I can eat it. Taking a bite out of food allergies...Currently, about 8 percent of children in the United States and about 2 percent of adults have diagnosed food allergies. It’s a mysterious epidemic. The rate of food allergies has more than doubled over the past decade and appears to be rising, with the rate highest among preschoolers. (Many more people self-identify as food allergic, but they are actually suffering from food intolerances or sensitivities.)”  

https://stanmed.stanford.edu/2014fall/i-can-eat-it.html

“Intestinal permeability....The opening of intercellular tight junctions (increased intestinal permeability) can allow passage of microbes, microbial products, and foreign antigens into the mucosa and the body proper. This can result in activation of the immune system and secretion of inflammatory mediators.[12] Increased intestinal permeability is a factor in several diseases, such as Crohn's disease, celiac disease,[13] type 1 diabetes,[14] type 2 diabetes,[13] rheumatoid arthritis, spondyloarthopathies,[15] inflammatory bowel disease,[8][16] irritable bowel syndrome,[9] schizophrenia,[17][18] certain types of cancer,[8] obesity,[19] fatty liver,[20] atopy and allergic diseases,[14] among others. In the majority of cases, increased permeability develops prior to disease,[8] but the cause–effect relationship between increased intestinal permeability in most of these diseases is not clear.[16][21] A well studied model is celiac disease, in which increased intestinal permeability appears secondary to the abnormal immune reaction induced by gluten and allows fragments of gliadin protein to get past the intestinal epithelium, triggering an immune response at the intestinal submucosa level that leads to diverse gastrointestinal or extra-gastrointestinal symptoms.[22][23] Other environmental triggers may contribute to altered permeability in celiac disease, as intestinal infections and iron deficiency.[22] Once established, this increase of permeability might self-sustain the inflammatory immune responses and perpetuate a vicious circle.[22] Eliminating gluten from the diet leads to normalization of intestinal permeability and the autoimmune process shuts off. [24]”  

https://en.m.wikipedia.org/wiki/Intestinal_permeability#Clinical_significance

“Ionizing radiation is commonly used to treat a number of malignancies. Although highly effective and now more targeted, many patients suffer side effects. The number of cancer survivors has increased and so there are more patients presenting with symptoms that have arisen as a result of radiotherapy. Radiation damage to small bowel tissue can cause acute or chronic radiation enteritis producing symptoms such as pain, bloating, nausea, faecal urgency, diarrhoea and rectal bleeding which can have a significant impact on patient’s quality of life.
This review outlines the pathogenesis of radiation injury to the small bowel along with the prevention of radiation damage via radiotherapy techniques plus medications such as angiotensin-converting enzyme inhibitors, statins and probiotics. It also covers the treatment of both acute and chronic radiation enteritis via a variety of medical (including hyperbaric oxygen), dietetic, endoscopic and surgical therapies.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3871275/

- “If you know that you have had radiation sickness, then you should be suspecting that radiation induced food intolerance may be present.” Steven Magee CEng MIET - Q
- “If you damage your digestive tract, you may end up with food intolerance that lead to mineral and vitamin deficiencies that may have profound effects on your physical and mental health.” Steven Magee CEng MIET - Q
- “People with radiation intestinal damage should adopt a low FODMAP diet that is gluten free.” Steven Magee CEng MIET - Q
- “The Complete Low-FODMAP Diet: A Revolutionary Plan for Managing IBS and Other Digestive Disorders by Sue Shepherd PhD et al.” http://a.co/d/d0iQUy1
- “Radiation Therapy Side Effects...Many people who get radiation therapy have fatigue. Fatigue is feeling exhausted and worn out. It can happen all at once or come on slowly. People feel fatigue in different ways and you may feel more or less fatigue than someone else who is getting the same amount of radiation therapy to the same part of the body.” https://www.cancer.gov/about-cancer/treatment/types/radiation-therapy/side-effects
- “Non-Hodgkin Lymphoma Risk Factors...Studies of survivors of atomic bombs and nuclear reactor accidents have shown they have an increased risk of developing several types of cancer, including NHL, leukemia, and thyroid cancer. Patients treated with radiation therapy for some other cancers, such as Hodgkin lymphoma, have a slightly increased risk of developing NHL later in life. This risk is greater for patients treated with both radiation therapy and chemotherapy.” https://www.cancer.org/cancer/non-hodgkin-lymphoma/causes-risks-prevention/risk-factors.html
- “Radiation Exposure in Pregnancy...Fetal overexposure to radiation could result in an increased risk of childhood leukemia and cancer.” https://www.vume.org/health-wellness/news-resource-articles/radiation-exposure-pregnancy
- “Do You Have Respiratory Issues? Exposure to Cell Phone Radiation, “Dirty Electricity”, WiFi and Other Sources of Electrosmog Can Make It Worse...Besides also boosting possible cancer risk, research has confirmed that exposure to cell phone and WiFi radiation and/or Electrosmog has a cumulative toxic effect when combined with other toxins. Research has confirmed that exposure can increase pre-existing conditions even if it didn’t cause them.” https://www.activistpost.com/2018/05/do-you-have-respiratory-issues-exposure-to-cell-phone-radiation-dirty-electricity-wifi-and-other-sources-of-electrosmog-can-make-it-worse.html
- “ALLERGIES & RADIATION REPORT. The discovery that radiation, coupled with other elements, produces allergies is new with this report and my upcoming book. The pieces have been there, independently found by others, but never put together. Using this new information,

- “After living an allergy free life, I developed seasonal allergies after having a CT X-Ray radiation scan of my lungs.” Steven Magee CEng MIET - Q
- “Radiation Exposure...If you are exposed to small amounts of radiation over a long time, it raises your risk of cancer. It can also cause mutations in your genes, which you could pass on to any children you have after the exposure.” [https://medlineplus.gov/radiationexposure.html](https://medlineplus.gov/radiationexposure.html)
Treatment Of Abnormally High Radiation Exposure

- "Outdoor sunlight avoidance for several months is recommended after receiving abnormally high radiation exposures." Steven Magee CEng MIET - [Q]
- "Hormone May Prevent Dirty Bomb Deaths. Neumune Could Also Reduce Casualties in Nuclear Attack...A close relative of the performance-boosting supplement DHEA may be able to combat radiation from a "dirty bomb," Researchers say." [https://www.webmd.com/balance/news/20041005/hormone-may-prevent-dirty-bomb-deaths#1](https://www.webmd.com/balance/news/20041005/hormone-may-prevent-dirty-bomb-deaths#1)
- "Androstenediol, or 5-androstenediol (abbreviated as A5 or Δ5-diol), also known as androst-5-ene-3β,17β-diol, is an endogenous weak androgen and estrogen steroid hormone and intermediate in the biosynthesis of testosterone from dehydroepiandrosterone (DHEA). It is closely related to androstenedione (androst-4-ene-3,17-dione)...Androstenediol has been investigated for use as a radiation countermeasure. Its value as a radiation countermeasure is based mainly on its stimulation of production of white blood cells and platelets.[6] Its potential use as a radiation countermeasure was developed by the Armed Forces Radiobiology Research Institute (AFRRI) and subsequently studied by AFRRI and Hollis-Eden Pharmaceuticals under the proposed brand name Neumune for the treatment of acute radiation syndrome.[6][7]. The clinical trials with rhesus monkeys were successful. According to the Hollis-Eden report, only 12.5% of the 40 Neumune-treated animals died versus 32.5% in the placebo group." [https://en.wikipedia.org/wiki/Androstenediol](https://en.wikipedia.org/wiki/Androstenediol)
- "Preliminary clinical findings on NEUMUNE as a potential treatment for acute radiation syndrome...5-androstenediol (5-AED) has been advanced as a possible countermeasure for treating the haematological component of acute radiation syndrome (ARS). It has been used in animal models to stimulate both innate and adaptive immunity and treat infection and radiation-induced immune suppression...NEUMUNE significantly increased circulating neutrophils (p < 0.001) and platelets (p < 0.001) in the peripheral blood of adult and elderly subjects. A dose-response relationship was identified. Findings suggest that parenteral administration of 5-AED in aqueous suspension may be a safe and effective means to stimulate innate immunity and alleviate neutropenia and thrombocytopenia associated with ARS." [https://www.ncbi.nlm.nih.gov/pubmed/21149931](https://www.ncbi.nlm.nih.gov/pubmed/21149931)
- "Hyaluronic acid is radioprotective in the intestine through a TLR4 and COX-2-mediated mechanism...The intestinal epithelium is sensitive to radiation injury. Damage to the intestinal epithelium is dose limiting in radiation therapy of abdominal cancers. There is a need for agents that can be given before radiation therapy to protect the intestinal epithelium...HA or other TLR4 agonists may be practical agents for protecting the intestinal epithelium during radiation therapy of abdominal malignancies." [https://www.physiology.org/doi/full/10.1152/ajpgi.00248.2011](https://www.physiology.org/doi/full/10.1152/ajpgi.00248.2011)
- "Development of a panel of seven efficacious radiation countermeasure candidates against acute radiation syndrome (ARS). These agents have low toxicity and practical routes of administration. They are ready for advanced development by other DOD agencies when resources become available. All are at Technology Readiness Level (TRL) 3 or above. This is the level for which AFRRI is funded (DOD S&T activities 6.2 and 6.3). One candidate (genistein or BIO-300) is at TRL 5, and another (5-AED) is at TRL 6. Five of these countermeasure candidates were conceived at AFRRI, and research and development initiated at..."
AFRRI. These are 5-AED, tocols, genistein (BIO 300), ciprofloxacin (CIPRO), and ghrelin. Two were researched at early stages in collaboration with companies: Ex-Rad® and CDX-301. Three have FDA Investigational New Drug (IND) status for ARS: 5-AED, genistein (BIO 300), and Ex-Rad®. Six have human safety trials: 5-AED, genistein (BIO 300), Ex-Rad®, CDX-301, CIPRO, and Ghrelin. The seventh (tocols) has very low toxicity in non-GLP studies (administered in a manner suitable for an ARS countermeasure). All enhance survival in irradiated animals in robust studies repeated multiple times. Four of these countermeasure candidates are dual use, i.e., approved or being developed for mainstream medical indications: CIPRO: antibiotic. Ghrelin: cachexia, hemodialysis, seizures, gastroparesis. CDX-301: hematopoietic stem cell transplantation. BIO 300: lung cancer, prostate cancer

- "Recommended foods and supplements to help protect your health and Counter the Effects of Radiation...Diet and your body’s susceptibility to radiation are closely entwined. Radiation and pollutants destroy vitamins A, C, E, K, several B vitamins, essential fatty acids, calcium and neuro-hormones. If your body lacks calcium, potassium and other nutrients, it will more readily absorb the radioactive elements that are similar in structure to these nutrients. Your best bet is to eat natural, fresh, organic (as much as possible) unprocessed foods, avoiding white sugar, red meat, refined wheat, caffeine and homogenized milk."
- "Natural Ways to Protect Against Radiation...Introduce more chlorophyll-rich foods into your diet, such as seaweed, kelp, blue-green algae, spirulina, and chlorella. These plants contain rich minerals, including iodine, that bind up the receptors site in your thyroid so that any radioactive iodine that you end up being exposed to will be unable to harm your thyroid. These foods also contain potent antioxidants, like selenium, that prevent destructive free radical activity and cancerous growth, as well as chelating agents that bind to toxins and eliminate them from your body. Eat antioxidant-rich foods of every color, especially cherries, blueberries, pomegranates, yams, and sweet potatoes. The variety of antioxidants found in these foods help your body to mop up free radicals and toxins. Drink six to eight 8-ounce glasses of filtered water every day to flush and hydrate your system. Consider taking vitamin C, E, and D to assist antioxidant actions within your body. Also, alpha lipoic acid is a nutrient that protects cells from radiation damage. Herbs like dandelion, peppermint, and chrysanthemum help the body detoxify. Undergoing a medically supervised detox program like the Tao of Wellness Detox Retreat can support your body’s cleansing function."
  [https://www.huffpost.com/entry/radiation-protection-_b_840246](https://www.huffpost.com/entry/radiation-protection)_b_840246
People Most Exposed To Ionizing Radiation

- Astronauts.
- Airline crew.
- Industrial radiography.
- Medical radiology and nuclear medicine.
- Uranium mining.
- Nuclear power plant and nuclear fuel reprocessing plant workers.
- Research laboratories (government, university and private).
- High altitude workers.
- Nuclear medicine patients
- Radiation therapy patients
- Patients exposed to X-rays.
Treatment Of Ultraviolet (UV) Damage

- “In 2019 I noticed a positive response after supplementing with 50 mg of DHEA daily. I have a history of high ultraviolet (UV) exposure from living in Hawaii, working at very high altitudes, and managing reflective industrial and utility solar photovoltaic (PV) power plants.” Steven Magee CEng MIET - Q
- “I had been to the endocrinologist in 2017 due to my feet changing from size 9 to size 10 in just a few months. I had to throw out all of my shoes and buy new ones. I was told that there was nothing wrong with my hormones. The medical report shows they did not test my DHEA hormone levels, which I later showed a positive response to.” Steven Magee CEng MIET - Q
- “DHEA (dehydroepiandrosterone) is one of the hormones produced by the adrenal glands. After being secreted by the adrenal glands, it circulates in the bloodstream as DHEA-sulfate (DHEAS) and is converted as needed into other hormones.”
- “The effect of ultraviolet radiation and pretreatment of dehydroepiandrosterone on RMK cells in culture...Recent reports suggest that ultraviolet radiation (UV) can easily target the genome as well as damage the cell membrane and contribute to cell death. Dehydroepiandrosterone (DHEA) is believed to be a powerful endogenous antioxidant, and is important in protection against aging as well as an immune stimulant...after UV treatment the MDA levels increased indicating that DHEA was efficient in protecting the cells from damage. Morphological evaluation of the cells treated with UV radiation showed an increase in degeneration of chromat in and a decrease in cell size as compared to non-treated groups.”
- “DHEA (Dehydroepiandrosterone)...DHEA reduced UV-induced DNA damage by 90%. These findings suggest that DHEA may help to prevent against chemically and physically-induced DNA damage...Symptoms of DHEA deficiency may include persisting fatigue, depression, anxiety, hypersensitivity to noise, loss of libido, dry eyes, skin, and hair, loss of head hair, axial (armpit) hair, and pubic hair.”
- “Lung Cancer Surgery, Radiation Therapy, and DHEA...'Administration of DHEA to laboratory mice and rats inhibits development of experimental tumors of the breast, lung, colon, liver, skin and lymphatic tissues.' (J Cell Biochem Suppl 1995; 22: 210)...'Total body radiation' used to destroy white cells before bone marrow transplantation is known to significantly reduce DHEA levels (Bone Marrow Transplant 1997; 20: 561) and (Horm Res 1995; 43: 279). Since I think all tissues live on DHEA, I think cancer does also. I think this is the mechanism whereby radiation works against cancers; radiation reduces available DHEA. Since cancers are rapidly growing, they are more sensitive to high levels of DHEA. Radiation reduces DHEA, so the entire person is adversely affected by low DHEA, but the cancer is more affected. The cancer dies before the rest of the person.”
- “6 Symptoms of Low DHEA and What You can Do About Them...One major problem with having low DHEA is that it causes your immune system to weaken. This will cause you to have an array of health problems. For starters, it will be easier for you to get infections and develop sicknesses. You may experience diarrhea, lack of hunger, and nausea in the early stages. Allergies may even be more noticeable too. As it continues to get worse, your internal and external organs will be more susceptible to inflammation. It is better to restore your DHEA as
soon as you experience the early symptoms of a weak immune system.”

- “DHEA Deficiency Symptoms and Treatments...A deficiency can lead to problems with immune function, inflammation problems and an increased risk of heart problems and even certain cancers..Most studies are based on a dose of 50 mg per day. However, the dose you need could vary from 15 to 75 mg a day divided into three doses, taken a half hour before meals.”

- “The effect of six months treatment with a 100 mg daily dose of dehydroepiandrosterone (DHEA) on circulating sex steroids, body composition and muscle strength in age-advanced men and women...A daily oral 100 mg dose of DHEA for 6 months resulted in elevation of circulating DHEA and DS concentrations and the DS/cortisol ratio. Biotransformation to potent androgens near and slightly above the range of their younger counterparts occurred in women with no detectable change in men. Given this hormonal milieu, an increase in serum IGF-I levels was observed in both genders but dimorphic responses were evident in fat body mass and muscle strength in favour of men. These differences in response to DHEA administration may reflect a gender specific response to DHEA and/or the presence of confounding factor(s) in women such as oestrogen replacement therapy.”

- “DHEA...is helpful to treat: Addison's disease, Depression, Lupus, Obesity...Alzheimer's disease, Chronic fatigue syndrome, Erectile dysfunction (impotence), Osteoporosis, Parkinson's disease, Schizophrenia, Symptoms of menopause such as breast tenderness, fluid retention, mood changes, and hot flashes.”

- “Male Benefits of DHEA Supplements...DHEA reduces the risk of heart disease in men, assists with weight loss, reduces inflammation and increases metabolism. According to a 2003 study published in the "Journal of the Medical Association of Thailand," lowering inflammation in the body appeared to be one of the main ways in which the risk of heart disease was reduced. DHEA has been reported to lower high density lipoprotein, often referred to as "good cholesterol."”

- “Ageing and hormones are inter-related terms playing crucial role in human’s life. Dehydroepiandrosterone, commonly known DHEA, is among those hormones which directly interfere with the ageing process and its effects is remarkably visible. The role of DHEA in fighting against the signs of aging have been tested for a long time. Recent researches in the field of hormones and steroids has provided the researcher with new insights to investigate the potentials of DHEA and its sulfate esters in the field of skin aging complications.”

- “Younger, Healthier SKIN... The anti-stress hormone DHEA, and the sleep hormone melatonin, are both found in human skin...While the exact roles of DHEA and melatonin in human skin are still under scrutiny, researchers have identified several mechanisms through which these hormones protect against aging, maintain the health of skin, and affect how sunlight reacts with skin cells. All three are connected. For example, sunlight and aging suppress immunity; immunity affects health, and melatonin and DHEA affect them all.”

- “DHEA (Dehydroepiandrosterone)...the most abundant steroid in the human body, has been dubbed the ‘mother of all hormones’; it has many roles within the body and plays an important
role in the manufacture of the hormones testosterone, estrogen, progesterone, and corticosterone. The decline of DHEA with age parallels that of HGH, so by age 65, our bodies make only 10 to 20% of what they did at age 20.”

- “Dehydroepiandrosterone (DHEA), also known as androstenolone, is an endogenous steroid hormone.[4] It is one of the most abundant circulating steroids in humans,[5] in whom it is produced in the adrenal glands,[6] the gonads, and the brain.[7] It functions as a metabolic intermediate in the biosynthesis of the androgen and estrogen sex steroids both in the gonads and in various other tissues.[4][8][9] However, DHEA also has a variety of potential biological effects in its own right, binding to an array of nuclear and cell surface receptors,[10] and acting as a neurosteroid and modulator of neurotrophic factor receptors.[11] In the United States, DHEA is sold as an over-the-counter supplement, and medication, called prasterone.”

- “Researchers Ponder The Benefits Of DHEA On Many Fronts...Human epidemiological and pilot clinical studies suggest that elevated levels of DHEA in the blood may be beneficial in preventing heart disease, improving immune function and well-being in the elderly, and combating depression. The hormone may also be helpful in treating systemic lupus erythematosus. Numerous animal studies have shown that DHEA may prevent obesity, diabetes, cancer, and heart disease, as well as enhance the immune system and expand life span.”

- “Lowered DHEA-S plasma levels in adult individuals with autistic disorder...The aim of this study was to determine for the first time neurosteroid levels, dehydroepiandrosterone (DHEA) and DHEA-sulfate (DHEA-S) in particular, in a group of adult patients with autistic disorder and compare these levels with normal healthy individuals. Levels of DHEA, DHEA-S and cortisol were compared between 15 adult drug-free patients with autistic disorder and 13 healthy controls. The Ritvo-Freeman Real-Life Rating Scale (RLRS) and the Overt Aggression Scale (OAS) were assessed as a measure of symptom severity. Significant lower DHEA-S levels were observed in the group with autistic disorder as compared to controls (p<0.05). DHEA-S levels appear to be low in patients with autistic disorder and, while speculative, may play a role in the etiopathophysiology of the disorder.”

- “Is Your Depression Linked to Low DHEA Levels?...DHEA exists in two forms, DHEA and DHEAS. DHEAS is the form most commonly measured in the bloodstream and many physicians believe that low levels are related to depressed mood, fatigue, and a general sense of not feeling well...Evaluating DHEAS levels and prescribing DHEA if levels are low should be part of a comprehensive plan for depression.”

- “DHEA: What You Need to Know...When DHEA levels are low, your body does not have enough working material for proper endocrine function. This throws off your hormone production and you feel a general sense of malaise, along with other symptoms of hormonal imbalance — how severe depends on how many other demands are being made on your body at the same time. There is a growing body of evidence that healthy levels of DHEA may help support the bones, fight depression, fatigue, and aid in weight loss”

- “Adrenal Syndrome - Cortisol and DHEA – Regulating Health...Adrenal syndrome results from chronic stress—conversely, chronic stress promotes adrenal syndrome—and creates an elevated cortisol-to-DHEA ratio from Pregnenolone Steal, the preferential hormone distribution when
the body is under chronic stress. Ultimately, exhaustion of the adrenal glands leads to a deficiency of cortisol, DHEA, and other hormones, severely compromising your ability to be healthy and recover from illness.” [http://www.coreonehealth.com/cortisol-and-dhea-regulating-health](http://www.coreonehealth.com/cortisol-and-dhea-regulating-health)

- “Adrenal syndrome, also referred to as adrenal exhaustion, is one of the most undiagnosed, misdiagnosed, and mistreated health problems. The degree of its severity ranges from mild dysfunction to total failure of the adrenal glands (known as Addison’s disease). Because the adrenal glands are responsible for so many critical functions, even a minor impairment in their function can have a negative impact on the entire body. A chronic disruption—one that persists over time—of normal adrenal function can undermine immunity and metabolism, leading to debilitating health conditions.” [http://www.coreonehealth.com/adrenal-syndrome](http://www.coreonehealth.com/adrenal-syndrome)

- “Adrenal Fatigue: Symptoms & Healing Alternatives...Adrenal fatigue is characterized by relentless, debilitating fatigue. The adrenal glands are your body’s primary “shock absorbers.” These two little thumb-sized glands sitting on top of your kidneys produce hormones including norepinephrine, cortisol and DHEA that allow you to respond to the conditions of your daily life in healthy and flexible ways...Adrenal fatigue is characterized by cortisol levels that are too high at night and not high enough in the morning.” [https://www.drnorthrup.com/adrenal-exhaustion/](https://www.drnorthrup.com/adrenal-exhaustion/)

- “Adrenal Syndrome - Hans Selye, Stress Pioneer...The body's resistance to the stress may gradually be reduced, or may collapse quickly. Generally, this means the immune system, and the body's ability to resist disease, may be almost totally eliminated. Patients who experience long-term stress may succumb to heart attacks or severe infection due to their reduced immunity. For example, a person with a stressful job may experience long-term stress that might lead to high blood pressure and an eventual heart attack.” [http://www.coreonehealth.com/hans-selye-stress-pioneer](http://www.coreonehealth.com/hans-selye-stress-pioneer)

- “Addison's disease, also known as primary adrenal insufficiency and hypocortisolism, is a long-term endocrine disorder in which the adrenal glands do not produce enough steroid hormones. [1] Symptoms generally come on slowly and may include abdominal pain, weakness, and weight loss.[1] Darkening of the skin in certain areas may also occur.[1] Under certain circumstances, an adrenal crisis may occur with low blood pressure, vomiting, lower back pain, and loss of consciousness.[1] An adrenal crisis can be triggered by stress, such as from an injury, surgery, or infection.” [https://en.wikipedia.org/wiki/Addison%27s_disease](https://en.wikipedia.org/wiki/Addison%27s_disease)

- “The Health Benefits of Alpha-Lipoic Acid...Sun-Damaged Skin...An early study published in the Aesthetic Surgery Journal concluded that a topical 5% alpha-lipoic cream was able to reduce facial lines, especially around the eyes and upper lip, by as much as 50 percent in women ages 41 to 63 with moderate sun damage. The pore sizes of the participants were also seen to decrease. The topical cream was well tolerated with no apparent side effects.” [https://www.verywellhealth.com/alpha-lipoic-acid-88727](https://www.verywellhealth.com/alpha-lipoic-acid-88727)

- “Do any supplements help prevent sunburn or skin damage from sun exposure?...Supplements containing beta-carotene, cocoa, vitamin C, and/or vitamin E may provide modest protection from sun damage to the skin, according to small studies. There is also some preliminary evidence that a branded fern extract (Fernblock/Heliocare) may be helpful.” [https://www.consumerlab.com/answers/do-any-supplements-help-prevent-sunburn-or-skin-damage-from-sun-exposure/supplements_for_sun_damage/](https://www.consumerlab.com/answers/do-any-supplements-help-prevent-sunburn-or-skin-damage-from-sun-exposure/supplements_for_sun_damage/)

- “Quick look at 10 oral antioxidants for sun protection...1. Beta-Carotene...2. Selenium...3. Lutein...4. Zeaxanthin...5. Lycopene...6. Pycnogenol...7. Fernblock...8. Omega-3s From Fish
“β-Carotene and other carotenoids in protection from sunlight... This review focuses on the nutritional aspect of phytochemicals in humans—ie, the provision of carotenoid micronutrients by dietary means to the skin and their role in protection. Human intervention studies have documented protective effects for β-carotene or for lycopene provided either by a carotenoid-rich diet or by supplementation. In exposed tissues, light induces primary and secondary photooxidative processes. Scavenging of reactive oxygen species is considered to be a mechanism of action underlying the protective activity of carotenoids... an optimal supply of antioxidant micronutrients in the skin increases basal dermal defense against UV irradiation, supports longer-term protection, and contributes to maintenance of skin health and appearance.”

“UV light, beta-carotene and human skin—beneficial and potentially harmful effects... Solar radiation is one of the most important environmental stress agents for human skin, causing sunburn, premature skin aging, and skin cancer. Beta-carotene is discussed to protect against photooxidative stress and thus prevent skin damage... Recent studies on skin cells in culture have revealed that beta-carotene acts not only as an antioxidant but also has unexpected prooxidant properties.”

“β-Carotene and other carotenoids in protection from sunlight... The exposure to solar UV radiation has been estimated to be ~10% for outdoor-working adults and ~3% for indoor-working adults of the total available annual UV radiation (on a horizontal plane) (24). The UV doses that people are exposed to increase with increasing altitude and with decreasing latitude... In view of the potential detrimental health effects such as sunburn, ocular damage, photoaging, immune suppression, DNA damage, and skin cancer, it is important to consider protective strategies... Controlled exposure of human volunteers to sunlight for 12 d (total UV dose of ~10,000 mJ/cm^2) led to significant decreases in skin and plasma β-carotene concentrations (25).”

“β-carotene protects from solar radiation... Dunaliella salina algae is bombarded with the full brunt of solar UV (ultraviolet) radiation and has evolved a novel mechanism for defending itself from the radiation’s damaging effects. More than 8% of its dry body mass is β-carotene, more than any other organism that produces the compound. The algae produces β-carotene in response to UV stress and localizes it to lipid droplets within its chloroplasts. In that location it is able to absorb and neutralize the damaging oxygen radicals produced from excessive UV and sun exposure.”

“Beta-Carotene and Vitamin E Help Prevent Sunburn... Supplementation results in a sunscreen factor of two or three, meaning that we can withstand two to three times more exposure without a reaction.”

“Nutrition for Healthy Skin: Vitamin E, Pantothenic Acid, and Selenium... These nutrients are particularly important for antioxidant defense of the skin, which is crucial in slowing the aging process as well as protecting the skin from sun damage, pollutants, and other environmental toxins. They are also beneficial for treating acne, which is characterized by sebum overproduction, follicular hyperkeratinization, oxidative stress and inflammation. (1) By consuming foods rich in these vitamins and minerals, your skin will look clearer, brighter, and more youthful than ever before.”

“The Top 5 Vitamins for Skin Care... Vitamin A... Vitamin B3... Vitamin B5... Vitamin C... Vitamin
“List of Supplements to Protect your Skin from Sun Damage...Skin Support from the Inside. Vitamin E...Green Tea...Vitamin C...Vitamin B Complex...Vitamin D...Skin Support from the Outside. Coconut Oil...Aloe Vera...Oatmeal...Sunscreen.”

“Do Vitamins Really Help to Prevent & Reverse Sun Damaged Skin?...Since UV rays zap a lot of your skin’s nutrients, many people often ask if taking vitamin supplements can actually reverse the ravages of sun exposure...The Vitamin B complex helps your skin tissue rebuild and repair...Vitamin C encourages and increases the production of collagen in the skin. It’s also the most common antioxidant naturally found in our skin, and the sun can really zap it...Vitamin E is another antioxidant-rich element that battles the effects of free radicals and protects your cell membranes against damage. It helps reduce sun damage and counteract premature aging by preventing wrinkles and improving the texture of your skin.”

“Vitamin B Cuts Skin Cancer Risk; Supplement Regimen To Be Used Alongside Sunscreen...Summertime is almost upon us, and with it brings the sun’s strong rays to lift our spirits and cause some potential damage to our fragile skin. Australian researchers from the University of Sydney recently discovered nicotinamide, a form of vitamin B powerful enough to reduce the recurrence of common skin cancers by 23 percent.”

“How Vitamin B5 is the Perfect Skin Product After a Summer in the Sun...It’s no secret that UV rays damage the skin and cause it to age prematurely. Still, there’s only so much you can do to protect your skin during the summer when most people spend hours at a time outdoors. Fortunately, some of the best face serums for fall include vitamin B5 and can help repair damage the sun has done to your skin over the past few months. With regular use, vitamin B5 helps the skin regenerate itself after prolonged sun damage.”

“The Protective Role of Astaxanthin for UV-Induced Skin Deterioration in Healthy People—A Randomized, Double-Blind, Placebo-Controlled Trial...Skin is a major safeguard tissue in humans. Because biological barrier function is deteriorated by several kinds of stresses including exposure to ultra-violet (UV) rays, the protection and treatment of skin conditions by dietary supplements are important...Astaxanthin seems protective against UV-induced skin deterioration and helps maintain healthy skin in healthy people.”

“Want to Look Younger? Take Astaxanthin Every Day for 2 Weeks...Astaxanthin's unique "antioxidative artillery" provides for an impressive array of health benefits, including improving cardiovascular health, stabilizing blood sugar, boosting your immune system, fighting cancer, reducing inflammation, improving eye health—and even improving your athletic abilities...Researchers concluded that astaxanthin "can significantly prevent UV-induced collagen degradation, wrinkles, lipid peroxidation, sunburn, phototoxicity and photoallergy."”

“Astaxanthin Provides Broad Spectrum Protection...Researchers have sought to explore the use of astaxanthin as a topical sunscreen because of its powerful ultraviolet light-absorbing properties.5 They soon found, however, that astaxanthin has many additional benefits, including..."
free radical scavenging, mitochondrial protection, anti-inflammatory effects, and protection from glycation.11-18. In the words of one researcher, astaxanthin shows “demonstrable promise for slowing age-related functional decline.”19

- “Sun protection in a pill: the photoprotective properties of Polypodium leucotomos extract...Physical blocks (i.e. wearing appropriate clothing), exposure avoidance, and the use of sunscreens are the main methods of photoprotection currently used. However, phytochemical and natural botanical extracts such as polypodium leucotomos, a tropical fern found in Central and South America, demonstrate a strong potential as adjuncts to sunscreen protection...Oral administration of PL extracts and its favorable safety profile could have significant implications in the prevention of skin cancer.” [https://www.ncbi.nlm.nih.gov/pubmed/25040452](https://www.ncbi.nlm.nih.gov/pubmed/25040452)
- “Safety and Efficacy of Oral Polypodium leucotomos Extract in Healthy Adult Subjects...Polypodium leucotomos extract 240mg taken twice daily for 60 days was a safe and effective means for reducing the damaging effects of ultraviolet radiation.” [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4345929/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4345929/)
- “What Is Polypodium Leucotomos?...Most commonly, Polypodium leucotomos is taken orally for the treatment of inflammation and a variety of skin ailments including psoriasis, vitiligo (the loss of pigment in patches of the skin), atopic dermatitis (eczema: inflammation of the skin), and melasma (over-pigmented patches of dark skin). It also serves as a protectant against sunburn (solar erythema) and helps prevent and relieve polymorphous light eruption (PMLE).” [https://www.sunsaferx.com/health-and-wellness/polypodium-leucotomos/](https://www.sunsaferx.com/health-and-wellness/polypodium-leucotomos/)
- “POLYPODIUM LEUCOTOMOS...Polypodium leucotomos is a fern from Central America. The underground “runners” (rhizomes) are used for medicine. Polypodium leucotomos is used to prevent certain skin problems including sunburn, eczema (atopic dermatitis), psoriasis, vitiligo, and skin cancer. It is also used for other cancers and Alzheimer’s disease.” [https://www.webmd.com/vitamins/ai/ingredientmono-1152/polypodium-leucotomos](https://www.webmd.com/vitamins/ai/ingredientmono-1152/polypodium-leucotomos)
- “Ability of PABA to protect mammalian skin from ultraviolet light-induced skin tumors and actinic damage...Application of 50 para-aminobenzoic acid (PABA) to hairless mice one hour prior to ultraviolet light (UVL) irradiation will almost totally protect these animals from developing tumors induced by chronic exposure to UVL in the 290 to 320 nm range in conjunction with a chemical carcinogen.” [https://www.ncbi.nlm.nih.gov/pubmed/1194718](https://www.ncbi.nlm.nih.gov/pubmed/1194718)
- “PARA-AMINOBENZOIC ACID (PABA)...Para-aminobenzoic acid (PABA) is a chemical found in the folic acid vitamin and also in several foods including grains, eggs, milk, and meat. PABA is taken by mouth for skin conditions including vitiligo, pemphigus, dermatomyositis, morphea, lymphoblastoma cutis, Peyronie's disease, and scleroderma. PABA is also used to treat infertility in women, arthritis, "tired blood" (anemia), rheumatic fever, constipation, systemic lupus erythematosus (SLE), and headaches. It is also used to darken gray hair, prevent hair loss, make skin look younger, and prevent sunburn. PABA is best known as a sunscreen that is applied to the skin (used topically).” [https://www.webmd.com/vitamins/ai/ingredientmono-1004/para-aminobenzoic-acid-paba](https://www.webmd.com/vitamins/ai/ingredientmono-1004/para-aminobenzoic-acid-paba)
- “I was a towhead in my youth, and m still fair skinned. In my youth (until age 55 or so) I could never tan. I went straight to red, then straight back. In my mid 50's I started supplements of Alpha Lipoic Acid and CoQ10 about 100 mg each for other reasons. I found out that: A) No more chapped lips, no lip balm for about 15 years and B) I could sunbathe at will without sunburn, I could actually get a tan (wow). BUT ultimately there was skin damage, maybe
because I went to extreme. I quit after two seasons.”  

- “Now You Can Be Safer in the Sun...It is sad to say that photo-oxidative ultraviolet A radiation reduces skin and blood antioxidants and damages cell components, not to mention DNA… Green tea polyphenols, in combination with sunscreens, may provide an effective strategy for reducing the risk of skin cancers...Taking L-tyrosine as a supplement can help the body to produce melanin, which helps tanning and is likely to reduce the risk of sunburn.”  

- “L Tyrosine & Melanin...Melanin is the specific pigment that is responsible for the color of hair, skin and the iris of the eye. One of its primary functions is to protect the skin from sun damage and dissipate most of the UV radiation as heat...L-tyrosine is a precursor of melanin. This means that certain biochemical pathways convert L-tyrosine into melanin through the use of numerous "intermediate molecules" that are systematically modified into the end product.”
https://www.livestrong.com/article/477628-l-tyrosine-melanin/

- “Pycnogenol clinically shown to help protect skin against UV damage... supplementation of Pycnogenol® in healthy volunteers was shown to inhibit the inflammation caused by UV-exposure and consequently protected the skin from sunburn...Pycnogenol® was demonstrated to be protective against chronic UV-exposure induced skin malignancies. These findings point to a significant photo-protective and antiphoto- ageing effect of Pycnogenol®.”
https://www.justvitamins.co.uk/blog/pycnogenol-clinically-shown-to-help-protect-skin-against-uv-damage/

- “Protection from inflammation, immunosuppression and carcinogenesis induced by UV radiation in mice by topical Pycnogenol…topical Pycnogenol offered significant and dose-dependent protection from SSUV-induced acute inflammation, immunosuppression and carcinogenesis, when applied to the skin after daily irradiation. Pycnogenol, therefore, in addition to its recognized health benefits in other organs, appears to have potential in providing photoprotection for humans in a complementary role with sunscreens, having demonstrable activity when applied to the skin after, rather than before, UV exposure.”
People Exposed To Abnormally High Ultraviolet (UV) Levels

- **High Altitude Disease (HAD):**
  - Pilots.
  - Observatory workers.
  - Ski resort workers.
  - Antenna workers.
  - National park and forest rangers.
  - Hikers.
  - Mountain climbers.
  - High Altitude Adaptation Disease (HAAD): People with sea level adapted genetics living at high altitudes.

- **Winter Sports Disease (WSD):**
  - Skiers
  - Snowboarders.
  - Hikers.

- **Reflective Environment Disease (RED):**
  - Solar photovoltaic (PV) workers.
  - People living in a home with a view of a reflective solar photo-voltaic (PV) system.
  - Window cleaners.
  - Jobs in downtown areas filled with tall reflective buildings.
  - People with a large view of the ocean, large lake, or large river.
  - People that engage in water sports.
  - Sailors.

- **Ultraviolet (UV) Emitting Products Disease (UEPD):**
  - “Lights That Give Off UV Rays...Fluorescent bulbs are most commonly found in two varieties: compact fluorescent bulbs for use in homes and fluorescent tube lighting that is often used in offices and stores. Both bulbs emit more UV light than traditional incandescent bulbs...The lights used in tanning beds are typically long, tubular fluorescent bulbs that emit both UVA and UVB rays.” [https://sciencing.com/lights-give-off-uv-rays-8332010.html](https://sciencing.com/lights-give-off-uv-rays-8332010.html)
  - “High intensity discharge bulbs such as metal halide bulbsand high pressure sodium bulbs are a different story. Most HIDs emit a significant amount of UV radiation and require specific UV-blocking filters to meet safety standards in most working conditions. When an industrial sized space is lit by so many powerful HIDs, the safety concern is even greater.” [https://oeo.com/led-lights-emit-uv-radiation/](https://oeo.com/led-lights-emit-uv-radiation/)
  - Tanning lamps and beds.
  - Electricians working daily with ultraviolet emitting lighting products.
  - Workplaces lit by ultraviolet emitting lighting products.
  - People living in homes lit by ultraviolet emitting lighting products.
  - Using televisions and computer monitors that emit ultraviolet light.
  - Welders working with electrical arc welders and cutters.

- **Radiation Sickness From High Ultraviolet (UV) Levels:**
  - Sitting next to a sunny window daily.
  - Daily sunbathing.
- Outdoor jobs.
- Driving jobs.
- Police officers.
- Continent Adaptation Disease (CAD): People that have relocated from near the poles to near the equator.
- Vacation Disease (VD): People from cloudy and dull environments that vacation in sunny environments.
Oxygen Starvation Organ Damage

- “The organs that have been identified as having issues in very high altitude worker Steven Magee are: 1. Brain. 2. Lungs. 3. Heart. 4. Skin. 5. Liver. 6. Bones. 7. Gastrointestinal system. 8. Kidneys 9. Vitamin B12 & iron absorption problems are currently being diagnosed and may involve the stomach, intestines, liver & blood. 10. Hormonal problems that involve various organ systems of the body.” Steven Magee CEng MIET - Q
- “Ischemia or ischaemia is a restriction in blood supply to tissues, causing a shortage of oxygen that is needed for cellular metabolism (to keep tissue alive).[3] Ischemia is generally caused by problems with blood vessels, with resultant damage to or dysfunction of tissue. It also means local anemia in a given part of a body sometimes resulting from congestion (such as vasoconstriction, thrombosis or embolism). Ischemia comprises not only insufficiency of oxygen, but also reduced availability of nutrients and inadequate removal of metabolic wastes. Ischemia can be partial (poor perfusion) or total.” https://en.wikipedia.org/wiki/Ischemia
- “Understanding the Full Spectrum of Organ Injury Following Intrapartum Asphyxia…Those who survive often suffer from a range of health issues including brain damage—manifesting as cerebral palsy (CP)—respiratory insufficiency, cardiovascular collapse, and renal dysfunction, to name a few...Severe hypoxia at birth is essentially a cardiorespiratory problem, and while brain damage has received the most attention, the global nature of the hypoxic–ischemic insult and myriad of biochemical disruptions that follow cause significant injury to many organ systems, as outlined in this review. “ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5313537/
- “Multiorgan dysfunction in infants with post-asphyxial hypoxic-ischaemic encephalopathy...There is consensus of opinion of representative obstetric and paediatric associations that multiorgan or multisystem dysfunction (MOD) is a constant feature of the neonatal post-asphyxial syndrome...All infants with severe post-asphyxial HIE had evidence of dysfunction of at least one organ/system in addition to the central nervous system.” http://fn.bmj.com/content/89/2/F152
- “Perinatal Asphyxia. Definition: Occurs when placental or pulmonary gas exchange to a fetus/newborn is compromised, resulting in hypoxia in the blood. Implications: Hypoxia forces fetal cells to undergo anaerobic respiration which produces less energy for cells and lactic acid as a byproduct. Energy produced from anaerobic respiration cannot properly supply fetal/newborn tissue therefore cell function becomes compromised. The tissues affected first include the heart, muscle, and brain. Myocardial function eventually becomes depressed and hypotension results in end organ damage to a variety of systems. When oxygen is reinstituted into the blood, reactive oxygen species can further damage tissues, this is known as reperfusion injury (1).” https://pedclerk.bsd.uchicago.edu/page/perinatal-asphyxia
- “Perinatal asphyxia, neonatal asphyxia or birth asphyxia is the medical condition resulting from deprivation of oxygen to a newborn infant that lasts long enough during the birth process to cause physical harm, usually to the brain. Hypoxic damage can occur to most of the infant's organs (heart, lungs, liver, gut, kidneys), but brain damage is of most concern and perhaps the least likely to quickly or completely heal. In more pronounced cases, an infant will survive, but with damage to the brain manifested as either mental, such as developmental delay or intellectual disability, or physical, such as spasticity.” https://en.wikipedia.org/wiki/Perinatal_asphyxia
- “Cerebral palsy (CP) is a group of permanent movement disorders that appear in early
childhood.[1] Signs and symptoms vary among people.[1] Often, symptoms include poor coordination, stiff muscles, weak muscles, and tremors.[1] There may be problems with sensation, vision, hearing, swallowing, and speaking.[1] Often babies with cerebral palsy do not roll over, sit, crawl, or walk as early as other children of their age.[1] Other symptoms may include seizures and problems with thinking or reasoning, either of which occurs in about one third of people with CP.[1] While the symptoms may get more noticeable over the first few years of life, the underlying problems do not worsen over time.”

https://en.wikipedia.org/wiki/Cerebral_palsy

- “Asphyxia or asphyxiation is a condition of severely deficient supply of oxygen to the body that arises from abnormal breathing. An example of asphyxia is choking. Asphyxia causes generalized hypoxia, which affects primarily the tissues and organs. There are many circumstances that can induce asphyxia, all of which are characterized by an inability of an individual to acquire sufficient oxygen through breathing for an extended period of time. Asphyxia can cause coma or death.”
  https://en.wikipedia.org/wiki/Asphyxia

- “Reperfusion injury or reperfusion insult, sometimes called ischemia-reperfusion injury (IRI) or reoxygenation injury, is the tissue damage caused when blood supply returns to tissue (re- + perfusion) after a period of ischemia or lack of oxygen (anoxia or hypoxia). The absence of oxygen and nutrients from blood during the ischemic period creates a condition in which the restoration of circulation results in inflammation and oxidative damage through the induction of oxidative stress rather than (or along with) restoration of normal function...Reperfusion of ischemic tissues is often associated with microvascular injury, particularly due to increased permeability of capillaries and arterioles that lead to an increase of diffusion and fluid filtration across the tissues. Activated endothelial cells produce more reactive oxygen species but less nitric oxide following reperfusion, and the imbalance results in a subsequent inflammatory response.[1] The inflammatory response is partially responsible for the damage of reperfusion injury. White blood cells, carried to the area by the newly returning blood, release a host of inflammatory factors such as interleukins as well as free radicals in response to tissue damage. [2] The restored blood flow reintroduces oxygen within cells that damages cellular proteins, DNA, and the plasma membrane. Damage to the cell's membrane may in turn cause the release of more free radicals. Such reactive species may also act indirectly in redox signaling to turn on apoptosis. White blood cells may also bind to the endothelium of small capillaries, obstructing them and leading to more ischemia.[2] Another hypothesis would be that normally, tissues contain free radical scavengers to avoid damage by oxidizing species normally contained in the blood. Ischemic tissue would have decreased function of these scavengers because of cell injury. Once blood flow is reestablished, oxygen species contained in the blood will damage the ischemic tissue because the function of the scavengers is decreased. Reperfusion injury plays a part in the brain's ischemic cascade, which is involved in stroke and brain trauma. Similar failure processes are involved in brain failure following reversal of cardiac arrest;[3] control of these processes is the subject of ongoing research. Repeated bouts of ischemia and reperfusion injury also are thought to be a factor leading to the formation and failure to heal of chronic wounds such as pressure sores and diabetic foot ulcer.[4] Continuous pressure limits blood supply and causes ischemia, and the inflammation occurs during reperfusion. As this process is repeated, it eventually damages tissue enough to cause a wound.[4] In prolonged ischemia (60 minutes or more), hypoxanthine is formed as a breakdown product of ATP metabolism. The enzyme xanthine dehydrogenase acts in reverse, that is as a xanthine oxidase as a result of the higher availability of oxygen. This oxidation results in molecular oxygen being converted into
highly reactive superoxide and hydroxyl radicals. Xanthine oxidase also produces uric acid, which may act as both a prooxidant and as a scavenger of reactive species such as peroxynitrite. Excessive nitric oxide produced during reperfusion reacts with superoxide to produce the potent reactive species peroxynitrite. Such radicals and reactive oxygen species attack cell membrane lipids, proteins, and glycosaminoglycans, causing further damage. They may also initiate specific biological processes by redox signaling. Reperfusion can cause hyperkalemia”

- “Ischemia-reperfusion injury of the appendicular musculoskeletal system...Ischemia-reperfusion (IR) tissue injury is the resultant pathology from a combination of factors, including tissue hypoxia, followed by tissue damage associated with re-oxygenation. IR injury contributes to disease and mortality in a variety of pathologies, including myocardial infarction, ischemic stroke, acute kidney injury, trauma, circulatory arrest, sickle cell disease and sleep apnea.[1][2][3][4] Whether resulting from traumatic vessel disruption, tourniquet application, or shock, the extremity is exposed to an enormous flux in vascular perfusion during a critical period of tissue repair and regeneration.[5][6] The contribution of this ischemia and subsequent reperfusion on post-traumatic musculoskeletal tissues is unknown; however, it is likely that similar to cardiac and kidney tissue, IR significantly contributes to tissue fibrosis...During periods of ischemia, cellular break down products accumulate in the local tissue. Once reperfusion occurs, these cellular products are returned to the systemic circulation, and are exposed to other organs. Organs involved in filtration (e.g., the kidneys and the liver), may be overwhelmed by the high load of cellular break down products, and face injury themselves (e.g., acute kidney injury).”

- “Ischemia or ischaemia is a restriction in blood supply to tissues, causing a shortage of oxygen that is needed for cellular metabolism (to keep tissue alive).[3] Ischemia is generally caused by problems with blood vessels, with resultant damage to or dysfunction of tissue. It also means local anemia in a given part of a body sometimes resulting from congestion (such as vasoconstriction, thrombosis or embolism). Ischemia comprises not only insufficiency of oxygen, but also reduced availability of nutrients and inadequate removal of metabolic wastes. Ischemia can be partial (poor perfusion) or total...Signs and symptoms. Since oxygen is carried to tissues in the blood, insufficient blood supply causes tissue to become starved of oxygen. In the highly metabolically active tissues of the heart and brain, irreversible damage to tissues can occur in as little as 3–4 minutes at body temperature. The kidneys are also quickly damaged by loss of blood flow (renal ischemia). Tissues with slower metabolic rates may undergo irreversible damage after 20 minutes. Clinical manifestations of acute limb ischemia (which can be summarized as the "six P's") include pain, pallor, pulseless, paresthesia, paralysis, and poikilothermia.”

- “Reactive oxygen species (ROS) are chemically reactive chemical species containing oxygen. Examples include peroxides, superoxide, hydroxyl radical, and singlet oxygen.[2] In a biological context, ROS are formed as a natural byproduct of the normal metabolism of oxygen and have important roles in cell signaling and homeostasis.[3] However, during times of environmental stress (e.g., UV or heat exposure), ROS levels can increase dramatically.[3] This may result in significant damage to cell structures. Cumulatively, this is known as oxidative stress. The production of ROS is strongly influenced by stress factor responses in plants, these factors that increase ROS production include, drought, salinity, chilling, nutrient deficiency, metal toxicity and UV-B radiation. ROS are also generated by exogenous sources such as
ionizing radiation...Damaging effects. Effects of ROS on cell metabolism are well documented in a variety of species. These include not only roles in apoptosis (programmed cell death) but also positive effects such as the induction of host defence[10][11] genes and mobilization of ion transport systems.[citation needed] This implicates them in control of cellular function. In particular, platelets involved in wound repair and blood homeostasis release ROS to recruit additional platelets to sites of injury. These also provide a link to the adaptive immune system via the recruitment of leukocytes.[citation needed] Reactive oxygen species are implicated in cellular activity to a variety of inflammatory responses including cardiovascular disease. They may also be involved in hearing impairment via cochlear damage induced by elevated sound levels, in ototoxicity of drugs such as cisplatin, and in congenital deafness in both animals and humans.[citation needed] ROS are also implicated in mediation of apoptosis or programmed cell death and ischaemic injury. Specific examples include stroke and heart attack.[citation needed]

In general, harmful effects of reactive oxygen species on the cell are most often:[12] damage of DNA or RNA; oxidations of polyunsaturated fatty acids in lipids (lipid peroxidation); oxidations of amino acids in proteins; oxidative deactivation of specific enzymes by oxidation of co-factors...Oxidative damage

In aerobic organisms the energy needed to fuel biological functions is produced in the mitochondria via the electron transport chain. In addition to energy, reactive oxygen species (ROS) with the potential to cause cellular damage are produced. ROS can damage lipid, DNA, RNA, and proteins, which, in theory, contributes to the physiology of aging. ROS are produced as a normal product of cellular metabolism. In particular, one major contributor to oxidative damage is hydrogen peroxide (H2O2), which is converted from superoxide that leaks from the mitochondria. Catalase and superoxide dismutase ameliorate the damaging effects of hydrogen peroxide and superoxide, respectively, by converting these compounds into oxygen and hydrogen peroxide (which is later converted to water), resulting in the production of benign molecules. However, this conversion is not 100% efficient, and residual peroxides persist in the cell. While ROS are produced as a product of normal cellular functioning, excessive amounts can cause deleterious effects.[17] Memory capabilities decline with age, evident in human degenerative diseases such as Alzheimer's disease, which is accompanied by an accumulation of oxidative damage. Current studies demonstrate that the accumulation of ROS can decrease an organism's fitness because oxidative damage is a contributor to senescence. In particular, the accumulation of oxidative damage may lead to cognitive dysfunction, as demonstrated in a study in which old rats were given mitochondrial metabolites and then given cognitive tests. Results showed that the rats performed better after receiving the metabolites, suggesting that the metabolites reduced oxidative damage and improved mitochondrial function.[18] Accumulating oxidative damage can then affect the efficiency of mitochondria and further increase the rate of ROS production.[19] The accumulation of oxidative damage and its implications for aging depends on the particular tissue type where the damage is occurring. Additional experimental results suggest that oxidative damage is responsible for age-related decline in brain functioning. Older gerbils were found to have higher levels of oxidized protein in comparison to younger gerbils. Treatment of old and young mice with a spin trapping compound caused a decrease in the level of oxidized proteins in older gerbils but did not have an effect on younger gerbils. In addition, older gerbils performed cognitive tasks better during treatment but ceased functional capacity when treatment was discontinued, causing oxidized protein levels to increase. This led researchers to conclude that oxidation of cellular proteins is potentially important for brain function.”

“Reactive oxygen species. The reactive oxygen species are the contributors of oxidative stress which lead to various diseases and disorders such as cardiovascular disease, cancer, aging, and various neurodegenerative diseases”
https://www.sciencedirect.com/topics/neuroscience/reactive-oxygen-species
Gastrointestinal Hazards

- “The gastrointestinal tract (digestive tract, digestional tract, GI tract, GIT, gut, or alimentary canal) is an organ system within humans and other animals which takes in food, digests it to extract and absorb energy and nutrients, and expels the remaining waste as feces. The mouth, esophagus, stomach and intestines are part of the gastrointestinal tract. Gastrointestinal is an adjective meaning of or pertaining to the stomach and intestines. A tract is a collection of related anatomic structures or a series of connected body organs” https://en.wikipedia.org/wiki/Gastrointestinal_tract
- “Gastrointestinal problems were a feature of working at the very high altitude summit of Mauna Kea, Hawaii, USA.” Steven Magee CEng MIET - Q
- “While working extreme night shifts, I would take digestive supplements to offset gastrointestinal problems that would develop at the very high altitude summit of Mauna Kea, Hawaii, USA.” Steven Magee CEng MIET - Q
- “The effects of high altitude on humans are considerable. The percentage oxygen saturation of hemoglobin determines the content of oxygen in blood. After the human body reaches around 2,100 m (7,000 feet) above sea level, the saturation of oxyhemoglobin begins to decrease rapidly.” https://en.wikipedia.org/wiki/Effects_of_high_altitude_on_humans
- “When flying leads to stomach pain...Patients with a chronic intestinal inflammation often experience bouts of inflammation after a journey. The main cause of this is not the stress of travelling, but the lack of oxygen experienced in an aircraft or during high altitude stays in the mountains.” https://www.sciencedaily.com/releases/2013/09/130916090838.htm
- “Oxygen Deprivation in Newborn Foals...Other organs in the respiratory and gastrointestinal systems are frequently affected if oxygen deprivation is severe or prolonged.” https://ker.com/equinews/oxygen-deprivation-in-newborn-foals/
- “Intestinal ischemia (is-KEE-me-uh) describes a variety of conditions that occur when blood flow to your intestines decreases due to a blocked blood vessel, usually an artery. Intestinal ischemia can affect your small intestine, your large intestine (colon) or both. Intestinal ischemia is a serious condition that can cause pain and make it difficult for your intestines to work properly. In severe cases, loss of blood flow to the intestines can damage intestinal tissue and possibly lead to death. Treatments are available for intestinal ischemia. To improve the chances of recovery, it's crucial to recognize the early symptoms and get medical help right away.” https://www.mayoclinic.org/diseases-conditions/intestinal-ischemic-syndrome/symptoms-causes/syc-20373946
- “Intestinal Ischemic Syndrome...Early signs and symptoms of acute mesenteric ischemia include: Severe abdominal pain, concentrated in one area of the abdomen. Nausea and/or vomiting. Bloody stools. History of chronic atrial fibrillation or cardiovascular disease” https://my.clevelandclinic.org/health/diseases/17136-intestinal-ischemic-syndrome
- “The physiology of intestinal oxygenation and the pathophysiology of intestinal ileus. Intestinal Ileus is Gut Shock caused by Bowel Hypoxia. The morbidity and mortality of Intestinal Ileus has puzzled more than two generations of investigators because they have overlooked the fact that the gas which collects in obstructed small intestine is mostly (90+%) Nitrogen. For some strange reason a gut full of nitrogen has not been looked on as comparable to a lung full of nitrogen, even though the lung and gut have a common embryological origin. My proposal is
that intestinal epithelium lining a nitrogen filled lumen becomes as oxygen starved as alveolar lining in a similar circumstance. Bowel hypoxia may be brought about either by failure of the intestine to "breathe out", having breathed in due to mechanical block, or gut paralysis, from any cause, of which one may be failure of blood borne oxygen transport to the bowel, Individually, or together, these may reduce or stop the flow of air and/or aerated intestinal contents along the lumen.”

- “Physiologic hypoxia and oxygen homeostasis in the healthy intestine. A Review in the Theme: Cellular Responses to Hypoxia...In recent years, the intestinal mucosa has proven to be an intriguing organ to study tissue oxygenation. The highly vascularized lamina propria juxtaposed to an anaerobic lumen containing trillions of metabolically active microbes results in one of the most austere tissue microenvironments in the body. Studies to date have determined that a healthy mucosa contains a steep oxygen gradient along the length of the intestine and from the lumen to the serosa. Advances in technology have allowed multiple independent measures and indicate that, in the healthy mucosa of the small and large intestine, the lumen-apposed epithelia experience Po2 conditions of <10 mmHg, so-called physiologic hypoxia. This unique physiology results from a combination of factors, including countercurrent exchange blood flow, fluctuating oxygen demands, epithelial metabolism, and oxygen diffusion into the lumen. Such conditions result in the activation of a number of hypoxia-related signaling processes, including stabilization of the transcription factor hypoxia-inducible factor. Here, we review the principles of mucosal oxygen delivery, metabolism, and end-point functional responses that result from this unique oxygenation profile.”

- “Polyps of the Colon and Rectum...An intestinal polyp is any mass of tissue that arises from the bowel wall and protrudes into the lumen. Most are asymptomatic except for minor bleeding, which is usually occult. The main concern is malignant transformation; most colon cancers arise in a previously benign adenomatous polyp. Diagnosis is by endoscopy. Treatment is endoscopic removal.”

- “Colon Polyps...Symptoms. Many times, people are not aware they have colon polyps because there are no symptoms. Larger growths can bleed, causing blood in the stool. Sometimes bleeding polyps can cause fatigue and other symptoms of anemia (low levels of red blood cells). On rare occasions, a large polyp can cause diarrhea or secretion of large amounts of potassium. This can cause marked fatigue and muscle weakness.”

- “What Causes, Prevents Colon Polyps. Vitamin D Shines in New Study; Smoking Worse Than Expected...Taking a multivitamin -- most of which contain 400 IUs of vitamin D -- was associated with reducing polyp risk by about 25%. These multivitamins also contain adequate amounts of calcium, folate, vitamin E, and selenium, which Lieberman also found to help lower polyp risk, "but not as much as vitamin D," he says. In order to get the full protective effect of vitamin D -- at 645 IU -- add a small glass of milk daily to the multivitamin.”

- “How Your Diet Affects Your Risk of Colon Polyps...The foods that had the highest inflammation scores were processed meats and red meat, Bostick said. Dairy foods that contained fat also had pro-inflammatory scores, whereas poultry and fish were neutral; they didn't cause inflammation, but they didn't appear to fight it either, he said. Fruits, vegetables and nonfat dairy, on the other hand, were determined to be anti-inflammatory, he said.”
“Sigmoid Colon Pain: Causes, Symptoms, and Treatment...Sigmoid colon pain symptoms can vary from one person to the next. As indicated earlier, some people experience mildly annoying symptoms. If the following symptoms arise, medical attention should be sought as soon as possible. Bloody diarrhea. Rectal bleeding. Loss of appetite. Loss of weight. Fatigue. Fever and chills. Intestinal obstruction. Skin problems. Tenderness in abdomen.”

“In 2018 at the age of 48, many years after the onset of various gastrointestinal problems while working at very high altitude atop Mauna Kea, I had a colonoscopy that removed a 5mm polyp from the sigmoid colon.”

“The sigmoid colon (pelvic colon) is the part of the large intestine that is closest to the rectum and anus. It forms a loop that averages about 35–40 cm (13.78-15.75 in) in length. The loop is typically shaped like a Greek letter sigma (ς) or Latin letter S (thus sigma + -oid). This part of the colon normally lies within the pelvis, but on account of its freedom of movement it is liable to be displaced into the abdominal cavity.”

“Mapping the body: the sigmoid colon. This S-shaped stretch of large bowel is the site of a variety of problems – some very unpleasant to treat...Inflammatory bowel disease such as ulcerative colitis and Crohn's disease may occur here. Diverticulitis, in which little outpouchings of bowel form and become inflamed, is more common in the sigmoid than any other part of the bowel. Small growths called polyps, as well as cancers, also favour this site.”


“Signs and Symptoms of Colorectal Cancer...A change in bowel habits, such as diarrhea, constipation, or narrowing of the stool, that lasts for more than a few days. A feeling that you need to have a bowel movement that is not relieved by doing so. Rectal bleeding. Dark stools, or blood in the stool. Cramping or abdominal (belly) pain. Weakness and fatigue. Unintended weight loss.”

“Causes of Low Potassium...Gastrointestinal Tract Problems. Certain health conditions such as diarrhea or vomiting can lead to excess loss of potassium. Enemas or excessive use of laxatives can also cause hypokalemia. Significant hypokalemia can occur in people who have undergone ileostomy or other bowel surgeries. Villous adenoma is a type of colon polyp, which can cause the excessive excretion of potassium from the colon.”

“Potassium Deficiency and Potassium Supplements...Potassium is a mineral that is critical for various body functions. Potassium is also an electrolyte works in the body along with calcium, sodium, chloride and magnesium to conduct electricity. Maintaining the right balance of potassium in the body is important, for a deficiency will lead to hyperkalemia and an excess will result in hypokalemia...Loss of potassium from the GI tract can be due to diarrhea, vomiting or laxative use.”
• “Potassium...Certain conditions can cause potassium deficiencies, or hypokalemia. These include: kidney disease. overuse of diuretics. excess sweating, diarrhea, and vomiting. magnesium deficiency. use of antibiotics, such as carbenicillin and penicillin”

https://healthtools.aarp.org/health/potassium

• “Hypokalemia, also spelled hypokalaemia, is a low level of potassium (K+) in the blood serum...Hypokalemia is one of the most common water–electrolyte imbalances.[4] It affects about 20% of people admitted to hospital...In the heart, hypokalemia cause arrhythmias because of more complete recovery from sodium-channel inactivation, making the triggering of an action potential less likely. In addition, the reduced extracellular potassium (paradoxically) inhibits the activity of the IKr potassium current and delays ventricular repolarization. This delayed repolarization may promote reentrant arrhythmias.”

https://en.m.wikipedia.org/wiki/Hypokalemia

• “In 2018 I was showing a positive response to supplementing with 360mg of Potassium daily.”

• “Immigrating To The U.S.? Get Ready For A New Gut Microbiome (And Maybe More Pounds)”


• “My job was called “Summit Lead” when on the very high altitude summit of Mauna Kea. A few of us would rotate through this position during the weekdays, as we only worked part time on the summit. One of the other “Summit Lead’s” died from fatal gastrointestinal disease. He had spent far more time on the summit than I ever did and had accumulated much larger biologically toxic exposures.” Steven Magee CEng MIET - Q

• “When dealing with mysterious sickness, I advise people to look at what their coworkers were dying from for clues. My coworkers were were dying from suicide, gastrointestinal disease, heart disease and brain disease.” Steven Magee CEng MIET - Q

• “Routine preventative 5 year interval Colonoscopies should be mandatory for all very high altitude workers, regardless of their age.” Steven Magee CEng MIET - Q
Blood Clot Hazards

- “Coughing but Don’t Have a Cold? These 8 Blood Clot Symptoms Might Save Your Life...1. Cough without a cold...2. Swelling in one limb...3. Vomiting or diarrhea...4. Red lines along the veins...5. Severe or chronic headaches...6. Shortness of breath...7. Leg pain or tenderness...8. Chest pain and heavy breathing.” https://www.theepochtimes.com/coughing-but-dont-have-a-cold-these-8-blood-clot-symptoms-might-save-your-life_2752119.html
Supplements For High Altitude Sickness & Deficiency Hazards

- “There were no recommendations given to us about vitamin and mineral requirements in low oxygen, low pressure and high radiation environments when at high altitude by the astronomy management teams.” Steven Magee CEng MIET - Q
- “I exhibited a positive response to 400 iu vitamin E daily in 2018.” Steven Magee CEng MIET
- “Effects of Cold and Altitude on Vitamin and Mineral Requirements...Persons who live or who engage in prolonged physical exertion for extended periods of time in the cold or at high altitudes appear to have special nutritional needs...Supplementation with additional vitamins E, C, and pantothenic acid, however, would ensure that these critical nutrients would be provided in amounts that cannot be obtained from the consumption of food alone. Including other vitamins and minerals at or near the RDA and MRDA levels should ensure adequate nutrient status for all metabolic functions.” https://www.nap.edu/read/5197/chapter/18#239
- “Oxidative Stress at High Altitudes and Effects of Vitamin E...supplementation with antioxidants is advisable. The only known studies (Simon-Schnass, 1994; Simon-Schnass and Korniszewski, 1990; Simon-Schnass and Pabst, 1988) available have shown a beneficial influence of vitamin E on physical performance, blood flow, and some parameters, indicating an increased oxidative stress at high altitudes. However, the synergistic functions of other antioxidants, such as β-carotene and vitamin C (Halliwell et al., 1987), justify the recommendation of a supplementation.” https://www.ncbi.nlm.nih.gov/books/NBK232888/
- “nutritional and herbal supplements to prevent altitude sickness... Ginkgo: 120-180 mg/day (any history of asthma). Milk Thistle: 120-240 mg/day (any liver complaints). Antioxidants: Vitamin C 2-3,000 mg/day. Vitamin E 400 iu/day. alpha lipoic Acid 150-300 mg/day. Raise glutathione levels: Selenium 200 mcg/day (if you have a family history of cancer never stop taking this!). N-acetyl-cysteine 1-2000 mg/day (especially if prone to nasal congestion). l-glutamine: 3,000 mg/day (especially if prone to stomach irritation). Adaptogenic herbs: your choice: Korean Ginseng, Siberian Ginseng, Ashwagandha, Reishi,(which has a growing reputation of being useful ) etc. Cardiotonics: Hawthorne Berry Extract (Crataegus): 250-500 mg/dayand Co Q 10 90 mg/day (both especially if you have a weak heart)” http://www.denvernaturopathic.com/news/altitude.html
- “Are there vitamins to take for altitude sickness?...Both vitamin C and vitamin E are said to help with altitude sickness, as are other antioxidants. Antioxidants like beta carotene, selenium and zinc help because they reduce the free radicals suspected to exacerbate altitude sickness. Antioxidants can help you breathe more easily... The recommended dosage of vitamin C is 2,000 to 3,000 milligrams per day while the dosage of vitamin E is 400 international units (iu) a day.” https://health.howstuffworks.com/diseases-conditions/respiratory/are-there-vitamins-to-take-for-altitude-sickness.htm
- “Acute Mountain Sickness; Prophylactic Benefits of Antioxidant Vitamin Supplementation at High Altitude...Free-radical-mediated damage to the blood-brain barrier may be implicated in the pathophysiology of acute mountain sickness (AMS)...The antioxidant group ingested 4 capsules/day-1 (2 after breakfast/2 after evening meal) that each contained 250 mg of L-ascorbic acid (Vitamin C), 100 IU of dl-α-tocopherol acetate (Vitamin E) and 150 mg of α-lipoic acid...Antioxidant supplementation resulted in a comparatively lower Lake Louise AMS score at high altitude.” http://altituderx.com/vitamin-e/
- “Altitude sickness...Vitamin E: Vitamin E may offer some benefits in exposure to high altitude.
Antioxidant supplementation (vitamin E with beta carotene, vitamin C, selenium, and zinc) may improve ventilatory threshold at high altitudes; however, antioxidants may not reduce inflammation after exercise at high altitudes.

“Adjusting to Altitude in Jackson Hole... Studies have shown that increased levels of vitamin C have helped to prevent and reduce instances of altitude sickness. Vitamin E, glutathione, and alpha-lipoic acid are common antioxidants also shown to support your body at higher altitudes. Adaptogenic herbs can also help with lung function and oxygen transportation, the most common being ginko biloba and rhodiola.”

“Can Vitamins Increase Blood Oxygen Level?...You need iron and a variety of vitamins for maintaining high numbers of healthy red blood cells to keep oxygen levels in your blood as high as necessary...Vitamin C...vitamin B-5, and vitamin B-6...Vitamin B-12...Vitamin A”

“14 More Ways To Give Yourself Oxygen-Rich Blood...Maximize Your Glutathione levels...Take Baking Soda...Take CoQ10... Take a few drops of chlorophyll...Try Vitamin B-12 and Folate...Check Your Vitamin A...Take Alpha-Lipoic Acid (ALA)”

“Ingredient Spotlight: Alpha Lipoic Acid Can Make A Great Focus Energy Drink...Alpha Lipoic acid (ALA) is a nootropic supplement widely used to support brain function is found in plants, used in food, and even focus energy drinks. Alpha Lipoic acid (ALA) is also naturally occurring antioxidant made by the body. It works from the cellular level in the body, turning glucose into energy. In healthy bodies, the ALA produced is enough for normal bodily functions. ALA, just like other antioxidants, fight “free radicals” in the body. These are waste products from normal bodily functions that when in excess, cause harmful chemical reactions that damage cells, making it harder to ward off infections.”

“Supplements to Increase Oxygen While Running...Iron...B Vitamins...Vasodilators...Magnesium”

“Cancer: Seven Ways to Oxygenate Your Cells...Supplement with antioxidants. Vitamin A, Vitamin C with bioflavonoids, and complete Vitamin E all are powerful antioxidants...Supplement with B-Vitamins...Supplement with Vitamin D3.”

“Vitamin E Deficiency Clinical Presentation...Patients with vitamin E deficiency may show signs and symptoms of hyporeflexia that progress to ataxia, including limitations in upward gaze. Patients may present with profound muscle weakness and visual-field constriction. Patients with severe, prolonged vitamin E deficiency may develop complete blindness, cardiac arrhythmia, and dementia.”

“Vitamin E Deficiency Is Rampant — Why You Don’t Want to Be...Insufficient vitamin E can increase your risk for a wide variety of diseases, including immune dysfunction, cognitive deterioration and cardiovascular disease.”

“Link between vitamin E & brain tumours found in metabolite study...A link between vitamin E levels in the blood and the increased risk of brain tumours has been established in a
Scandinavian study.” https://www.nutraingredients.com/Article/2016/05/24/Link-between-vitamin-E-brain-tumours-found-in-metabolite-study?

- “Antioxidants and Radiation Therapy...Vitamin E. Similar to selenium, with which it can act in synergistic fashion in protecting cells against radiogenic transformation (5), vitamin E has been shown to decrease radiation-induced chromosome damage in human tumor cells but not in normal cells and has an inhibitory effect on a variety of cancer cells (10). A combined treatment with vitamins E and C inhibits apoptosis in human endothelial cells more effectively than either alone, while increasing Bcl-2 and downregulating the pro-apoptotic Bax (11). By contrast, vitamin E induces apoptosis in human breast and prostate cancer cells as well as leukemia (12) and glioblastoma cells (13). Pretreatment of cells with vitamin E and selenium increases the levels of glutathione, glutathione peroxidase, and catalase, while doubling the breakdown of toxic peroxide and reducing transformation (5).” https://academic.oup.com/jn/article/134/11/3207S/4688649

- “Symptoms of Vitamin C Deficiency...A lack of vitamin C in the diet can result in vitamin C deficiency anemia. An acute vitamin C deficiency results in the disease scurvy. Signs and symptoms begin to manifest after 45 to 80 days of vitamin C deprivation. By that time, the body’s stored vitamin C pool falls to about 20 percent of its optimal amount” https://www.livestrong.com/article/276699-symptoms-of-vitamin-c-deficiency/


- “Vitamin B5 (Pantothenic Acid) - Deficiency Risk and Symptoms...Symptoms of deficiency: Fatigue; Insomnia; Depression; Irritability; Vomiting; Stomach pains; Burning feet; Respiratory infections.” https://www.justvitamins.co.uk/blog/vitamin-b5-pantothenic-acid-deficiency-risk-and-symptoms5/

- “Top 5 Signs of Deficiency of Vitamin B5...1…burning sensations in the hands and feet and numbness coupled with poor coordination. 2…muscle cramps, numbness, and tingling sensations of muscles which make them very uncomfortable. 3…irritability, fatigue, tiredness, and apathy. 4. Intestinal symptoms like diarrhea, vomiting, and water retention...5…Hypoglycemia. Sleep disturbances, restlessness, and irritability.” https://www.newsmax.com/fastfeatures/signsofvitaminb5signsanddeficiencyofvitaminb5deficiencyofvitaminb5deficiencyofvitaminb5/2011/03/17/id/389851/

- “Vitamin A Deficiency Clinical Presentation...Subclinical forms of VAD may not cause any symptoms, but the risk of developing respiratory and diarrheal infections is increased, the growth rate is decreased, and bone development is slowed. Patients may have a recent history of increased infections, infertility secondary to impaired spermatogenesis, or recent spontaneous abortion secondary to impaired embryonic development. The patient may also report increased fatigue, as a manifestation of VAD anemia.” https://emedicine.medscape.com/article/126004-clinical

- “Vitamin A deficiency...Night blindness and its worsened condition, xerophthalmia, are markers of VAD, as it can also lead to impaired immune function, cancer, and birth defects. Collections of keratin in the conjunctiva, known as Bitot's spots, are also seen. Imtiaz's sign is the earliest ocular sign of VAD. Conjunctival epithelial defects occur around lateral aspect of the limbus in the subclinical stage of VAD. These conjunctival epithelial defects are not visible on a
biomicroscope, but they take up black stain and become readily visible after instillation of kajal (surma); this is called "Imtiaz's sign".[10] Vitamin A deficiency is one of several hypovitaminoses implicated in follicular hyperkeratosis.”

https://en.wikipedia.org/wiki/Vitamin_A_deficiency

- “Radiation-induced small bowel disease: latest developments and clinical guidance...Radiation therapy may disturb the indigenous gut flora which are important in maintaining a normal mucosal function [Berthrong, 1986] and there is emerging evidence that probiotics may have a radio-protective effect.”
  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3871275/

- “Antioxidants & Treatment...It is possible that taking antioxidant supplements during (radiation) treatment can protect normal tissues from the damaging side effects of treatments and may improve tumor response and patient survival (1-3). On the other hand, some studies indicate that taking antioxidant supplements may interfere with chemotherapy and radiation therapy by reducing their effectiveness. It is possible that antioxidants may protect tumor cells, in addition to healthy cells, from the oxidative damage intentionally caused by conventional treatments. This, in turn, may reduce the effectiveness of the treatments (4-7).”

- “Antioxidants and Radiation Therapy...Antioxidants decrease painful side effects. Vitamin supplementation may help treat side effects of radiation therapy. Vitamin E (400 IU) and vitamin C (500 mg) have been shown to offer protection against proctitis, a painful chronic injury that affects 5–20% of people receiving radiation therapy for cervical and prostate cancer (15); a striking regression of chronic radiation-induced fibrosis was seen in a clinical trial that combined radiation treatment of head and neck cancer with vitamin E (1000 IU) and pentoxyfylline (0.8 g/d) supplementation (16).”
  https://academic.oup.com/jn/article/134/11/3207S/4688649

  https://www.medicalnewstoday.com/articles/322384.php
Prescription Drug Treatments For Altitude Sickness

- “I never observed any prescription drugs other than medical oxygen being given to sickened Mauna Kea workers during my time on the very high altitude summit of Mauna Kea.” Steven Magee CEng MIET - Q
- “Thieves grab RAF Viagra and £7m of equipment...The MoD was quick to point out that “Viagra has other medical uses — for example it is also often used to treat low blood pressure and altitude sickness”.” https://www.thetimes.co.uk/article/thieves-grab-raf-viagra-and-pound7m-of-equipment-f05hjtq8kr5
- “Trump says he didn't know about military spending on Viagra...The Military Times reported in 2017 the Defense Department spent $84.2 million on erectile dysfunction medications such as Viagra — 10 times more than it spent on health care services for transgender personnel.” https://www.axios.com/trump-didnt-know-about-military-viagra-spending-4edc6e58-70a5-4aaa-ba6a-0776d085e3bd.html
- “High Altitude Headache? I get headaches at high altitudes. Is there anything I can do to prevent them?...Viagra and Cialis to prevent and treat severe symptoms of mountain sickness. They increase blood flow to other vital organs, not just the penis, and some mountain climbers report better success with them than with Diamox.” https://www.drweil.com/health-wellness/body-mind-spirit/headache/high-altitude-headache/
- “Sildenafil, sold as the brand name Viagra among others, is a medication used to treat erectile dysfunction and pulmonary arterial hypertension.[3] Its effectiveness for treating sexual dysfunction in women has not been demonstrated.[3] Common side effects include headaches and heartburn, as well as flushed skin. Caution is advised in those who have cardiovascular disease. Rare but serious side effects include prolonged erections, which can lead to damage to the penis, and sudden-onset hearing loss. Sildenafil should not be taken by people who take nitrates such as nitroglycerin (glycerin trinitrate), as this may result in a severe and potentially fatal drop in blood pressure.[3] Sildenafil acts by inhibiting cGMP-specific phosphodiesterase type 5 (phosphodiesterase 5, PDE5), an enzyme that promotes degradation of cGMP, which regulates blood flow in the penis. Pfizer scientists Andrew Bell, David Brown, and Nicholas Terrett originally discovered sildenafil as a treatment for various cardiovascular disorders.[4][5] Since becoming available in 1998, sildenafil has been a common treatment for erectile dysfunction; its primary competitors are tadalafil (trade name Cialis) and vardenafil (Levitra).” https://en.wikipedia.org/wiki/Sildenafil
- “Tadalafil (INN)[2] is a PDE5 inhibitor marketed in pill form for treating erectile dysfunction (ED) under the name Cialis /siˈælis/ see-AL-iss, and under the name Adcirca /ˈædˌsɜːrkə/ ad-SUR-ka for the treatment of pulmonary arterial hypertension. In October 2011 the U.S. Food and Drug Administration (FDA) approved Cialis for treating the signs and symptoms of benign prostatic hyperplasia (BPH) as well as a combination of BPH and erectile dysfunction when the conditions coincide. It initially was developed by the biotechnology company ICOS, and then again developed and marketed worldwide by Lilly ICOS, LLC, the joint venture of ICOS Corporation and Eli Lilly and Company. Cialis tablets, in 2.5 mg, 5 mg, 10 mg, and 20 mg doses, are yellow, film-coated, and almond-shaped. The approved dose for pulmonary arterial hypertension is 40 mg (two 20 mg tablets) once daily. Tadalafil is also manufactured and sold under the name of Tadacip by the Indian pharmaceutical company Cipla in doses of 10 mg and 20 mg. On November 21, 2003 the FDA approved tadalafil (as Cialis) for sale in the United
States as the third ED prescription drug pill (after sildenafil citrate (Viagra) and vardenafil (Levitra)). Like sildenafil and vardenafil, tadalafil is recommended as an 'as needed' medication. Cialis is also offered as a once-daily medication. Tadalafil was approved in May 2009 in the United States for the treatment of pulmonary arterial hypertension[3] and is under regulatory review in other regions for this condition. In late November 2008, Eli Lilly sold the exclusive rights to commercialize tadalafil for pulmonary arterial hypertension in the United States to United Therapeutics for an upfront payment of $150 million.”

https://en.wikipedia.org/wiki/Tadalafil

- “Diamox - my experience in preventing altitude sickness...It is useful to take the Diamox at night before sleeping. This helps to reduce the strange phenomenon known as "periodic breathing" or "Cheyne Stokes respiration." When this happens, your breathing alternates between rapid breathing and almost not breathing at all for a short time. You might sleep better if it can be reduced as it is a bit frightening for some people.”
  https://www.tripadvisor.com/ShowTopic-g294222-i6446-k4532782-o10-Diamox_my_experience_in_preventing_altitude_sickness-Tibet.html

- “Acetazolamide for altitude sickness...Acetazolamide increases the amount of urine produced and changes the acidity of the blood. The net effect is to improve breathing and reduce fluid around the brain and in the lungs. Acetazolamide is not licensed to prevent and treat altitude sickness, although it has long been used for this purpose.”
  https://www.doctorfox.co.uk/pdf/medical-info-altitude-sickness-acetazolamide.pdf

- “Acetazolamide, sold under the trade name Diamox among others, is a medication used to treat glaucoma, epilepsy, altitude sickness, periodic paralysis, idiopathic intracranial hypertension, and heart failure.[2][3] It may be used long term for the treatment of open angle glaucoma and short term for acute angle closure glaucoma until surgery can be carried out.[4] It is taken by mouth or injection into a vein.[2] Common side effects include numbness, ringing in the ears, loss of appetite, vomiting, and sleepiness.[2] It is not recommended in those with significant kidney problems, liver problems, or who are allergic to sulfonamides.[2][4] Acetazolamide is in the diuretic and carbonic anhydrase inhibitor families of medication.[2] It works by decreasing the amount of hydrogen ions and bicarbonate in the body.[2] Acetazolamide came into medical use in 1952.[5] It is on the World Health Organization's List of Essential Medicines, the most effective and safe medicines needed in a health system.[6] Acetazolamide is available as a generic medication.[2] The wholesale cost in the developing world is about 1.40 to 16.93 USD per month.[7] In the United States the wholesale cost is about 125.34 USD per month.[8]...In the treatment of mountain sickness, acetazolamide forces the kidneys to excrete bicarbonate, the conjugate base of carbonic acid. By increasing the amount of bicarbonate excreted in the urine, the blood becomes more acidic.[12] As the body equates acidity of the blood to its CO2 concentration, artificially acidifying the blood fools the body into thinking it has an excess of CO2, and it excretes this imaginary excess CO2 by deeper and faster breathing, which in turn increases the amount of oxygen in the blood.[17][18] Acetazolamide is not an immediate cure for acute mountain sickness; rather, it speeds up part of the acclimatization process which in turn helps to relieve symptoms.[19] Acetazolamide is still effective if started early in the course of mountain sickness. As prevention it is started one day before travel to altitude and continued for the first 2 days at altitude.”
  https://en.wikipedia.org/wiki/Acetazolamide

- “Dexamethasone is a type of corticosteroid medication.[1] It is used in the treatment of many conditions, including rheumatic problems, a number of skin diseases, severe allergies, asthma, chronic obstructive lung disease, croup, brain swelling, and along with antibiotics in
tuberculosis.[1] In adrenocortical insufficiency, it should be used together with a medication that has greater mineralocorticoid effects such as fludrocortisone.[1] In preterm labor, it may be used to improve outcomes in the baby.[1] It may be taken by mouth, as an injection into a muscle, or intravenously.[1] The effects of dexamethasone are frequently seen within a day and last for about three days.[1] The long-term use of dexamethasone may result in thrush, bone loss, cataracts, easy bruising, or muscle weakness.[1] It is pregnancy category C in the United States meaning use should be based on benefits being predicted to be greater than risks.[2] In Australia, it is category A, meaning it has been frequently used in pregnancy and not been found to cause problems to the baby.[3] It should not be taken when breastfeeding.[1] Dexamethasone has anti-inflammatory and immunosuppressant effects.[1] Dexamethasone was first made in 1957.[4] It is the World Health Organization's List of Essential Medicines, the most effective and safe medicines needed in a health system.[5] Dexamethasone is not expensive.[6] In the United States a month of medication typically costs less than 25 USD.[1] In India a course of treatment for preterm labor is about 0.5 USD.[6] It is available in most areas of the world. [6]...Dexamethasone is used in the treatment of high-altitude cerebral edema (HACE), as well as high-altitude pulmonary edema (HAPE). It is commonly carried on mountain-climbing expeditions to help climbers deal with complications of altitude sickness.”


• “Furosemide for High Altitude Pulmonary Edema...Dr Mason suggests that furosemide (Lasix) given in large doses orally and intravenously may have dramatic beneficial effect in the treatment of high altitude pulmonary edema (HAPE). A case is described in which 120 mg orally and 80 mg intravenously were given, resulting in a 4,000-ml diuresis in 6 1/2 hours, with allegedly beneficial results. Unfortunately, such anecdotal reports have led to the indiscriminate use of furosemide in the treatment of HAPE as well as for the prevention of mountain sickness.” https://jamanetwork.com/journals/jama/article-abstract/341844

• “Furosemide, sold under the brand name Lasix among others, is a medication used to treat fluid build-up due to heart failure, liver scarring, or kidney disease.[1] It may also be used for the treatment of high blood pressure.[1] It can be taken intravenously or by mouth.[1] When taken by mouth, it typically begins working within an hour, while intravenously, it typically begins working within five minutes.[1] Common side effects include low blood pressure with standing, ringing in the ears, and sensitivity to sunlight.[1] Potentially serious side effects include electrolyte abnormalities, low blood pressure, and hearing loss.[1] Blood tests are recommended regularly for those on treatment.[1] Furosemide is a type of loop diuretic that works by decreasing the reabsorption of sodium by the kidneys.[1] Furosemide was discovered in 1962.[2] It is on the World Health Organization's List of Essential Medicines, the most effective and safe medicines needed in a health system.[3] The wholesale price in the developing world is between US$0.004 and US$0.02 per day.[4] In the United States it is available as a generic medication and costs about US$0.15 per day.[1] Furosemide is on the World Anti-Doping Agency's banned drug list due to concerns that it may mask other drugs.[5] It has also been used to prevent and treat race horses for exercise-induced pulmonary hemorrhage.[6][7]” https://en.wikipedia.org/wiki/Furosemide
Altitude Acclimatization Hazards

- “The incorrect acclimatization guide for the 13,796 feet high summit of Mauna Kea: ‘It's important to acclimatize at least a 1/2 hour (1 to 1 ½ hours for first timers) at the Hale Pohaku facility or the Visitor Information Station (9,200 foot/2,800 m level) before going to the summit.’” Steven Magee CEng MIET - Q http://www2.keck.hawaii.edu/observing/ObserverPacket/highaltitude101.htm
- "to adapt to 4,000 metres (13,000 ft) of altitude would require 45.6 days" http://en.wikipedia.org/wiki/Effects_of_high_altitude_on_humans
- “climbers are advised by medical experts to ascend only 300 meters a day at altitudes over 3,000 meters to give their bodies time to adapt.” https://www.ucalgary.ca/utoday/issue/2016-01-27/study-looks-effects-oxygen-depletion-high-altitude-workers-chile
- “Abrupt exposure to high altitude negatively affects mental and physical performance and overall health because it lowers the oxygen supply to the body's tissues for a significant amount of time. This condition, known as hypoxia, is what leads to altitude sickness.” https://www.army.mil/article/111471/Army_developing_tool_to_reduce_altitude_sickness_in_d deployed_Soldiers/
- "It not only predicts whether a soldier would get ill at certain altitudes, it gives a prescription for exposure. This tool can prescribe, for example, that if [soldiers spend] two days at 8,000 feet before they go to their final altitude of 14,000 feet, the likelihood and severity of AMS would be drastically reduced.” https://www.livescience.com/40337-military-altitude-sickness.html
- “Mountain Warfare- High Altitude Illness & Prevention...Describe the Ascend by Stages method of Acclimatization...Spend 2 or 3 days at each stage, beginning at 8,000 feet and subsequent stages of 2,000 to 3,000 feet increments, will insure that the ultimate destination is reached. By this time, a considerable degree of acclimatization will have occurred, mountain sickness greatly reduced and the operational potential greatly increased...Over what altitude can substantial disability and ineffectiveness occur in 50-80% of troops? Rapid ascension over 12,000 feet” https://quizlet.com/33077235/mountain-warfare-high-altitude-illness-prevention-flash-cards/
- “But inside the control room at 16,500 feet, my head was splitting. I was out of breath and couldn’t tell if my shot was in focus. My cameraman Josh Barajas was struggling too. He asked repeatedly where his memory card was, and repeatedly I told him he’d already put it in the camera. ...My blood oxygen read 83 — that’s low. At sea level, I would be in the hospital for a reading of 93.” http://www.pbs.org/newshour/updates/reporters-notebook/
- “some employees report blacking out or falling asleep at the wheel as they wind their way back down the mountain... some of the body and brain-altering effects of oxygen depletion are causing untold accidents at the observatory... the most significant issue is an employee’s ability to undertake the complex tasks necessary for safe work performance — memory, attention and planning....These likely become compromised at altitude because of the lack of oxygen and the inadequate time for the body to adapt” https://www.ucalgary.ca/utoday/issue/2016-01-27/study-looks-effects-oxygen-depletion-high-altitude-workers-chile
- “Training to prepare for oxygen deficiency in the high mountains...acclimatizing has its limits, somewhere between 5,000 and 8,000m any length of time is detrimental due to the decrease in air pressure, so you can't just climb half-way up Everest, spend a week resting and the kick it
for the last part, you'll be worse off after that week than when you began."
https://outdoors.stackexchange.com/questions/1254/training-to-prepare-for-oxygen-deficiency-in-the-high-mountains

- "Altitude sickness, unregulated drugs and medical gas enabled workers to become drug abusers/addicts." Steven Magee CEng MIET – Q http://www.keckobservatory.org/
- "Over-the-counter drug abuse or addiction was a problem that I observed at Mauna Kea." Steven Magee CEng MIET – Q http://www.crchealth.com/addiction/otc-drug-abuse/
- “Oxygen deprivation and supplemental oxygen are both bio-hazards for Mauna Kea workers.” - Q Steven Magee CEng MIET http://elsmar.com/Forums/showthread.php?t=48325
- "It is well documented that high altitude expeditions may elicit alterations in both emotional and cognitive functioning. These changes are likely due to the cumulative effects of hypoxia, high altitude deterioration, physical exhaustion, fluid and electrolyte disturbances, and preexisting psychological morbidity." http://onlinelibrary.wiley.com/doi/10.1111/j.1708-8305.2009.00369.x/full
- "Journeying to these places of high altitude carries significant risk of illness and death." Centre for Altitude Space and Extreme Environment Medicine (CASE Medicine) http://www.case-medicine.co.uk/news_detail.php?article=33
- “It was common for sea level adapted staff to report tiredness and fatigue daily after returning to sea level from the high altitude mountain observatory.” Steven Magee CEng MIET - Q
- “A Review of the Physiology and Nutrition in Cold and in High-Altitude Environments by the Committee on Military Nutrition Research...the many adverse physiological reactions, physical, or cognitive performance difficulties, and mood changes at high altitudes, when combined with increased risks for mountain illnesses, trauma, and malnutrition, create obvious difficulties for military operations.” https://www.ncbi.nlm.nih.gov/books/NBK232855/
- “I moved from the day shift to the extreme night shift because I knew that they had a better acclimatization of a few hours at 9,200 feet, as opposed to the ridiculous half hour at 9,200 feet for the day shift. There was only one acclimatization from near sea level to 9,200 feet per week for the night shift workers, as they lived on the mountain for the duration of their shifts.” Steven Magee CEng MIET - Q
Altitude Case Studies

- “High altitude cerebral edema with a fatal outcome within 24 h of its onset: Shall acclimatization be made compulsory?...We present a case of a 39-year-old healthy male patient who developed HACE with fatal out-come within 24 h of travelling to a height of 3524 meters above sea level...Here, the patient had rapidly ascended to an altitude of 3343 meters and went into coma within 3 h of developing symptoms of AMS (headache, nausea, and vomiting). The recommended ascent is 300 m/day while the ascent in our case was almost 10 times the recommended ascent...This patient was a middle-aged healthy person with no risk factors.”
  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3858714/

- “High altitude pulmonary edema (HAPE) in a Himalayan trekker: a case report...High altitude pulmonary edema is a non-cardiogenic form of pulmonary edema that develops in unacclimatized individuals at altitudes over 2500 m...A 55 years of age Indian ethnic South African lady was emergency air-lifted from 4410 m altitude in the Nepal Himalayas to Kathamandu (1300 m) with a suspected case of high altitude pulmonary edema. She had continued ascending despite experiencing mild altitude symptoms at Namche (3440 m), and these symptoms worsened considerably at Tengboche (3860 m).”
  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3984695/

- “Retinal Hemorrhages Associated with High Altitude...A 50-year-old man presented with blurry vision and scotomas in his right eye immediately after a 2-week hiking trip in the Andes at an altitude of 19,600 ft (6000 m). During the 2 weeks, he was taking acetazolamide in an effort to prevent altitude sickness and reported having no symptoms during his hike...High-altitude retinopathy is a common finding among hikers at altitudes above 16,000 ft (4900 m) and may portend the onset of more serious manifestations of high-altitude sickness, including cerebral or pulmonary edema.”

- “Retinopathy as a Matter of Altitude. Hiking at 11,000 feet results in startling discovery of underlying retinal pathology...A 28-year-old man presented to the Los Angeles County + University of Southern California Medical Center after he experienced sudden onset of visual loss in his right eye while hiking at 11,000 feet a week earlier. He returned to sea level 24 hours after hiking. His vision had improved by the time he visited the clinic, but he still experienced what he described as a ring scotoma...Ascent to high altitude is well known to induce characteristic changes in the posterior segment. Vascular engorgement and tortuosity as well as disc hyperemia have been observed in individuals at an altitude of at least 16,400 feet and are considered to be normal responses to the hypoxic environment.1 Knowing at what altitude these changes are first observed is difficult, but they have been documented as low as 10,800 feet above sea level.”

- “ring scotoma. An annular area of blindness in the visual field surrounding the point of fixation, associated with glaucoma and pigmentary degeneration of the retina.”
  https://www.dictionary.com/browse/ring-scotoma

- “High Altitude Retinal Hemorrhage...sudden atmospheric pressure changes can generate vascular modifications in the retina. We present a clinical case of retinal hemorrhage related to high altitude and propose to revise its pathophysiology...36 year old Male patient came to our institute with sudden diminished vision in the right eye associated with loss of consciousness while climbing a mountain. In the ophthalmological examination, we could appreciate in the right eye a macular hemorrhage and in both eyes few diffuse hemorrhages in mild periphery.
The patient lost follow-up and return after 1 year for a check-up. He had spontaneous resolution of all hemorrhages. Conclusion: the acute mountain sickness affects mostly not climatized people. Changes in atmospheric pressure generate reduction of the partial pressure of oxygen in the blood. This can lead to vascular changes in the retina. This change may not appear if there is a proper climatization while climbing a mountain. The presence of high altitude retinopathy alerts about cerebral oedema related to high altitude.”

- "Mountain Medicine, A Review of the Eye at Altitude...In 1988, on the southwest face of Mt. Everest, two climbers died above 8000 meters; their last radio message was that they were both totally blind.”
- “A Mount Everest record-holder says summit 'traffic jams' aren’t the problem — it’s the trek down that kills people...When returning, their body is out of energy, and many people die due to this cause...10 of the 11 climbers who died on Everest this month — Seamus Lawless, Ravi Thakar, Donald Cash, Anjali Kulkarni, Nihal Bagwan, Kalpana Das, Ernst Landgraf, Dhruba Bista, Robin Fisher, and Christopher Kulish — had already reached the apex. They were on their way down when they either fell, collapsed, died of exhaustion or illness, stopped to rest and mysteriously expired, or went to sleep and never woke.”
- “Does Altitude Increase Your Risk of a Heart Attack? Last November, Conrad Anker suffered a heart attack at 20,000 feet. Did the altitude have something to do with it?...The biggest predictor of a heart attack wasn’t the altitude at which they occurred, but rather the age and sex of the individual and whether they’d taken time to acclimate.”
- “Miss Teen Universe Lotte van der Zee, 20, died after suffering cardiac arrest on skiing holiday.”
- “The death of two Keystone skiers recently due to cardiac issues are stark reminder of heart risks at altitude...twin tragedies took place within days of each other at Keystone Resort. Arvada resident Daniel Mares, 53, and Silverthorne resident Durwood Marshall, 66, died at Keystone while skiing during the Christmas holiday weekend. In both cases, Summit County Coroner Regan Wood determined that cardiac issues were the proximate cause of death...cardiovascular problems are also a common — if more mundane — cause for sudden death on the slopes, especially among lowlanders.”
- “Russian mountain death caused by high altitude, coroner rules...A man died from an irregular heartbeat caused by high altitude while climbing Europe's highest mountain, a coroner has ruled. Daniel Read, 37, of Woodbridge, Suffolk, died in July climbing 5,642m (18,510 ft) Mount Elbrus in Russia...The coroner recorded a verdict of cardiac arrhythmia, or irregular heartbeat, caused by high altitude.”
- “Woman, 20, died of altitude sickness hiking Colorado trail, coroner confirms...Susanna Deforest was hiking the popular Pitkin County trail on Aug. 17 with three other friends when she became severely ill. The Collegeville, Penn., woman died overnight while waiting for rescue crews...”

Ayers said. “She then traveled to a higher camping site at an altitude where HACE can
“He climbed the tallest mountain on each continent, then died as he descended Mount Everest...Cash's children said their father had been working for years toward his dream of joining the "Seven Summits Club" and that he knew the risks. A previous expedition left him without parts of his fingers on his right hand due to frostbite...Cash's family says they believe he died due to cardiac arrest. Sherpas attempted CPR and gave him oxygen, but Cash died as they descended the congested route.”


"An avid mountain climber, Konrath is one of less than 300 people who have climbed to the highest point on all seven continents...Konrath appeared to explain a plan to sneak into his ex-wife’s house at night and shoot her while their children were asleep in their rooms...Konrath told ABC News' "20/20" in a jailhouse interview." http://abcnews.go.com/US/inside-bizarre-case-indiana-surgeon-accused-plotting-wifes/story?id=33800834

"Lisa Marie Nowak is an American former naval flight officer and NASA astronaut...Florida prosecutors filed three formal charges against Nowak: (1) attempted kidnapping with intent to inflict bodily harm or terrorize, (2) burglary of a conveyance with a weapon, and (3) battery...Her lawyer stated that she suffered from major depression, obsessive-compulsive disorder, insomnia, and "brief psychotic disorder with marked stressors" at the time of the incident. She was also suffering from Asperger Syndrome"

https://en.wikipedia.org/wiki/Lisa_Nowak

“NASA astronaut accused of stealing identity, accessing bank account of estranged wife while in space: report...A NASA astronaut has been accused of committing the first crime in outer space after her estranged wife alleged she stole her identity and accessed her bank account without permission during a six-month mission aboard the International Space Station...astronaut Anne McClain.” https://www.foxnews.com/us/nasa-astronaut-identity-theft-bank-account-divorce-wife

“Anne Charlotte McClain (born June 7, 1979) is a lieutenant colonel in the U.S. Army, engineer and a NASA astronaut...On August 23, 2019, The New York Times reported that Worden has filed a complaint against McClain through the Federal Trade Commission accusing her of illegally accessing financial information while residing in the International Space Station. This accusation "outed" McClain as a homosexual woman, making her the first openly homosexual astronaut.” https://en.wikipedia.org/wiki/Anne_McClain

“Sally Kristen Ride (May 26, 1951 – July 23, 2012) was an American astronaut and physicist. Born in Los Angeles, she joined NASA in 1978 and became the first American woman in space in 1983...She is the first known LGBT astronaut.” https://en.wikipedia.org/wiki/Sally_Ride

“At least 59 people were killed and more than 500 were injured in a shooting..."Lone wolf" gunman behind deadly mass shooting was...Stephen Paddock... a licensed pilot who owned two planes...Neighbors characterized Stephen Paddock as a "reclusive" and "weird" man who "never went out in back and enjoyed the backyard, nature."


“A person who avoids sunlight may eventually develop solar radiation deficiency sickness.” Steven Magee CEng MIET - Q

“Stephen Paddock had a pilot's license and flew small airplanes in the past. The altitudes that..."
he flew at and whether he used oxygen above 10,000 feet in un-pressurized planes to prevent Cerebral Hypoxia from occurring is unknown. The highest altitude that he has been exposed to in an un-pressurized environment is a mystery. In 2017 he committed the worst mass shooting in modern USA history, killing many and wounding hundreds.” Steven Magee CEng MIET - Q

- “Pilots have an established history of committing mass murder during their suicides.” Steven Magee CEng MIET - Q
- “Suicide by pilot” https://en.wikipedia.org/wiki/Suicide_by_pilot
- “On 24 March 2015, the aircraft, an Airbus A320-211, crashed 100 kilometres (62 mi) north-west of Nice in the French Alps. All 144 passengers and six crew members were killed. It was Germanwings' first fatal crash in the 18-year history of the company. The crash was deliberately caused by the co-pilot, Andreas Lubitz, who had previously been treated for suicidal tendencies and declared "unfit to work" by a doctor. Lubitz kept this information from his employer and instead reported for duty. Shortly after reaching cruise altitude and while the captain was momentarily out of the cockpit, he locked the cockpit door and initiated a controlled descent that continued until the aircraft impacted a mountainside.” https://en.wikipedia.org/wiki/Germanwings_Flight_9525
- “It is not surprising that two of the most notorious modern mass murderers in the USA and Europe were both high altitude pilots.” Steven Magee CEng MIET - Q
- “Airline pilot charged with killing 3 in Kentucky in 2015...American Airlines said in a statement it is cooperating in the investigation. The airline said Martin has been a pilot for subsidiary PSA Airlines since January 2018. Martin's jail mugshot shows him wearing a pilot's uniform.” https://abcnews.go.com/US/wireStory/airline-pilot-charged-killing-kentucky-2015-62981756
- “The McDonald gun shooting incident...On the 5th of February, 1970, a rather bizarre incident happened at the McDonald Observatory, at the 2.7m reflector telescope. A newly hired employee was apparently very dissatisfied with his new job, or, something else was very wrong. Whatever the reason was for said person to be angry with the world, he had decided to take it out on the telescope itself. Bringing with him a 9mm gun, he first fired a shot at his supervisor, and then fired seven shots, point blank, into the primary mirror of the telescope, no doubt hoping to shatter it. Alas, big chunks of glass like telescope mirrors, do luckily not break so easily, so the bullets merely created small holes in the mirror. Not being happy with this outcome, he also attacked the mirror with a hammer, but to no avail. The mirror did still not shatter. Shortly after, the person was subdued by the rest of the astronomer staff, rushing to the site.” https://astroanecdotes.com/2015/03/26/the-mcdonald-gun-shooting-incident/
- “James Coleman...A telescope technician working at the Very Long Baseline Array said Coleman followed a co-worker to the radio telescope Tuesday and used his truck to drive through a gate and ram a small office building three times. He allegedly spent the next 45 minutes trying to break down a door from inside a foyer and attempted to ram an Office of Mauna Kea Management ranger’s truck.” http://westhawaiitoday.com/news/local-news/mental-exam-ordered-alleged-telescope-attacker
- “Is Station 31 making Seattle firefighters sick? Study hopes to find answers about ‘Cancer House’...So when firefighter Steve Roberts — a healthy man who has summited Mount Rainier (14,411 feet) twice and has no family history of cancer — developed brain cancer, forcing his retirement in March 2016, the desire for answers acquired a new urgency.” https://www.seattletimes.com/seattle-news/is-station-31-makingseattle-firefighters-sick-study-hopes-to-find-answers-about-cancer-house/
"Kurt “Charlie” Steil…used to run competitively in marathons and ultramarathons, including a
grueling race up Pikes Peak (14,115 feet)... About four years ago he was diagnosed with
amnestic mild cognitive impairment, or short-term memory loss, robbing him of his ability to
go about his daily life the way he once did. The condition also has caused him to lose some
physical strength" [https://www.uwstout.edu/news/upload/LT_021715_N_PolingTrail.pdf]

"Steven Magee, Chartered Electrical Engineer, was medically diagnosed with Amnestic
Disorder which is characterized by short term memory loss in 2016 at the age of 46. He had
worked for five years on the 13,796 feet very high altitude summit of Mauna Kea, Hawaii, USA
from 2001 to 2006 and had noticed memory problems developing during the last years that he
worked there. The condition has now progressed into a disability." Steven Magee CEng MIET - Q
Mountain Case Study: Mount Kilimanjaro

- “Mount Kilimanjaro or just Kilimanjaro (ˌkɪlɪməˈnɑːroʊ),[7] with its three volcanic cones, "Kibo", "Mawenzi", and "Shira", is a dormant volcano in Tanzania. It is the highest mountain in Africa, about 4,900 metres (16,100 ft) from its base, and 5,895 metres (19,341 ft) above sea level...A small study of people attempting to reach the summit of Kilimanjaro in July and August 2005 found that 61.3 percent succeeded and 77 percent experienced acute mountain sickness (AMS).[58] A retrospective study of 917 persons who attempted to reach the summit via the Lemosho or Machame routes found that 70.4 percent experienced AMS, defined in this study to be headache, nausea, diarrhea, vomiting, or loss of appetite.[59] Kilimanjaro's summit is well above the altitude at which life-threatening high altitude pulmonary edema (HAPE) or high altitude cerebral edema (HACE), the most severe forms of AMS, can occur...A daily dose of 250 milligrams of acetazolamide is associated with a 48 percent relative-risk reduction of AMS compared to placebo, with a higher dose not providing additional protection but causing more adverse side effects.[62] The six-day Machame route, which involves one night of "sleeping low", may delay the onset of AMS but does not ultimately prevent its occurrence...According to the Kilimanjaro Christian Medical Centre in Moshi, 25 people died from January 1996 to October 2003 while climbing the mountain. Seventeen were female and eight were male, ranging in age from 29 to 74. Fourteen died from advanced high altitude illness, including one with HACE, five with HAPE, and six with both HACE and HAPE. The remaining eleven deaths resulted from trauma (three), myocardial infarction (four), pneumonia (two), cardio-pulmonary failure of other underlying cause (one), and acute appendicitis (one). The overall mortality rate was an estimated 13.6 per 100,000 climbers (0.0136 percent)...Large animals are rare on Kilimanjaro and are more frequent in the forests and lower parts of the mountain.”

- “Is Climbing Kilimanjaro Safe?...Climbing Kilimanjaro is probably one of the most dangerous things you will ever do. Every year, approximately 1,000 people are evacuated from the mountain, and approximately 10 deaths are reported. The actual number of deaths is believed to be two to three times higher. The main cause of death is altitude sickness. Everyone climbing Mount Kilimanjaro should be familiar with the symptoms of altitude sickness...On our descent, we noticed 10 people who appeared to be suffering from HACE, with clear evidence of altered consciousness and ataxia. Many were only able to walk with the physical support of two porters....At over 10,000 feet (3,000 m), more than 75% of climbers will experience at least some form of mild AMS.”

- “Kilimanjaro climbers 'take health risks'...Climbers scaling Mount Kilimanjaro are taking unnecessary risks with their health, experts have warned...The researchers camped for three weeks on the mountain at a height of 4,730m - not far below the 5,895m summit. They assessed climbers using the Lake Louise consensus scoring system, which records symptoms such as headache, sickness and fatigue. The academics found almost half, or 47%, of those who had climbed Kilimanjaro, were suffering from altitude sickness before they reached the summit and most were ascending too high, too quickly. Signs of sickness include vomiting, headaches, difficulty sleeping and sometimes problems with co-ordination. Effects can be felt from as low as 2,500m above sea level and 75% of people will have mild symptoms at 3,000m or higher, the study said.”

- “10 Possible Causes Of Death And Danger On Mount Kilimanjaro, And How to Avoid
Environmental Radiation LLC - https://www.environmentalradiation.com


- “Mt. Kilimanjaro – How dangerous is it, really?…Why do 12,000 trekkers fail to reach the summit every year? The different symptoms from AMS, disillusionment and cold are the main reasons most of the 12,000 trekkers per year turn around and walk off. Individuals with HACE or HAPE cases are, hopefully, carried off the mountain. To me, this is a much more important issue because it affects 40% of the attempts made on Kilimanjaro. Nobody interviews these 12,000 folks that don’t reach the summit but all of them have spent money to get to Africa and climb the mountain. I’ll wager the majority has come on a “budget”, picked an “affordable” outfitter and chosen the 5 or 6 day climbs clinging to the notion that Kilimanjaro is a non-technical walk-up (which it is) but it’s the altitude and the potential malaise associated with it, which brings people to their knees.”  https://www.whygo.com/mt-kilimanjaro/mt-kilimanjaro-how-dangerous-is-it-really.html

- “9 things no one ever tells you about climbing Mt. Kilimanjaro…5. It’s not always easy on a relationship…We heard that one honeymooning husband left his new wife alone on the mountain because the climb caused them to fight so much….9. You can be in the best shape of your life and fail to reach the summit. Altitude sickness is an equal opportunity bully. You may be able to run marathons, but the vomiting, nausea and sometimes hallucinations can knock you out well before you reach 19,000 feet…We had to bail at 16,000 feet with headaches and nausea worse than any hangover. My husband imagined he saw fish flopping on rocks in the alpine desert. We had to go down or risk serious illness.”  https://www.foxnews.com/travel/9-things-no-one-ever-tells-you-about-climbing-mt-kilimanjaro

- “OTHER KILIMANJARO HEALTH ISSUES…Simple precautions avoid common health problems associated with African climbing expeditions on Kilimanjaro mountain. Rapid changes in humidity and temperature cause coughs and colds, with flu-like symptoms from breathing cold air at high altitude. Aspirin, warm salt water gargles and anesthetic or menthol throat lozenges ease discomfort.”  https://www.africanmeccasafaris.com/travel-guide/tanzania/parks-reserves/mount-kilimanjaro/trek-climb/altitude-sickness-guide/other-health-issues

- “For my family of four, climbing Mount Kilimanjaro was true test of faith…The grayish tint of the suffering man's skin and his unfocused eyes weren't the only signs something was wrong. He seemed barely able to hang onto the man carrying him over the rocky terrain. With each step, the hiker's head bobbed like a soccer ball attached to a slinky…Kilimanjaro soars well above the altitude at which life-threatening altitude sickness can occur. In its mild form, it feels like a hangover with a headache, nausea and exhaustion. At its most severe, lungs can fill with fluid, hikers may cough up blood, and in the worst case, they die…I blame it on the altitude. It does funny things to the brain. It can distort distance and time, fatigue and hunger and all sorts of rational thought.”  https://www.courier-journal.com/story/travel/2019/02/15/mount-kilimanjaro-first-person-account-climbing-summit/2743120002/
Altitude Sickness Progression

- “6,000 Feet: A few people will start showing signs and symptoms of Acute Mountain Sickness (AMS).” Steven Magee CEng MIET - Q
- “8,000 Feet: Various people will be showing signs and symptoms of Acute Mountain Sickness (AMS).” Steven Magee CEng MIET - Q
- “10,000 Feet: Many people will be showing signs and symptoms of Acute Mountain Sickness (AMS). Sea level adapted humans will be in oxygen starvation, also known as Asphyxia.” Steven Magee CEng MIET - Q https://en.wikipedia.org/wiki/Asphyxia
- “12,000 Feet: Some people will be showing serious signs and symptoms of Acute Mountain Sickness (AMS). Many people will be in oxygen starvation, also known as Asphyxia. Mental impairment will be evident, often called “Summit Brain”. Immediate descent to lower altitude is recommended for these people.” Steven Magee CEng MIET - Q
- 14,000 Feet: Many people will be showing serious signs and symptoms of Acute Mountain Sickness (AMS). Some people may be experiencing visions and hallucinations. Many people will be displaying mental impairment, often called “Summit Brain”. Immediate descent to lower altitude is recommended for these people. Most people will be in oxygen starvation, also known as Asphyxia.- Q https://en.wikipedia.org/wiki/Asphyxia
Light Toxicity

- “The second edition of Toxic Light takes a look at the light pollution that may be in your local environment and relates it to the health problems that it may cause. Light in the human environment is only just starting to be understood and something as innocent as your sunglasses may be able to make you ill! There are many examples of commonplace items in your environment that may have the ability to affect your health. Get ready for enlightenment about the most important human nutrient of light!” [http://amzn.com/1461151880](http://amzn.com/1461151880)
- “Sunlight by Zane R. Kime...A vital book on the relationship of sunlight to human health. Studies from scientific literature are described which demonstrate the sunlight's effects on lowering cholesterol, blood pressure and blood sugar; on increasing endurance, sex hormones and resistance to infection. Crucial dietary suggestions are made to insure healthy skin when exposed to sunlight.” [http://a.co/2DTlwoG](http://a.co/2DTlwoG)
- “Chasing the Sun: The Epic Story of the Star That Gives Us Life by Richard Cohen...interviewing psychologists in the Norwegian Arctic about the effects of darkness...Einstein helped duplicate the source of the Sun's power to create the atomic bomb....extraordinary myths (in India, just a few years ago, pregnant women were still being kept indoors during an eclipse, for fear their babies would be born blind or with cleft palates); and surprising anecdotes (during the Vietnam War, a large number of mines dropped into Haiphong harbor blew up simultaneously in response to a large solar flare....It not only explains the star that so inspires us, but shows how complex our relations with it have been—and continue to be.” [http://a.co/imx7iCu](http://a.co/imx7iCu)
Computer Toxicity

- “Astronomy was field in which computers where extensively used and in some cases, multiple computers with several screens.” Steven Magee CEng MIET - Q
- “Computer vision syndrome (CVS) is a condition resulting from focusing the eyes on a computer or other display device for protracted, uninterrupted periods of time. Some symptoms of CVS include headaches, blurred vision, neck pain, fatigue, eye strain, dry eyes, irritated eyes, double vision, vertigo/dizziness, polyopia, and difficulty refocusing the eyes. These symptoms can be further aggravated by improper lighting conditions (i.e. glare or bright overhead lighting) or air moving past the eyes (e.g. overhead vents, direct air from a fan).” https://en.wikipedia.org/wiki/Computer_vision_syndrome
- “Digital Eye Strain...With an increase in digital technology, many individuals suffer from physical discomfort after screen use for longer than two hours at a time. The Vision Council refers to this collection of symptoms as digital eye strain. More than 83 percent of Americans report using digital devices for more than two hours per day, and 53.1 percent report using two digital devices simultaneously, with 60.5 percent reporting experiencing symptoms of digital eye strain.” https://www.thevisioncouncil.org/content/digital-eye-strain
- “With teen mental health deteriorating over five years, there’s a likely culprit...We found that teens who spent five or more hours a day online were 71 percent more likely than those who spent only one hour a day to have at least one suicide risk factor (depression, thinking about suicide, making a suicide plan or attempting suicide). Overall, suicide risk factors rose significantly after two or more hours a day of time online.” https://mailchi.mp/be80fffa67e5/with-teen-mental-health-deteriorating-over-five-years-theres-a-likely-culprit?e=2ae974ca77
- “Working the astronomy night shift required sitting and staring at many computer screens for up to eighteen hours per night for several nights.” Steven Magee CEng MIET - Q
- “Repetitive strain injuries (RSI) are to the body's muscles, joints, tendons, ligaments, bones, or nerves caused by repetitive movements. Such injuries are more likely if the movements required force or were accompanied by vibrations, compression, or the maintenance of sustained or awkward positions. Prolonged use of computer equipment can result in upper limb disorders, notably in the wrist or the back. RSIs are a subset of musculoskeletal disorders. This article discusses and lists some specialized software that is available to aid individuals avoid injury or manage current discomfort/injury associated with computer use.” https://en.wikipedia.org/wiki/List_of_repetitive_strain_injury_software
- “A repetitive strain injury (RSI) is an "injury to the musculoskeletal and nervous systems that may be caused by repetitive tasks, forceful exertions, vibrations, mechanical compression, or sustained or awkward positions".” https://en.wikipedia.org/wiki/Repetitive_strain_injury
- “Purposelessness, burnout, interpersonal difficulties, under-confidence or overconfidence, competitiveness, lack of empathy, impulse control, depression, anxiety—all of these are rampant in my tech industry clients.” https://hackernoon.com/technology-and-the-mind-an-
existential-psychotherapists-thoughts-on-the-meaning-of-tech-308fe7b223f3

- “Is Computer Radiation Damaging Your Health?...If you use computers at work or at home, or both, then computers may be your biggest source of electromagnetic radiation (EMR) . Could this radiation threaten your health?” [http://emwatch.com/computer-radiation-may-damage-your-health/](http://emwatch.com/computer-radiation-may-damage-your-health/)

- “My 9 Tips To Cut Down On Exposure To Computer Radiation...All computers emit radiation or electromagnetic fields (EMFs) on many different frequencies. These EMFs can be extremely harmful to your health. Cancer and other serious diseases have been linked to these exposures – studies indicate pregnant women and small children are particularly vulnerable.” [https://www.electricsense.com/1138/my-9-tips-to-cut-down-on-exposure-to-computer-radiation/](https://www.electricsense.com/1138/my-9-tips-to-cut-down-on-exposure-to-computer-radiation/)

- “Dr. John Ott: The Light Side of Health...We used a friend of mine, a real computer buff, as our guinea pig. On a Friday evening, after he had spent his customary eight-hour day in front of the VDT, we took a sample of his blood and found severe rouleaux clumping. Well, he spent a lot of time outdoors that weekend, didn't watch television or go near his computer, and on Sunday we took him sailing, without sunglasses. Monday morning, we tested his blood again, and it was perfectly clear. No cell clumping at all.” [https://www.motherearthnews.com/nature-and-environment/john-ott-zm0z86zhun](https://www.motherearthnews.com/nature-and-environment/john-ott-zm0z86zhun)
Triggering Of The Human Mating Cycle

- "Astronomers Are Finally Doing Something About Sexual Harassment. Recent scandals have forced the field to confront a pervasive culture of gender discrimination and abuse...famed planet-hunter Geoff Marcy had violated Title IX sexual-harassment policies at the University of California, Berkeley, with the accusations against him spanning nine years. Soon after the initial report, three women who had worked with him during his previous post at San Francisco State University came forward, suggesting that his serial harassment of junior female colleagues had gone on for decades."
- “He Fell In Love With His Grad Student — Then Fired Her For It. Christian Ott, a young astrophysics professor at Caltech, engaged in “discriminatory and harassing” behavior toward two female graduate students, a university investigation has found.”
  [https://www.buzzfeed.com/azeenghorayshi/ott-harassment-investigation?utm_term=.ob4A3LjaOm#sf6rLwAN6b]
- “Congresswoman Speier on Sexism in Science”
  [https://youtu.be/FyWeNycz1mA]
- “A Professor’s Sexual Harassment Case Came Out In Congress, And He’s Fighting Back. Astronomer Timothy Slater is demanding over $30 million from a woman who shared details of an investigation into his case with journalists. He’s also suing the university that conducted the investigation.”
- “Neil deGrasse Tyson Under Investigation for Sexual Misconduct. Two new allegations surfaced last week, following an earlier accusation of rape.”
- “The lawsuit claims that even after serious complaints were lodged, Dartmouth encouraged the women to continue working with Heatherton, Kelley and Whalen. “Dartmouth warned the victims that the accused professors would likely retaliate against students who discontinued working with them by disparaging them and revoking their academic support, actions which could result in the victims being expelled or placed on academic probation,” the lawsuit said. “Thus, at Dartmouth’s suggestion, the victims continued working with their harassers for nearly four months.””
- "I worked the extremely long night shifts for three years on the 13,796 feet very high altitude summit of Mauna Kea and I noticed during that time that my mating cycle was being repeatedly triggered. It cleared up when I left for my next job." Steven Magee CEng MIET - Q
- “Sleep sex, or sexsomnia, is a condition in which a person will engage in sexual activities while asleep. This condition falls within the broad class of sleep disorders known as parasomnias. In extreme cases, sexsomnia has been alleged, and accepted, as at least a part of the cause of sexual assault, including rape. The proposed medical diagnosis is NREM arousal parasomnia – sexual behaviour in sleep. Sexsomnia is considered a type of non-rapid eye movement sleep (NREM) parasomnia. Sexsomniacs do not remember the acts that they perform while they are asleep. Sexsomnia can co-occur alongside other sleep disorders such as sleepwalking, sleep apnea, night terrors and bedwetting and can be triggered by stress, previous sleep deprivation and excessive consumption of alcohol or other drugs; it is one of the possible adverse effects of zolpidem. Sleep related epilepsy may be associated with sexual arousal, pelvic thrusting and
orgasms. Sexsomnia episodes may be triggered by physical contact with a bed partner. Sexsomnia, which is a fairly new medically recognized behaviour, has been used in criminal defense cases of rape.”  https://en.wikipedia.org/wiki/Sleep_sex

- “The drugs can also slash inhibitions, most famously the sexual variety. "The effect here can be quite potent for many," says W. Christopher Winter, M.D., a Men's Health advisor and the medical director of the sleep medicine center at Martha Jefferson Hospital, in Charlottesville, Virginia. In his practice he's seen die-hard prudes turn wanton under Ambien's influence.”  https://www.menshealth.com/health/sleeping-pill-dangers

- “The U.S. Food and Drug Administration (FDA) is warning that compulsive or uncontrollable urges to gamble, binge eat, shop, and have sex have been reported with the use of the antipsychotic drug aripiprazole (Abilify, Abilify Maintena, Aristada, and generics). These uncontrollable urges were reported to have stopped when the medicine was discontinued or the dose was reduced.”  https://www.fda.gov/Drugs/DrugSafety/ucm498662.htm

- “Technology and the Mind: An Existential Psychotherapist’s Thoughts on the Meaning of Tech...This is most profound in high-level tech execs who experience burnout or those who have problematic porn use. Psychologists are deluged with cases of both right now.”  https://hackernoon.com/technology-and-the-mind-an-existential-psychotherapists-thoughts-on-the-meaning-of-tech-308fe7b223f3

- “A particular team of world leading male astronomers that I regularly worked with engaged in extensive sordid conversations about their female counterparts that I had not witnessed in the many other astronomy teams. It was unique to their group. What was also unique to their group was the intensive all night long computer work. It was so intense that getting rest room breaks during the night was always a problem.”  Steven Magee CEng MIET - Q

- “Excessive masturbation is a sign that you are routinely in a high electromagnetic interference (EMI) environment.”  Steven Magee CEng MIET - Q

- “My research is indicating that sleep deprivation and unnatural electromagnetic radiation exposures can trigger the human mating cycle.”  Steven Magee CEng MIET - Q

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Island Hazards

- “It is common in high altitude astronomy to find astronomical observatories located on sparsely populated remote volcanic islands.” Steven Magee CEng MIET - Q
- “Island Fever. A psychological illness that usually affects poor people found in Hawaii and other islands. Island Fever is the realization that you are stuck on which ever island you are living and not going anywhere. Sure, you can take a plane to Asia, United States and Europe if you have the money to pay for it. Most beach bums do not have it so they are stuck on Oahu. Sure you can take a plane to Maui, Lanai, etc... But getting the money (around $100 RT) is also a problem too. Besides, don't forget SSDI... Same Sh*t, Different Island. People who live on mainlands have trouble understanding Island Fever because they can hop on a cheap bus or train and travel to many different countries. While people in Oahu are stuck on a rock the size of Chicago.” https://www.urbandictionary.com/define.php?term=Island%20Fever
- “Islanded. The feeling of hopelessness, isolation or being trapped. The inability to make progress. Generally the emotions and feelings associated with being trapped on a desert Island. Due to lack of resources I'm feeling very Islanded on this project.” https://www.urbandictionary.com/define.php?term=Islanded
- “Heart failure and bacterial pneumonia are among the top three health issues in Hawai‘i, but officials say the number one concern is mental health. "Mental health is a crisis," described Dr. Ginny Pressler, Vice President of Hawai‘i Pacific Health. http://www.hawaiinewsnow.com/story/22758669/statewide-study-identifies-hawaiis-top-health-concerns
- “What Are the Social Problems in Hawaii?...As you can see, there is plenty going on in Hawaii that could get on your nerves. As nice as the state is to live in, there are many problems. Some people are severely affected by racism. I didn’t experience it much, but it depends where you live and how much money you have. Really, that’s the truth.” https://www.aimforawesome.com/hawaii/what-are-the-social-problems-in-hawaii/
- “What is vog? The term ‘vog’ refers to the hazy air pollution caused by the volcanic emissions from Kīlauea volcano, which are primarily water vapor (H2O), carbon dioxide (CO2), and sulfur dioxide (SO2) gas. As SO2 is released from the summit and east rift eruptive vents, it reacts in the atmosphere with oxygen, sunlight, moisture, and other gases and particles and, within hours to days, converts to fine particles, which scatter sunlight, causing the visible haze that is observed downwind of Kīlauea. Areas far downwind (e.g., the west side of Hawai‘i Island and other islands in the state) are mostly affected by the fine particles, however, areas closer to the eruptive vents, including the communities ranging from Ocean View to Hilo, can be exposed to both SO2 gas and fine particles during periods of vog. SO2 is a colorless, irritating gas that has an acrid odor like fireworks or a burning match. It is also emitted from sources such as fossil fuel power plants and motor vehicles. Fine particles consist of particulate matter less than 2.5 micrometers in diameter and are referred to as ‘PM2.5’. These particles are smaller than the width of a human hair. PM2.5 in vog is mainly composed of acid and neutral sulfate particles. Other sources of PM2.5 include vehicle exhaust and smoke from fires. Vog contains mostly SO2 and acid particles, in contrast to urban, industrial, and other pollution sources, which also contain additional toxic contaminants, such as ozone and hydrocarbons.” http://www.ivhhn.org/vog/what-vog
- “The Wrath of Vog...It comes on the Kona winds—the dreaded yellow-brown haze of vog that
Environmental Radiation LLC - https://www.environmentalradiation.com

makes eyes burn and lungs protest. On the Big Island, of course, it has done far more damage. How bad could it get? And what do we really know about vog and its effects?"


- “Health Effects. Is vog harmful to my health? People with pre-existing respiratory conditions are more prone to adverse effects of vog which may include: headaches, breathing difficulties, increased susceptibility to respiratory ailments, watery eyes, and sore throat. The long-term health effects of vog are unknown.” http://ltgov.hawaii.gov/emergency-information/important-information-about-vog/health-effects/

- “Volcanic air pollution over the Island of Hawai’i: Emissions, dispersal, and composition. Association with respiratory symptoms and lung function in Hawai’i Island school children...Chronic exposure to acid vog is associated with increased cough and possibly with reduced FEV1/FVC, but not with asthma or bronchitis. Further study is needed to better understand how volcanic air pollution interacts with host and environmental factors to affect respiratory symptoms, lung function, and lung growth, and to determine acute effects of episodes of increased emissions.” https://www.sciencedirect.com/science/article/pii/S0160412016301052


- “Mercury poisoning is a type of metal poisoning due to mercury exposure.[3] Symptoms depend upon the type, dose, method, and duration of exposure.[3][4] They may include muscle weakness, poor coordination, numbness in the hands and feet, skin rashes, anxiety, memory problems, trouble speaking, trouble hearing, or trouble seeing….Human-generated sources, such as coal-burning power plants[14] emit about half of atmospheric mercury, with natural sources such as volcanoes responsible for the remainder.” https://en.m.wikipedia.org/wiki/Mercury_poisoning

- “This Is What Happens When You Breathe In Volcanic Ash...This is one particularly insidious way in which volcanic ash can kill you, but generally speaking, inhaling it will be the primary cause of people pushing up the daisies. Remember, you’re inhaling glass, so at the very least, the ash is lacerating the insides of your bronchioli, alveoli and capillaries….In the long-term, it can cause silicosis, an ailment that results in potentially permanent scars to your lungs. If the ash falls into the water supply and people drink it, the same painful condition affects their digestive system too.” https://www.forbes.com/sites/robinandrews/2017/05/20/this-is-what-happens-when-you-breathe-in-volcanic-ash/#624a8d9f1c5e

- “Hawaii vog changes the environmental conditions in many areas including air quality, creates acid rain, drinking water quality, environmental radiation, light transmission, human health impacts, and so on.” Steven Magee CEng MIET - Q
Fatigue Hazards

- “Daily fatigue was a problem for many very high altitude workers.” Steven Magee CEng MIET - Q
- “The 14 Most Common Causes of Fatigue...1: Not Enough Sleep...2: Sleep Apnea...4: Anemia...5: Depression...7: Caffeine Overload...10: Dehydration...11: Heart Disease...12: Shift Work Sleep Disorder.” https://www.onhealth.com/content/1/causes_of_fatigue
- “Using vitamin B-12 for the management of Chronic Fatigue Syndrome (CFS)...In these patients, problems such as numbness or tingling in the extremities, abnormal gait, memory loss, weakness of the limbs, changes in mood and personality and even fatigue were improved, and even resolved, with B-12 therapy. In addition, during this period of time Dr. Les Simpson was describing how changes in the red blood cells in persons with CFS reversed when high doses of B-12 were administered. With this in mind, we began treating patients with cyanocobalamin (a form of vitamin B-12 that is readily available in the U.S.) at doses from 1000 mcg weekly to 5000 mcg three times weekly, given subcutaneously (through injections under the skin). “ http://www.prohealth.com/library/showarticle.cfm?libid=3466
- “Fatigue & Fibro Fog: Could You Have a B-12 Deficiency?...A feeling of being tired all the time. Problems with memory and concentration. Trouble sleeping. Diarrhea and/or constipation. These can all be important signs of the body’s need for more vitamin B-12...A B-12 deficiency can be difficult to diagnose because serum blood levels of B-12 may test normal. Having circulating B-12 in the blood doesn't mean it is being utilized properly by the body's cells.” http://www.prohealth.com/library/showarticle.cfm?libid=17236&B2=BNRHPFA&utm_source=BNRHPFA&utm_campaign=Home-Page-Featured-Article
- “9 Ways to Get Your Energy Back...1. Rule out health problems. Fatigue is a common symptom of many illnesses, including diabetes, heart disease, arthritis, anemia, thyroid disease, and sleep apnea. Talk to your doctor if you feel unusually tired...Many medications can contribute to fatigue. These include some blood pressure medicines, antihistamines, diuretics, and other drugs.” https://www.webmd.com/balance/features/get-energy-back#1
- “Why Fatigue Can Be Dangerous or Even Deadly...Chronic fatigue is a complex medical condition characterized by feeling tired to such an extent that it limits someone’s ability to carry out daily routine activities.” https://www.careworkshealth.com/blog/why-fatigue-can-be-dangerous/
- “The Dangers Of Fatigue In The Workplace...Fatigue increases the risk of injuries or other accidents. As an employer, ensure your workers are not experiencing signs or effects of fatigue on the job. You can help make your workers and your business safer by including information on fatigue and sleep in your safety guidelines and orientations. You can also develop a fatigue management plan.” https://safetyalliancebc.ca/the-dangers-of-fatigue-in-the-workplace/
- “The Danger Of Worker Fatigue. Every year OSHA releases a list of its Top 10 most frequently cited workplace safety violations, and every year we see the usual suspects: fall protection, hazard communications, respiratory protection, and scaffolding. All of these violations are a real threat to the health and safety of workers on the job site, but the most dangerous issue is not one that can be seen by OSHA inspectors or your Safety Director, and that’s worker fatigue.” https://coderedsafety.com/blog/the-dangers-of-work-fatigue/
“Dangers of Worker Fatigue – 7 warning signs...Fatigue is a common problem in workplaces and can greatly increase health and safety risks for workers. Fatigued workers can cause harm to themselves and others through impaired judgement and reduced capacity to perform their work. Workers who are fatigued may have a slower reaction time or be unable to make good decisions. Fatigue can also lower the immune system, leading to illness, and can result in long-term health effects, such as heart disease. Anyone who does not receive adequate quality sleep is susceptible to fatigue. Depending on the nature of their work, this could carry a high degree of risk.”

Depression Hazards

- “Out of a group of eight (8) extreme night shift workers, I was aware of four (4) workers who appeared to be displaying symptoms of depression. That is fifty percent of the team. That number may be higher if you include those that were already on successful depression treatment and were not publicly showing the symptoms.” Steven Magee CEng MIET - Q

- “It was well known to the team of eight (8) extreme night shift workers that group needed nine (9) workers to prevent overwork and accumulation of excess night shift hours that could not be taken because there were not enough workers to cover for the absence.” Steven Magee CEng MIET - Q

- “During my time at the W. M. Keck Observatory, I had formed the opinion that overworking of workers was part of the company's toxic culture.” Steven Magee CEng MIET - Q

- “Causes of Depression...It is generally believed that all mental disorders — including clinical depression — are caused by a complex interaction and combination of biological, psychological, and social factors. This theory is called the bio-psycho-social model of causation and is the most generally accepted theory among mental health professionals and researchers of the cause of disorders such as depression.”
  https://psychcentral.com/disorders/depression/depression-causes/

- “What causes depression?...It's often said that depression results from a chemical imbalance, but that figure of speech doesn't capture how complex the disease is. Research suggests that depression doesn't spring from simply having too much or too little of certain brain chemicals. Rather, there are many possible causes of depression, including faulty mood regulation by the brain, genetic vulnerability, stressful life events, medications, and medical problems. It's believed that several of these forces interact to bring on depression.”
  https://www.health.harvard.edu/mind-and-mood/what-causes-depression

- “Depression.  Causes of Depression.  There is no single known cause of depression. Rather, it likely results from a combination of genetic, biochemical, environmental, and psychological factors. Trauma, loss of a loved one, a difficult relationship, or any stressful situation that overwhelms the ability to cope may trigger a depressive episode. Subsequent depressive episodes may occur with or without an obvious trigger.”
  https://www.psychologytoday.com/basics/depression/causes-depression

- “Depression (major depressive disorder)...Depression is a mood disorder that causes a persistent feeling of sadness and loss of interest. Also called major depressive disorder or clinical depression, it affects how you feel, think and behave and can lead to a variety of emotional and physical problems. You may have trouble doing normal day-to-day activities, and sometimes you may feel as if life isn't worth living. More than just a bout of the blues, depression isn't a weakness and you can't simply "snap out" of it. Depression may require long-term treatment. But don't get discouraged. Most people with depression feel better with medication, psychotherapy or both.”
  https://www.mayoclinic.org/diseases-conditions/depression/symptoms-causes/syc-20356007

- “What causes depression?...Changes in the brain. Although there’s been a lot of research in this complex area, there’s still much we don’t know. Depression is not simply the result of a ‘chemical imbalance’, for example because you have too much or not enough of a particular brain chemical. It’s complicated, and there are multiple causes of major depression. Factors such as genetic vulnerability, severe life stressors, substances you may take (some medications,
drugs and alcohol) and medical conditions can affect the way your brain regulates your moods.”


- “12 Surprising Causes of Depression...Poor sleep habits. It's no surprise that sleep deprivation can lead to irritability, but it could also increase the risk of depression. A 2007 study found that when healthy participants were deprived of sleep, they had greater brain activity after viewing upsetting images than their well-rested counterparts, which is similar to the reaction that depressed patients have, noted one of the study authors."If you don't sleep, you don't have time to replenish [brain cells], the brain stops functioning well, and one of the many factors that could lead to is depression," says Matthew Edlund, MD, director of the Center for Circadian Medicine, in Sarasota, Fla., and author of The Power of Rest.”

http://www.health.com/health/gallery/0,,20515167,00.html#why-am-i-depressed--0

- “Common Causes of Depression...Gender. Women are about twice as likely as men to become depressed. No one's sure why. The hormonal changes that women go through at different times of their lives may play a role.”

https://www.webmd.com/depression/common-causes-depression
Digestive Tract Hazards

- “I developed strange intestinal problems when working at very high altitude on Mauna Kea. Intestinal pains and bouts of loose stools. Dietary experimentation lead to the conclusion that eating a diet that comprised of lots of steamed vegetables when home would reduce the symptoms.” Steven Magee CEng MIET - Q
- “Could Air Travel Trigger an Autoimmune Response? 4 Tips to Protect Your Health...GASTROINTESTINAL FLARE-UPS AND AIR TRAVEL...At the 2012 Digestive Disease Week conference in San Diego, scientists revealed that people struggling with inflammation in the gut may be at a higher risk for inflammatory flare-ups when they fly.” https://bodyecology.com/articles/could-air-travel-trigger-an-autoimmune-response-tips-to-protect-your-health
- “High-altitude gastrointestinal bleeding: An observation in Qinghai-Tibetan railroad construction workers on Mountain Tanggula...RESULTS: The overall incidence of GIB was 0.49% in 13 502 workers. The incidence increased with increasing altitude. The onset of symptoms in most patients was within three weeks after arrival at high altitude. Bleeding manifested as hematemesis, melaena or hematochezia, and might be occult. Endoscopic examination showed that the causes of altitude GIB included hemorrhage gastritis, gastric ulcer, duodenal ulcer, and gastric erosion. Experimental studies suggested that acute gastric mucosal lesion (AGML) could be induced by hypoxic and cold stress, which might be the pathogenesis of altitude GIB. Those who consumed large amount of alcohol, aspirin or dexamethasone were at a higher risk of developing GIB. Persons who previously suffered from peptic ulcer or high-altitude polycythemia were also at risk of developing GIB. Early diagnosis, evacuation, and treatment led to early recovery.” http://europepmc.org/articles/PMC4066012
- “Over-starvation aggravates intestinal injury and promotes bacterial and endotoxin translocation under high-altitude hypoxic environment...Multiple organs can be damaged by rapid ascent to an altitude above 3000 m....Studies have shown that high altitude hypoxia can directly cause pathological damage to the intestinal mucosa, and increase intestinal permeability. High altitude hypoxia can reduce secretion of IgG from the gastrointestinal mucosa, decrease the mucosal immune barrier, reduce bile secretion, cause enterohepatic circulation disorders, and destroy the intestinal biological barrier. Intestinal barrier damage can increase intestinal permeability, which results in bacterial translocation and occurrence of SIRS and MODS. Therefore, observation of intestinal translocation of bacteria and endotoxins can indirectly reflect intestinal mucosal barrier function....This is a study of the effects of hypobaric hypoxia on intestinal integrity in rats (n = 40). Animals exposed to hypobaric hypoxia for 72 h demonstrated histological damage to the small intestine, translocation of lanthanum particles, and increased serum levels of DAO, MDA and endotoxin. This was accompanied by increased translocation of bacteria into lymph nodes and the spleen. Concomitant treatment of rats with glucosamine reduced the severity of intestinal injury.” https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3070130/
- “High-Altitude-Induced alterations in Gut-Immune Axis: A review...ABSTRACT. High-altitude sojourn above 8000 ft is increasing day by day either for pilgrimage, mountaineering, holidaying or for strategic reasons. In India, soldiers are deployed to these high mountains for their duty or pilgrims visit to the holy places, which are located at very high altitude. A large population also resides permanently in high altitude regions. Every year thousands of pilgrims visit Holy cave of Shri Amarnath ji, which is above 15 000 ft. The poor acclimatization to high
altitude may cause alteration in immunity. The low oxygen partial pressure may cause alterations in gut microbiota, which may cause changes in gut immunity. Effect of high altitude on gut-associated mucosal system is new area of research. Many studies have been carried out to understand the physiology and immunology behind the high-altitude-induced gut problems. Few interventions have also been discovered to circumvent the problems caused due to high-altitude conditions. In this review, we have discussed the effects of high-altitude-induced changes in gut immunity particularly peyer's patches, NK cells and inflammatory cytokines, secretary immunoglobulins and gut microbiota.”

Food Hazards

- “The food was so bad at one particular high altitude observatory that I stopped eating there and brought sandwiches to work every day.” Steven Magee CEng MIET - Q
- “I came to know the food at high altitude observatories as some of the worst I had ever been served.” Steven Magee CEng MIET - Q
- “One of the bad habits that I developed in very high altitude astronomy was eating a bowl of free ice cream for breakfast, as the free cooked breakfast would make me feel really sickly when at the summit of Mauna Kea.” Steven Magee CEng MIET - Q
- “Poor quality food was a feature of high altitude observatories.” Steven Magee CEng MIET - Q
- “Recommended foods and supplements to help protect your health and Counter the Effects of Radiation...Radiation and pollutants destroy vitamins A, C, E, K, several N vitamins, essential fatty acids, calcium and neuro-hormones. If your body lacks calcium, potassium and other nutrients, it will more readily absorb the radioactive elements that are similar in structure to these nutrients. Your best bet is to eat natural, fresh, organic (as much as possible) unprocessed foods, avoiding white sugar, red meat, refined wheat, caffeine and homogenized milk.” [https://www.safespaceprotection.com/healthy-tips/the-anti-radiation-diet/](https://www.safespaceprotection.com/healthy-tips/the-anti-radiation-diet/)
- “Top 5 Ingredients Of A Healthy Diet During Radiation Therapy...Foods to avoid or reduce include sodium (salt), added sugars, solid fats, and alcohol. Some salt is needed in all diets. Your doctor or dietician can recommend how much salt you should consume based on your medical history.” [https://treatcancer.com/blog/top-5-ingredients-healthy-diet-radiation-therapy/](https://treatcancer.com/blog/top-5-ingredients-healthy-diet-radiation-therapy/)
- “Nutrition in Cancer Care (PDQ®)--Patient Version…A healthy diet includes eating and drinking enough of the foods and liquids that have important nutrients (vitamins, minerals, protein, carbohydrates, fat, and water) the body needs....Malnutrition can cause the patient to be weak, tired, and unable to fight infection.” [https://www.cancer.gov/about-cancer/treatment/side-effects/appetite-loss/nutrition-pdq](https://www.cancer.gov/about-cancer/treatment/side-effects/appetite-loss/nutrition-pdq)
- “The Plant Paradox: The Hidden Dangers in "Healthy" Foods That Cause Disease and Weight Gain” [http://a.co/51Hjd8k](http://a.co/51Hjd8k)
- “Wheat Belly: Lose the Wheat, Lose the Weight, and Find Your Path Back to Health. A renowned cardiologist explains how eliminating wheat from our diets can prevent fat storage, shrink unsightly bulges, and reverse myriad health problems.” [https://www.wheatbelly.com/](https://www.wheatbelly.com/)
- “The Evolution of Diet...Cordain came up with his own Paleo prescription: Eat plenty of lean meat and fish but not dairy products, beans, or cereal grains—foods introduced into our diet after the invention of cooking and agriculture. Paleo-diet advocates like Cordain say that if we stick to the foods our hunter-gatherer ancestors once ate, we can avoid the diseases of civilization, such as heart disease, high blood pressure, diabetes, cancer, even acne.” [https://www.nationalgeographic.com/foodfeatures/evolution-of-diet/](https://www.nationalgeographic.com/foodfeatures/evolution-of-diet/)
- “Radiation...Research indicates that ginger and lemon balm may help provide some protection against radiation. Also, fruit and vegetable intake may decrease radiation-induced chromosome damage. Dr. Dean Ornish was able to use a plant-based diet, without any surgery, chemotherapy, or radiation, to reduce prostate cancer progression.” [https://nutritionfacts.org/topics/radiation/](https://nutritionfacts.org/topics/radiation/)
Drinking Water Hazards

- “It was common to drink from plastic bottles and cans in high altitude astronomy.” Steven Magee CEng MIET - Q
- “Health Risks from Long Term Consumption of Reverse Osmosis Water...RO industry has become aware of the reality that long term consumption of demineralised water is not good for health.” https://www.ripublication.com/ijac17/ijacv13n2_11.pdf
- “Reverse Osmosis Water Exposed. What They Don't Tell You...Within several weeks or months various health complaints suggestive of acute magnesium (and possibly calcium) deficiency were reported. Among these complaints were cardiovascular disorders, tiredness, weakness or muscular cramps.” Again, serious side effects within just several weeks or months.” https://www.aqualiv.com/reverse-osmosis-water-filter-health/
- “World Health Organization Issues Reverse Osmosis Water Warning...After analyzing hundreds of scientific studies concerning demineralized or reverse osmosis water, the World Health Organization released a report stating that such water “has a definite adverse influence on the animal and human organism.”” https://drinknatureswater.wordpress.com/2017/12/03/world-health-organization-issues-reverse-osmosis-water-warning/
- “HEALTH RISKS FROM DRINKING DEMINERALISED WATER... In addition to an increased risk of sudden death, it has been suggested that intake of water low in magnesium may be associated with a higher risk of motor neuronal disease, pregnancy disorders (so-called preeclampsia), sudden death in infants, and some types of cancer. Recent studies suggest that the intake of soft water, i.e. water low in calcium, is associated with a higher risk of fracture in children, certain neurodegenerative diseases, pre-term birth and low weight at birth and some types of cancer. Furthermore, the possible role of water calcium in the development of CVD cannot be excluded.” http://www.who.int/water_sanitation_health/dwq/nutrientschap12.pdf
- “Gastrointestinal health effects associated with the consumption of drinking water produced by point-of-use domestic reverse-osmosis filtration units...During a prospective epidemiological study of gastrointestinal health effects associated with the consumption of drinking water produced by reverse-osmosis domestic units, a correlation was demonstrated between the bacterial counts on R2A medium incubated at 35 degrees C and the reported gastrointestinal symptoms in families who used these units. A univariate correlation was found with bacterial counts on R2A medium at 20 degrees C but was confounded by the bacterial counts at 35 degrees C. Other variables, such as family size and amount of water consumed, were not independently explanatory of the rate of illness. These observations raise concerns for the possibility of increased disease associated with certain point-of-use treatment devices for domestic use when high levels of bacterial growth occur.” https://www.ncbi.nlm.nih.gov/pmc/articles/PMC182827/
- “Bottled Water is hazardous to you and our world... A recent Environmental Working Group test found 38 contaminants in 10 brands of bottled water. Findings included caffeine, toxic bacteria, carcinogenic DBP’s, nitrates, arsenic, various industrial chemicals, and pharmaceutical agents.” https://www.naturalnews.com/032744_bottled_water_environment.html
- “Health Effects of Plastic Water Bottles...Some types of plastic water bottles contain chemicals that may leach into your drinking water. Bisphenol A, or BPA, is one of the most commonly cited culprits, and is found in hard plastic bottles marked with plastic code "7." Other plastics also pose a potential health threat.” https://www.livestrong.com/article/131685-health-effects-
“Why drinking from a can may be dangerous...To test the effects of drinking from cans, researchers in South Korea provided 60 adults over the age of 60 with soy milk either in a can or a glass bottle. Urine tests showed that those who drank from cans saw BPA levels up to 1,600% higher than those who drank from bottles”

“That bottled water you paid $3 for may contain tiny particles of plastic: Study..."There are connections to increases in certain kinds of cancer to lower sperm count to increases in conditions like ADHD and autism," said Mason. "We know that they are connected to these synthetic chemicals in the environment and we know that plastics are providing kind of a means to get those chemicals into our bodies.”

“In 2006, the US Government sponsored an assessment of the scientific literature on BPA. Thirty-eight experts in fields involved with bisphenol A gathered in Chapel Hill, North Carolina to review several hundred studies on BPA, many conducted by members of the group. At the end of the meeting, the group issued the Chapel Hill Consensus Statement,[57] which stated "BPA at concentrations found in the human body is associated with organizational changes in the prostate, breast, testis, mammary glands, body size, brain structure and chemistry, and behavior of laboratory animals."[58] The Chapel Hill Consensus Statement stated that average BPA levels in people were above those that cause harm to many animals in laboratory experiments.”
https://en.wikipedia.org/wiki/Bisphenol_A

“Phthalates, or phthalate esters, are esters of phthalic acid. They are mainly used as plasticizers, i.e., substances added to plastics to increase their flexibility, transparency, durability, and longevity...Due to the ubiquity of plasticized plastics, the majority of people are exposed to some level of phthalates. For example, most Americans tested by the Centers for Disease Control and Prevention have metabolites of multiple phthalates in their urine. In studies of rodents exposed to certain phthalates, high doses have been shown to change hormone levels and cause birth defects....Several phthalates are "plausibly" endocrine disruptors. The long-term health effects of exposure to endocrine disruptors, such as phthalates, are unclear. Authors of a 2006 study of boys with undescended testis hypothesized that exposure to a combination of phthalates and anti-androgenic pesticides may have contributed to that condition. A scientific review in 2013 came to the conclusion that epidemiological and in vitro studies generally converge sufficiently to conclude that phthalate anti-androgenicity is plausible in adult men.”
https://en.wikipedia.org/wiki/Phthalate

“Mechanisms underlying the anti-androgenic effects of diethylhexyl phthalate in fetal rat testis...Diethylhexyl phthalate (DEHP) is widely used as a plasticizer in consumer products and is known to disturb the development of the male reproductive system in rats. The mechanisms by which DEHP exerts these effects are not yet fully elucidated, though some of the effects are related to reduced fetal testosterone production.”

“Research Proves 'Gender-Bending' Chemicals Affect Reproduction...It is believed that phthalates have these adverse effects because they reduce testosterone synthesis by interfering with an enzyme needed to produce the male hormone. In one study, women who had higher concentrations of two types of phthalates (DEHP and DBP) also had boys who appeared more
feminized in their personality while playing.” [https://articles.mercola.com/sites/articles/archive/2010/11/18/research-proves-genderbending-chemicals-affect-reproduction.aspx]

- “Pharmaceuticals in Our Water Supply Are Causing Bizarre Mutations to Wildlife. Federal officials are studying the effects of pharmaceuticals such as pain killers and depression medicine in our water supply...From inter-sex fish in the Potomac River to frog mutations in Wisconsin, federal officials are spending this summer studying the effects of pharmaceuticals such as pain killers and depression medicine on the environment, because the drugs have turned up in America's drinking water.” [https://www.alternet.org/story/59305/pharmaceuticals_in_our_water_supply_are_causing_bizarre_mutations_to_wildlife]

- “When used at specified levels for water disinfection, the reaction of chlorine with water is not a major concern for human health. Other materials present in the water may generate disinfection by-products that are associated with negative effects on human health.” [https://en.wikipedia.org/wiki/Chlorine]

- “Chlorinated disinfection agents such as chlorine and chloramine are strong oxidizing agents introduced into water in order to destroy pathogenic microbes, to oxidize taste/odor-forming compounds, and to form a disinfectant residual so water can reach the consumer tap safe from microbial contamination. These disinfectants may react with naturally present fulvic and humic acids, amino acids, and other natural organic matter, as well as iodide and bromide ions, to produce a range of DBPs such as the trihalomethanes (THMs), haloacetic acids (HAAs), bromate, and chlorite (which are regulated in the US), and so-called "emerging" DBPs such as halonitromethanes, haloacetonitriles, haloamides, halofuranones, iodo- acids such as iodoacetic acid, iodo-THMs (iodotrihalomethanes), nitrosamines, and others.[1] Chloramine has become a popular disinfectant in the US, and it has been found to produce N-nitrosodimethylamine (NDMA), which is a possible human carcinogen, as well as highly genotoxic iodinated DBPs, such as iodoacetic acid, when iodide is present in source waters.” [https://en.wikipedia.org/wiki/Disinfection_by-product]

- "Don't Take These Risks with Your Water Dispensers...Water dispensers are like every other appliance in that they require cleaning and maintenance...Risks involved in using a water dispenser can be avoided if you exercise certain precautions.” [http://www.newair.com/articles/dont-take-these-risks-water-dispensers/]

- “Health Warning Over Water Coolers...Dirty water coolers may be putting people’s health at risk, a consumer watchdog has warned. In a recent environmental health survey 23 out of 87 samples from dispensers showed bacterial contamination. Coolers in leisure centres, offices, care homes and schools were among those to fail the tests.” [http://www.justsafety.co.uk/category/blog-articles/health-warning-over-water-coolers/]

- “I never observed a water dispenser be cleaned or sterilized during my time in high altitude astronomy.” Steven Magee CEng MIET - Q

- “Plastic bottles of Gatorade were given free to very high altitude workers on Mauna Kea and they were advised to drink it while on the summit.” Steven Magee CEng MIET - Q

- “Effects of Too Much Gatorade... Though Gatorade is an excellent tool to provide athletes with important electrolytes lost during exercise, it should only be drunk in small amounts as needed. Drinking too much Gatorade can have serious health consequences.” [https://www.livestrong.com/article/68710-effects-much-gatorade/]

- “Negative Effects of Gatorade...Gatorade was developed to improve the performance and endurance of athletes. It effectively accomplishes the job by replacing fluids, carbohydrates and
Electrolytes such as sodium and potassium. However, if you don’t need the extra boost of sugar and minerals, drinking Gatorade may add more calories and sodium to your diet than you need, which could put your health at risk.”

“The Risks of Drinking Too Many Electrolyte Replacement Drinks...Electrolyte replacement drinks contain ingredients intended to sustain optimal physical performance and prevent dehydration in people engaged in intense exercise. To accomplish the job, these drinks are a mix of water, carbohydrates for energy and electrolytes such as sodium, which are lost due to excessive sweating. While these drinks are beneficial when you need the nutrients, the extra sugar and sodium can lead to problems if you drink too much or consume sports drinks instead of water.”

“Negative Effects of Drinking Too Many Electrolytes...Hypernatremia...Hyperkalemia...Hypercalcemia...too much magnesium”

“Symptoms of Electrolyte Imbalance, Plus How to Solve It...The major electrolytes found within the body include calcium, magnesium, potassium, sodium, phosphate and chloride. Because these crucial nutrients help stimulate nerves throughout the body and balance fluid levels, an electrolyte imbalance can cause a variety of serious negative symptoms, including some that are potentially deadly.”

"Electrolyte Side Effects...Convulsions (seizures), dizziness, fast heartbeat, high blood pressure, irritability, muscle twitching, restlessness, swelling of feet or lower legs, weakness, Puffy eyelids, Vomiting (mild)”

“The Little-Known Reasons Behind Sleep Disorders like Restless Legs and Sleep Apnea...Vitamin and Mineral Balance. Magnesium and potassium are often related to sleep challenges, including restless legs, periodic leg movement sleep, night terrors and nighttime reflux. A very clever neurologist, Dr. Stasha Gominak, began wondering why so many of her slim, young patients (who did not fit the profile for sleep apnea) were suffering from sleep apnea, headaches, REM apnea and leg movement. She began treating her patients with magnesium, vitamin D, vitamin B12 — and she noticed iron deficiencies. She was successful at getting patients of CPAP (a sleep apnea device sending oxygen into airways at night) and relieving them of headaches.”

“How can high Altitude Systemic Edema be prevented?...Avoiding salt may help.”

“We were advised to drink plenty of fluids during our very high altitude summit work days to offset altitude sickness.”

“Water intoxication, also known as water poisoning or hyperhydration, is a potentially fatal disturbance in brain functions that results when the normal balance of electrolytes in the body is pushed outside safe limits by overhydration (excessive water intake).”
Feet Hazards

- “Why do I get swelling in my hands and feet? Swelling sometimes occurs in the arms, legs and even the face at altitude and is called peripheral edema. It is sometimes associated with altitude illness but occurs frequently in people without any other symptoms. Women experience peripheral edema more than men. Exercise may increase edema.”
  [http://www.altitudemedicine.org/altitude-illness/](http://www.altitudemedicine.org/altitude-illness/)

- “At the age of 45, I started to experience severe pains in one foot that progressed into both feet as I aged. I do wonder if it is the long term effects of high altitude peripheral edema.” Steven Magee CEng MIET - Q

- “Peripheral edema is edema (accumulation of fluid causing swelling) in tissues perfused by the peripheral vascular system, usually in the lower limbs. In the most dependent parts of the body (those hanging distally), it may be called dependent edema. The condition is commonly associated with aging, but can be caused by many other conditions, including congestive heart failure, trauma, alcoholism, altitude sickness, pregnancy, hypertension, sickle cell anemia, compromised lymphatic system, or merely long periods of time sitting or standing without moving.” [https://en.wikipedia.org/wiki/Peripheral_edema](https://en.wikipedia.org/wiki/Peripheral_edema)
Mercury Hazards

- “Mercury was in use in high altitude astronomy.” Steven Magee CEng MIET - Q
- “Material Safety Data Sheet. Mercury MSDS...Potential Acute Health Effects: Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.” http://www.sciencelab.com/msds.php?msdsId=9927224
- “Mercury and most of its compounds are extremely toxic and must be handled with care...Mercury can be absorbed through the skin and mucous membranes and mercury vapors can be inhaled, so containers of mercury are securely sealed to avoid spills and evaporation.”
- “Potential Hazards from Exposure to Elemental Mercury and Mercury Salts. Although most people know that elemental mercury and mercury salts are virulent poisons, it is commonly presumed that the danger is from oral ingestion. However, mercury is extremely volatile and the vapors are readily absorbed through the respiratory tract or unbroken skin. Mercury acts as a cumulative poison because the rate of elimination by body functions is low.”
- “Mercury poisoning is a type of metal poisoning due to mercury exposure.[3] Symptoms depend upon the type, dose, method, and duration of exposure.[3][4] They may include muscle weakness, poor coordination, numbness in the hands and feet, skin rashes, anxiety, memory problems, trouble speaking, trouble hearing, or trouble seeing.[1] High level exposure to methylmercury is known as Minamata disease.[2] Methylmercury exposure in children may result in acroynia (pink's disease) in which the skin becomes pink and peels.[2] Long-term complications may include kidney problems and decreased intelligence.[2] The effects of long-term low-dose exposure to methylmercury is unclear.”
- “Elemental mercury toxicity (which usually occurs in the vaporized form) can cause: mood swings, nervousness, irritability, and other emotional changes, insomnia, headache, abnormal sensations, muscle twitching, tremors, weakness, muscle atrophy, and decreased cognitive functions. High exposures of elemental mercury can cause kidney malfunction, respiratory failure, and death.”
- “Erethism, also known as erethism mercurialis, Mad hatter disease, or mad hatter syndrome is a neurological disorder which affects the whole central nervous system, as well as a symptom complex derived from mercury poisoning. Erethism is characterized by behavioral changes such as irritability, low self-confidence, depression, apathy, shyness[1][2] and timidity, and in some extreme cases with prolonged exposure to mercury vapors, delirium, personality changes and memory loss. People with erethism often have difficulty with social interactions. Associated physical problems may include a decrease in physical strength, “headaches, general pain, and
tremors after exposure to metallic mercury"[3] as well as an irregular heartbeat…After chronic exposure to the mercury vapours, hatters tended to develop characteristic psychological traits, such as pathological shyness and marked irritability” https://en.wikipedia.org/wiki/Erethism

- “"Mad as a hatter" is a colloquial English phrase used in conversation to suggest (lightheartedly) that a person is suffering from insanity. It is believed to emanate from Denton, Tameside in the North of England where men in the area predominantly worked in the hattery business which used mercury in the hat making process. Mercury poisoning causes symptoms similar to madness and death often occurred with the accumulation of mercury in the body. The earliest known appearance of the phrase in print is in an 1829 issue of Blackwood's Edinburgh Magazine.” https://en.wikipedia.org/wiki/Mad_as_a_hatter

- “Minamata disease (Japanese: 水俣病 Hepburn: Minamata-byō), sometimes referred to as Chisso-Minamata disease (チッソ水俣病 Chisso-Minamata-byō), is a neurological syndrome caused by severe mercury poisoning. Signs and symptoms include ataxia, numbness in the hands and feet, general muscle weakness, loss of peripheral vision, and damage to hearing and speech. In extreme cases, insanity, paralysis, coma, and death follow within weeks of the onset of symptoms. A congenital form of the disease can also affect fetuses in the womb.” https://en.wikipedia.org/wiki/Minamata_disease

- “When I worked at Columbia University and Dartmouth College we would handle the rubber filled mercury mirror support system with bare hands and no respiratory protection. What was ironic was that we were visually inspecting it for leaks and that microscopic leaks could be entering our bodies through our bare skin and respiratory tracts. I had no industry recognized training in correctly handling mercury systems, dealing with unexpected spills, the health hazards and the correct storage protocols. When I reflect on the mercury filled rubber mirror support band, it was just one of the many incompetence's that astronomers were subjecting their unsuspecting staff to.” Steven Magee CEng MIET - Q

- “Identify floors that may emit mercury vapor...Not all health hazards in schools are well-recognized. Until recently, very few people had heard that some rubber-like floors in school gyms, tracks, and other locations can emit mercury vapor.” https://www.njea.org/identify-floors-may-emit-mercury-vapor/

- “On August 14, 1996, Karen Wetterhahn, a chemistry professor working at Dartmouth College, spilled a small amount of dimethylmercury on her latex glove. She began experiencing the symptoms of mercury poisoning five months later and, despite aggressive chelation therapy, died a few months later from brain malfunction due to mercury intoxication.[22][23]” https://en.m.wikipedia.org/wiki/Mercury_poisoning

- “Like Karen Wetterhahn, I was mercury poisoned in the employment of Dartmouth College. Unlike Karen Wetterhahn, I survived the extremely sickening mercury poisoning.” Steven Magee CEng MIET - Q

- “It is probably a good thing that Karen Wetterhahn died from mercury poisoning, as if she had survived, she would have discovered the horrible Dartmouth College workers compensation experience for occupational disease.” Steven Magee CEng MIET - Q

- “In the space of less than a year, mercury poisoning took me from being sponsored for an exceptional ability green card by Dartmouth College to being shown the door.” Steven Magee CEng MIET - Q

- “Show someone the door - to tell someone to leave or make it clear you want someone to leave.” https://dictionary.cambridge.org/us/dictionary/english/show-someone-the-door
“Mercury poisoning wrecked my health and career.” Steven Magee CEng MIET - Q
“Mercury poisoning will take you into a very dark place and chelation will bring you back into the light.” Steven Magee CEng MIET - Q
“While astronomers have been studying Mercury, I have been living with mercury.” Steven Magee CEng MIET - Q
“Mercury is a hot and inhospitable world. Like the planet Mercury, mercury poisoning creates a hot and inhospitable world within the human.” Steven Magee CEng MIET - Q
“How Just Two Drops of Organic Mercury Can Destroy Your Brain. This famous ’80s case study is a terrifying glimpse into acute mercury poisoning.”

OSHA began its inspection in March 2016, after Environmental Remediation Services Inc. employees complained about mercury exposure and lack of personal protective equipment. The employees were removing liquid mercury and mercury-contaminated soil and wood from the third and fourth floors of Building 5 of the Main Plant. The agency’s inspection found that several employees inhaled or absorbed excessive levels of mercury vapor or liquid mercury through their skin. Biological monitoring confirmed the workers had symptoms consistent with respiratory mercury exposure. These symptoms can include neurological impairment, fever, fatigue, memory loss, tremor, feeling pins and needles in the skin, damage to the gums, and skin damage.”

“Last week, the U.S. Occupational Safety and Health Administration (OSHA) cited a Connecticut contractor, Manafort Brothers, with two willful and six serious violations because they exposed the workers at the demolition of Eversource’s Schiller Station in Portsmouth, New Hampshire project site to hazards related to mercury, respirators, protective clothing and sanitary conditions. Along with the citations, Manafort Brothers also faces total fines of $329,548.”

“Controlling Mercury Spills in Laboratories with A Thermometer Exchange Program...Several Occupational Exposure Limits (OELs) have been established for limiting exposure to airborne inorganic mercury vapors. The federal Occupational Safety and Health Administration Permissible Exposure Limits (OSHA PEL) is 0.1 milligrams per cubic meter of air (mg/m3). This is a “Ceiling” limit, which must not be exceeded during any part of the workday. The American Conference of Governmental Industrial Hygienists Threshold Limit Value (ACGIH TLVTM) is 0.025 mg/m3. This is an eight-hour-time-weighted-average. The National Institute for Occupational Safety and Health(NIOSH) established three Recommended Exposure Limits for inorganic mercury. These include a 0.05 mg/m3 eight-hour-time-weighted-average, a 0.1 mg/m3 Ceiling and a 10 mg/m3 Immediately Dangerous to Life or Heath (IDLH) level. An IDLH is an atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual’s ability to escape from a dangerous atmosphere. The ACGIH and NIOSH have both given inorganic mercury a “Skin Notation”, indicating that skin absorption is a route of exposure. It is important to note that the federal OSHA PEL is a legally enforceable limit, whereas both the ACGIH and NIOSH criteria are recommended limits.”

“Mercury Contamination. Review of a Residential Response...RIDEM notified EPA Region I, since the reportable quantity for elemental mercury is 1 lb. One pound of elemental mercury is
equivalent to 2 tablespoons; 25 lb equals 1 quart. EPA emergency response guidelines for residential mercury contamination were employed (Singhvi, Mehra & McGuire, 2004; see “Six Rs of Emergency Response” sidebar on p. 54). RIDEM, EPA Region 1, Rhode Island Department of Health Office of Environmental Health (EHEALTH) assumed joint command for the response.”

- “Mercury Spill - Mercury is Extremely Dangerous…Elemental mercury is a hazardous material that is designated as having reproductive critical effects. Liquid mercury is a highly toxic chemical that’s commonly found in thermometers, barometers, float valves, switches, relays and electric components…You should never attempt to clean a mercury spill using a standard vacuum cleaner as vacuum cleaner will force microscopic particles of the mercury into the air rather than keeping it contained and worsen the contamination. Another mistake is sweeping it with a broom, doing that will also spread the contamination.”

- “Mercury Toxicity and Treatment: A Review of the Literature…Mercury toxicity is not often included in the differential diagnosis of common subjective complaints such as fatigue, anxiety, depression, odd paresthesias, weight loss, memory loss, and difficulty concentrating, but these are the symptoms of low-grade chronic mercury exposure described by the investigators cited previously. Given the ability of the various forms of mercury to deposit in most parts of the human body, the range of symptoms potentially caused by mercury is quite large. Animal studies linking mercury toxicity to neurodegenerative diseases [117, 118] raise clinical concern, as do a series of associations between mercury and neurodegenerative diseases in humans [119–123].”

- “Chelation therapy is a medical procedure that involves the administration of chelating agents to remove heavy metals from the body.[1] Chelation therapy has a long history of use in clinical toxicology[2] and remains in use for some very specific medical treatments, although it is administered under very careful medical supervision due to various inherent risks…For the most common forms of heavy metal intoxication – lead, arsenic, or mercury – a number of chelating agents are available. Dimercaptosuccinic acid (DMSA) has been recommended for the treatment of lead poisoning in children by poison control centers around the world.[11] Other chelating agents, such as 2,3-dimercaptopropanesulfonic acid (DMPS) and alpha lipoic acid (ALA), are used in conventional and alternative medicine. Some common chelating agents are ethylenediaminetetraacetic acid (EDTA), 2,3-dimercaptopropanesulfonic acid (DMPS), and thiamine tetrahydrofurfuryl disulfide (TTFD).”

- “I was attending the doctor from 2006 through to 2008 for strange skin sensations, tingling/pains/numbness in my head, face, hands and legs, fatigue, stress, gastrointestinal problems, breathing difficulties and chest tightness/pains when exercising while working at an astronomical observatory that had a large amount of mercury stored on site. In 2009 it had progressed to include heart issues, fatigue, weakness and dizziness and I suggested to my doctor that my symptoms matched Eosinophilia and may be Lyme disease encephalitis or multiple sclerosis. Many years later in 2018 I showed a positive response to mercury chelation therapy.”

- “Using the Andy Cutler Protocol to Address Mercury Poisoning…The Cutler protocol may use any of three different chelators: ALA (alpha lipoic acid), DMPS (2,3-dimercapto-1-propanesulfonic acid) and DMSA (dimercaptosuccinic acid). ALA removes mercury, arsenic and antimony; DMPS removes mercury and arsenic; and DMSA removes mercury, cadmium, antimony, arsenic and lead. ALA is the most important chelator because it is fat-soluble and can
enter cells and cross the blood-brain barrier. ALA is available over-the-counter and is found in many products, and for most people, it will be the only chelator they will need to use. However, it is essential to use ALA carefully because it can wreak tremendous havoc with improper chelation.”

- “In 2019 it had emerged that I had been mercury poisoned while working in high altitude astronomy.” Steven Magee CEng MIET - Q

- “Reflecting on my time at the 2006 to 2008 observatory, I started to lose my voice in management meetings after extensively handling the rubber mercury mirror support system and the large glass jars of on-site stored mercury with my bare hands and no respiratory protection.” Steven Magee CEng MIET - Q

- “Eosinophilia occurs when a large number of eosinophils are recruited to a specific site in your body or when the bone marrow produces too many eosinophils. This can be caused by a variety of factors, including: Parasitic and fungal diseases. Allergies including allergies to medications or food. Adrenal conditions. Skin disorders. Toxins. Autoimmune disorders. Endocrine disorders. Tumors.”

- “The symptoms of eosinophilia are those of the underlying condition. For example, eosinophilia due to asthma is marked by symptoms such as wheezing and breathlessness, whereas parasitic infections may lead to abdominal pain, diarrhoea, fever, or cough and rashes. Medicine reactions often give rise to skin rashes, and they often occur after taking a new drug. Rarer symptoms of eosinophilia can include weight loss, night sweats, lymph node enlargement, other skin rashes, and numbness and tingling due to nerve damage.”

- “Drug Rash with Eosinophilia and Systemic Symptoms Caused by Topical Application of Mercury.”

- “Immune Reactive Conditions: The Mercury Connection to Inflammatory & Immune Reactive Conditions...The incidence of allergic and immune reactive conditions, such as allergies, asthma, lupus, and allergic contact disease has been increasing rapidly in the United States over the last decade. The prevalence of asthma doubled over the last decade to approximately 31 million (11.5% of the total population). At least 50 million have allergies (19%), and the largest increase has been in infants, with approximately 10% of infants—approximately 15 million in the U.S. with systemic eczema. Approximately 12% have had chronic sinusitis. Inflammation has been found to be a major factor in many chronic health conditions, including cardiovascular problems, diabetes, arthritis, depression, osteoporosis, periodontal disease, joint stiffness, chronic fatigue, fibromyalgia, age-related immune dysfunction, etc. Many studies have found exposure to mercury and other heavy metals to be common causes of such conditions.”

- “eMedicine Clinical Knowledge Base...Toxicity, Mercury…Neurologic, gastrointestinal, andrenal systems are the most commonly affected organ systems in mercury exposure..Mercury poisoning is usually misdiagnosed because of the insidious onset, nonspecific signs and symptoms, and lack of knowledge within the medical profession...Acute exposure caused by inhaled elemental mercury can lead to pulmonary symptoms. Initial signs and symptoms, such as fever, chills, shortness of breath, metallic taste, and pleuritic chest pain, may be confused with metal fume fever. Other possible symptoms could include stomatitis, lethargy, confusion, and vomiting.”
“Occupational Safety and Health Administration...Mercury is naturally occurring and exists in several forms. High mercury exposure results in permanent nervous system and kidney damage. Exposure is most likely to occur during mining, production, and transportation of mercury, as well as mining and refining of gold and silver ores. Mercury is commonly found in thermometers, manometers, barometers, gauges, valves, switches, batteries, and high-intensity discharge (HID) lamps. It is also used in amalgams for dentistry, preservatives, heat transfer technology, pigments, catalysts, and lubricating oils.”


“OSHA Standards State Standards...This section highlights OSHA standards, directives (instruction to OSHA staff), letters of interpretation (official letters of interpretation of the standards), and recommended exposure limits related to mercury.”

https://www.osha.gov/SLTC/mercury/standards.html

“Storing, Transporting and Disposing of Mercury...Packaging Mercury for Storage and Transportation. Place all mercury-containing products or containers of mercury inside a larger container with a tight fitting lid. Place kitty litter or oil-absorbent matter around the product to protect it from breaking or sudden shocks. Clearly label storage container as "Mercury - DO NOT OPEN."”

https://www.epa.gov/mercury/storing-transporting-and-disposing-mercury

“Mercury and its compounds: safe handling and dealing with spillages. Highly toxic, mercury requires special handling procedures. Lisa Bushby briefly discusses these, and the risks associated with mercury and its compounds, and describes some of the measures that should be taken in the event of a spillage.”

https://app.croneri.co.uk/feature-articles/mercury-and-its-compounds-safe-handling-and-dealing-spillages

“Mercury regulation in the United States...Mercury regulation in the United States is a set of laws and regulations limiting the maximum concentrations of mercury (Hg) that is permitted in air, water, soil, food and drugs. These laws and regulations are promulgated by U.S. Federal Agencies such as the Environmental Protection Agency (EPA) and Food and Drug Administration (FDA), as well as a variety of State and local authorities.”

https://en.wikipedia.org/wiki/Mercury_regulation_in_the_United_States

“‘Don’t Mess with Mercury’: Videos for teachers highlight spill awareness, response...As a new school year gets underway, the Agency for Toxic Substances and Disease Registry has released two teacher training videos as part of a campaign intended to call attention to the dangers of mercury exposure.”


“There were numerous large glass bottles of mercury stored at high altitude astronomical facilities and it was used in the telescope mirror support systems. It seemed to be an uncontrolled substance that was accessible to anyone at the facility.”

Steven Magee CEng MIET

“Mercury Clean Up Techniques and Case Studies”


“The problem with worker contamination by mercury is that the workers may cross contaminate a wide variety of items, such as computers, furniture, offices, tools, workshops, cars, restrooms, their personal items, their own homes, their partner, and so on.”

Steven Magee CEng MIET

“Dangerous Mercury Spills Still Trouble Schoolchildren. Thousands of kids are still exposed to dangerous liquid mercury in schools and homes. Contamination can last years, and cleanups are
costly...The local fire department alerted him that the home of a student at Agua Fria High School was contaminated with liquid mercury that apparently had been taken from a science classroom. The next day, emergency crews descended on the school in haz-mat suits, discovering a toxic trail of mercury vapors in classrooms, locker rooms, and buses...Mercury spills inside schools and houses, often unreported, can release vapors into the air for weeks, even years.” https://www.scientificamerican.com/article/mercury-spills-trouble-schoolchildren/

- “Teen unaware of mercury risk...But around that time, Michael said, he developed a rash all over his body. An emergency room doctor told Estes that it was a simple allergic reaction. Soon, Estes said, the rash faded. But over the last few weeks, Michael felt his energy draining. He began to miss school and lock himself up in his room, which had the highest levels of mercury contamination in the home. His fingers tingled, and he couldn't run. Mercury poisoning, which comes from exposure to the vapors from the liquified metal, causes personality changes, nervousness and trembling. Michael said he found refuge by taking as many as six hot baths a day. "I felt good when I was in there," he said.” https://lasvegassun.com/news/2004/jan/15/teen-unaware-of-mercury-risk/

- “After handling the observatory mercury systems, I had to start taking daily baths to calm down my hot skin pains. The baths were the only refuge from the terrible pains.” Steven Magee CEng MIET - Q

- “Mercury Exposure: Effects Across the Lifespan...The dissolved mercury vapor can oxidize to form inorganic mercuric mercury, a process that is inhibited by ethanol. Elimination is slow, with an average half-life of about 8 weeks for the body and possibly years for the brain.” https://neuro.psychiatryonline.org/doi/full/10.1176/jnp.2008.20.4.iv

- “Mercury poisoning is a type of metal poisoning due to exposure to mercury.[3] Symptoms depend upon the type, dose, method, and duration of exposure.[3][4] They may include muscle weakness, poor coordination, numbness in the hands and feet, skin rashes, anxiety, memory problems, trouble speaking, trouble hearing, or trouble seeing...Long-term complications may include kidney problems and decreased intelligence...Common symptoms of mercury poisoning include peripheral neuropathy, presenting as paresthesia or itching, burning, pain, or even a sensation that resembles small insects crawling on or under the skin (formication); skin discoloration (pink cheeks, fingertips and toes); swelling; and desquamation (shedding or peeling of skin)...Exposure to mercury can occur from breathing contaminated air,[9] from eating foods that have acquired mercury residues during processing,[10] from exposure to mercury vapor in mercury amalgam dental restorations,[11] and from improper use or disposal of mercury and mercury-containing objects, for example, after spills of elemental mercury or improper disposal of fluorescent lamps...In humans, approximately 80% of inhaled mercury vapor is absorbed via the respiratory tract, where it enters the circulatory system and is distributed throughout the body.[36] Chronic exposure by inhalation, even at low concentrations in the range 0.7–42 μg/m3, has been shown in case–control studies to cause effects such as tremors, impaired cognitive skills, and sleep disturbance in workers. Acute inhalation of high concentrations causes a wide variety of cognitive, personality, sensory, and motor disturbances. The most prominent symptoms include tremors (initially affecting the hands and sometimes spreading to other parts of the body), emotional lability (characterized by irritability, excessive shyness, confidence loss, and nervousness), insomnia, memory loss, neuromuscular changes (weakness, muscle atrophy, muscle twitching), headaches, polyneuropathy (paresthesia, stocking-glove sensory loss, hyperactive tendon reflexes, slowed sensory and motor nerve conduction velocities), and performance deficits in tests of cognitive function.”

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Mercury Quick Facts. Health Effects of Mercury Exposure...Can vaporize (evaporate) into the air in your house. The vapor cannot be seen or smelled. Can be toxic to people’s nervous system, lungs and kidneys...Breathing mercury vapors in air is the most common way to be exposed to elemental mercury, and is the most harmful to your health...How much mercury spilled in a room will make air in the room unsafe? Any amount of mercury spilled indoors can be hazardous. The more mercury is spilled, the more its vapor will build up in air and the more hazardous it will be. Even a small spill, such as from a broken thermometer, can produce hazardous amounts of vapor if a room is small enough, warm enough and people spend a good deal of time there, as in a small bedroom....Health effects caused by long-term exposure to mercury vapors • Anxiety • Excessive shyness • Anorexia • Sleeping problems • Loss of appetite • Irritability • Fatigue • Forgetfulness • Tremors • Changes in vision • Changes in hearing.”

“Mercury and health...Exposure to mercury – even small amounts – may cause serious health problems, and is a threat to the development of the child in utero and early in life...Mercury may have toxic effects on the nervous, digestive and immune systems, and on lungs, kidneys, skin and eyes. Mercury is considered by WHO as one of the top ten chemicals or groups of chemicals of major public health concern...Mercury exists in various forms: elemental (or metallic) and inorganic (to which people may be exposed through their occupation); and organic (e.g., methylmercury, to which people may be exposed through their diet). These forms of mercury differ in their degree of toxicity and in their effects on the nervous, digestive and immune systems, and on lungs, kidneys, skin and eyes...Health effects of mercury exposure. Elemental and methylmercury are toxic to the central and peripheral nervous systems. The inhalation of mercury vapour can produce harmful effects on the nervous, digestive and immune systems, lungs and kidneys, and may be fatal. The inorganic salts of mercury are corrosive to the skin, eyes and gastrointestinal tract, and may induce kidney toxicity if ingested. Neurological and behavioural disorders may be observed after inhalation, ingestion or dermal exposure of different mercury compounds. Symptoms include tremors, insomnia, memory loss, neuromuscular effects, headaches and cognitive and motor dysfunction. Mild, subclinical signs of central nervous system toxicity can be seen in workers exposed to an elemental mercury level in the air of 20 μg/m3 or more for several years. Kidney effects have been reported, ranging from increased protein in the urine to kidney failure.”

“If you know that you are working at a facility that uses mercury and you are slowly becoming sick, then it is a good idea to leave for your next job before that strange sickness progresses.” Steven Magee CEng MIET - Q

“The large amount of mercury at the observatory facility was one of the reasons why I wanted Occupational Health and Safety Administration (OSHA) to visit the facility and provide legal guidance. I attribute my mercury poisoning to be directly related to the observatory management preventing the arranged OSHA visit from taking place.” Steven Magee CEng MIET - Q

“The Ivy League is developing a sad history of preventable mercury poisoned employees that has led to death in at least one case.” Steven Magee CEng MIET - Q

“The Ivy League is an American collegiate athletic conference comprising sports teams from eight private universities in the Northeastern United States. The term Ivy League is typically used to refer to those eight schools as a group of elite colleges beyond the sports context.[2] The
eight members are Brown University, Columbia University, Cornell University, Dartmouth College, Harvard University, the University of Pennsylvania, Princeton University, and Yale University. Ivy League has connotations of academic excellence, selectivity in admissions, and social elitism.” [https://en.wikipedia.org/wiki/Ivy_League](https://en.wikipedia.org/wiki/Ivy_League)
Broken Mercury Filled Florescent Lamps – Hazards

- “I never received any industry recognized training in astronomy on how to safely clean up smashed mercury filled florescent tubes.” Steven Magee CEng MIET - Q
- “Factsheet: the three main health risks associated with energy saving lamps (CFLs)... Mercury. Energy saving lamps contain mercury, a substance which is extremely harmful for humans, animals and the ecosystem in general. It is especially toxic to the brain, the nervous system, the liver and the kidneys. Fetuses, babies and infants are the most vulnerable, as mercury exposure negatively influences the development of the brain (eg. lower IQ) and nervous system. Mercury can also damage the cardiovascular, immune and reproductive systems and possibly lead to tremors, emotional instability, memory loss, insomnia, neuromuscular changes, headaches, cancer and Alzheimer’s” https://lowenergylampsinfo.wordpress.com/2009/03/14/factsheet-the-three-main-health-risks-associated-with-energy-saving-lamps-cfls/
- “Avoiding Mercury Exposure from Fluorescent Bulbs. Metallic mercury poses health risks from inhalation and skin exposure. Tubular or compact fluorescent bulbs contain small amounts of the metal mercury sealed inside. If fluorescent bulbs are broken, small amounts of mercury will be released into the environment. Proper cleanup will reduce workers’ exposure to the low levels of mercury anticipated when a fluorescent bulb is accidentally broken.” https://www.osha.gov/Publications/osha3536.pdf
- “Protecting Workers from Mercury Exposure While Crushing and Recycling Fluorescent Bulbs...Reducing Mercury Exposure in the Workplace. All workplaces where fluorescent bulbs are deliberately broken or crushed should have: A cleanup plan that informs workers how to safely clean up incidental mercury releases from broken bulbs. Brooms should not be used to clean up broken fluorescent bulbs because they will spread the mercury. A vacuum cleaner should only be used if it is specifically designed to collect mercury. A regular vacuum cleaner will increase air levels of mercury and the vacuum will become contaminated. Contact with broken glass should be avoided.” https://www.osha.gov/Publications/mercuryexposure_fluorescentbulbs_factsheet.pdf
Broken Mercury Filled Spectral Lamps - Hazards

- “Wavelength calibration lamps containing mercury and other elements were in use in astronomy.” Steven Magee CEng MIET - Q
- “The wavelength calibration lamps normally used with the Goodman spectrograph are: HgAr, CuHeAr, Ne, and Ar. An Fe lamp is also available.”
  http://www.ctio.noao.edu/soar/content/goodman-comparison-lamps-updated
- “HgAr = Mercury Argon, CuHeAr = Copper Helium Argon, Ne = Neon, Ar = Argon Fe = Iron” Steven Magee CEng MIET
- “The Finder module contains spectral calibration (Ne, Ar, Hg-Ne & Xe) and flat field lamps.”
  http://mdm.kpno.noao.edu/13_manual/mgh06.html
- “The finder unit also houses a set of comparison lamps - an incandescent flat bulb, and Ne, Hg, Ar, and Xe discharge lamps - for calibrating spectra.”
  http://mdm.kpno.noao.edu/Manuals/mdmguide_current.html#mis
- “Chemical elements alphabetically listed”
  https://www.lenntech.com/periodic/name/alphabetic.htm
- “Neon light...If the signs are broken, the only hazardous element is the mercury. There are policies that neon signs have to go through to make sure it is safe if they are broken. If such a thing happens, the area needs to be well ventilated because concentrated amounts of the neon, argon, or whatever gas has been used, is not good to inhale and can cause side effects that are harmful to the body...Although neon gas is not poisonous or explosive, the small amount of mercury found in some neon lights is not dangerous as long as the tube is not damaged. Some neon sign shops will not repair neon lights when mercury has been used in the manufacturing process.”
  http://creationwiki.org/Neon_light
- “We were not told by the management teams to ventilate the area and to leave the area after breaking astronomical spectral lamps.” Steven Magee CEng MIET - Q
- “It was common to be exposed to smashed mercury filled spectral calibration lamps in astronomy.” Steven Magee CEng MIET - Q
- “The entire astronomical observatory team were installing a mercury argon spectral lamp (HgAr) during a training session when one of the workers smashed the mercury filled spectral lamp. We continued the training session with a new spectral lamp from stock. A week later I was at the doctors complaining of a variety of health conditions that were classic mercury poisoning.” Steven Magee CEng MIET - Q
- “In all of the workplaces that I have been in, broken mercury lamps were swept up with the nearest brush and pan and the broken glass thrown into the closest trash can. There were no records kept of mercury releases or where they had occurred.” Steven Magee CEng MIET - Q
- “During my career, I never received any training on how to deal with broken mercury lamps and the health hazards of the mercury released.” Steven Magee CEng MIET - Q
- “I had taken an obsolete astronomical spectral gas tube home from the observatory for use as an ornament. Many years later I broke the specialized gas tube in the home. In the days afterwards I started experiencing sickness that I had been reporting to my doctor during working at the high altitude observatory. My notes state: During the last few days my bones are starting to ache again and nerves are twitching in my body and face like they were when I worked at the Kitt Peak National Observatory (KPNO)...headaches...insomnia...zoning
out...tired...forgetful...confusion. 5 days earlier I had been atop Kitt Peak mountain and 4 days later the sheriff disconnected my electricity.” Steven Magee CEng MIET - Q

- “Had I been educated by my employers as to how hazardous mercury filled spectral lamps were, I would never have taken an obsolete mercury filled spectral lamp home.” Steven Magee CEng MIET - Q

- “I consider myself fortunate that I no longer live in the home where I broke a mercury filled astronomical spectral lamp.” Steven Magee CEng MIET - Q

- “Never buy a home from a mad scientist.” Steven Magee CEng MIET - Q
Mercury Vapor Detectors

- “I have no recollection of seeing a mercury vapor detector at facilities where mercury was in use.” Steven Magee CEng MIET - Q
- “The Mercury Vapour Indicator (MVI) is a revolutionary instrument accurately detecting hazardous mercury vapours in just 3 seconds! The instrument’s unique advantage is its dual beam UV absorption technology and ability to measure high concentrations of mercury without saturating; requiring no regeneration between readings, eliminating downtime.” [https://info.ionscience.com/mvi-mercury-detector](https://info.ionscience.com/mvi-mercury-detector)
- “The Tekran® Model 2537 Ambient Air Mercury Monitor was the first product developed by Tekran® and remains a driving force of innovation. The Model 2537 is the only analyzer available that is capable of automated, continuous, unattended atmospheric mercury speciation. Our instruments produce high-resolution, accurate data that continues to advance the understanding of mercury cycling in the environment.” [http://www.tekran.com/products/ambient-air/overview/](http://www.tekran.com/products/ambient-air/overview/)
Mercury Training Courses

- “While handling mercury systems in the employment of Columbia University and Dartmouth College, I have no recollection of receiving industry recognized health and safety training for the workplace hazards present.” Steven Magee CEng MIET - Q
- “Certain states do have 10 and/or 30 hour training, expiration, and renewal requirements… NEW HAMPSHIRE: State and local municipality funded projects of $100,000 or more, require that all employees have their OSHA 10 hour certification job before starting any work onsite. Employees who fail to obtain their 10 hour card after 15 days of starting work, will be removed from the jobsite and their employer can face penalties up to $2,500 and a civil penalty of $100 per employee for each day of noncompliance!…NEW YORK: Any public project where the contract is greater than $250,000, requires all employees to have their OSHA 10 hour training card prior to starting on a jobsite and turn in proof that they’ve done so. Once you have completed OSHA 10 training for work on Article 8 public projects, New York State does not require renewal. However, New York City does require renewal of the training every 5 years. NYC March 1, 2018 training requirements update: All workers onsite must be able to show that they have taken at least an OSHA 10 class within the previous five years. Supervisors are required to receive 60 hours of training, while new entrants to the construction workforce need to obtain a 10 hour OSHA training class and then a minimum of 40 hours of training to continue working.”
- “Mercury Awareness Course...The course covers the basics of mercury: its properties and characteristics; regulations and exposure limits; basic safety and personal protective measures; and release response for individuals performing work involving mercury or involving the possibility of mercury exposure. Training can be tailored to your specific work procedures and conditions and can include a practical demonstration. We can conduct sessions at our facility or a location of your choice.”
- “Handling Hazardous Materials. Learn to Safely Work with the Chemicals at Your Workplace. Becoming complacent or not staying up-to-date on the latest safety precautions and procedures can lead to dangerous situations, especially when working with hazardous chemicals. Having daily contact with hazardous materials, whether in a factory, a hospital or in the maritime field, can be extremely dangerous, and is not something to be taken lightly.”
- “OSHA General / Construction Industry — certified OSHA worker training. [10/30 hours]...HazCom 1910.1200 — employee right-to-know; site specific hazardous chemicals training. [2 & 4 hours]....Environmental Law Awareness — introduction and fundamentals of EPA regulation, 40 CFR and hazardous waste disposal. [4 & 8 hours]”
Oxygen Hazards

- “The closer you get to the Sun, the lower your blood oxygen levels go.” Steven Magee CEng MIET - Q

- "Levels of Oxygen Deficiency - Concentration of Oxygen Effects"

- “OSHA, FDA and DOT have guidelines developed for precautionary labels for use on oxygen cylinders and cryogenic vessels...the FDA requires "Rx Only" on the label, among a few other things” [http://applied-inc.com/new-osha-requirements-for-oxygen-cylinder-labels](http://applied-inc.com/new-osha-requirements-for-oxygen-cylinder-labels)

- “FDA Issues Final Rule Permitting Use of Symbols on Device Labeling...The final rule also now formally allows device manufacturers to use the Rx Only symbol in lieu of the longer prescription use only statement.” [http://www.fdalawblog.net/2016/06/fda-issues-final-rule-permitting-use-of-symbols-on-device-labeling/](http://www.fdalawblog.net/2016/06/fda-issues-final-rule-permitting-use-of-symbols-on-device-labeling/)

- "KEEP OUT OF REACH OF CHILDREN. WARNING! For emergency use only when administered by properly trained personnel for Oxygen deficiency and resuscitation. For all other medical applications, Rx ONLY. Uninterrupted use of high concentrations of Oxygen over a long duration, without monitoring its effects on Oxygen content of arterial blood, may be harmful. Use only with pressure reducing equipment and apparatus designed for Oxygen." [http://www.drugs.com/pro/oxygen.html](http://www.drugs.com/pro/oxygen.html)

- "Why do portable oxygen concentrators require a prescription? Like other medications, supplemental oxygen is a medical treatment and treatment is specific to the user. Your doctor may prescribe an oxygen flow rate, as well as the length of time you should use the oxygen each day." [http://www.domorewithoxygen.com/bid/340083/Do-Portable-Oxygen-Concentrators-Require-a-Prescription](http://www.domorewithoxygen.com/bid/340083/Do-Portable-Oxygen-Concentrators-Require-a-Prescription)


- "QUESTION: Why are compressed medical gases for medical use considered prescription drugs? ANSWER: Because their use as drugs, without the supervision of a licensed practitioner or by properly instructed emergency personnel, is not safe." [http://www.fda.gov/Drugs/GuidanceComplianceRegulatoryInformation/Guidances/ucm124716.htm](http://www.fda.gov/Drugs/GuidanceComplianceRegulatoryInformation/Guidances/ucm124716.htm)

- "Medical oxygen (or oxygen USP) is considered both a hazardous material by the U.S. Department of Transportation (DOT) and a prescription drug regulated by the U.S. Food and Drug Administration (FDA)." [http://www.homecaremag.com/law/jan-2014/protect-your-company-following-dots-oxygen-provider-regulations](http://www.homecaremag.com/law/jan-2014/protect-your-company-following-dots-oxygen-provider-regulations)

- "What are Prescription Drugs? A prescription drug refers to those medicines which must be prescribed by a medical professional and are regulated by the government. In the United States, a variety of medical professionals can authorize prescription drugs, including: physicians, nurse practitioners, dentists, veterinarians, psychologists and optometrists." [http://www.michaelshouse.com/prescription-drug-rehab/history-of/](http://www.michaelshouse.com/prescription-drug-rehab/history-of/)

- “We carry bottled oxygen on all of our climbs as a precaution and additional safety measure.
The oxygen canister is for use only in emergency situations. It is NOT used to assist clients who have not adequately acclimatized on their own to climb higher. The most immediate treatment for moderate and serious altitude sickness is descent. With Kilimanjaro's routes, it is always possible to descend, and descend quickly. Therefore, oxygen is used strictly to treat a stricken climber, when necessary, in conjunction with descent, to treat those with moderate and severe altitude sickness.” [https://www.ultimatekilimanjaro.com/acclimatization.htm](https://www.ultimatekilimanjaro.com/acclimatization.htm)

- "The goal of oxygen therapy is to maintain your blood oxygen at a level that meets your body’s demand for oxygen, usually above 89 percent. In general, oxygen is safe and effective when used correctly but, according to the American Thoracic Society, there are several recognizable hazards associated with its use that you should be aware of.” [http://www.inogen.com/blog/side-effects-oxygen-therapy/](http://www.inogen.com/blog/side-effects-oxygen-therapy/)
- "Patients with chronic obstructive pulmonary disease are at a particular risk of accumulating carbon dioxide if they are administered supplemental oxygen and these patients needs to be carefully monitored to prevent supplemental oxygen becoming dangerous rather than beneficial." [http://www.news-medical.net/health/Oxygen-Therapy-Side-Effects.aspx](http://www.news-medical.net/health/Oxygen-Therapy-Side-Effects.aspx)
- "Oxygen therapy is used to treat hypoxia. The concentration of oxygen required depends on the condition being treated. Inappropriate concentrations of oxygen may cause very serious problems for the patient - even death." [http://patient.info/doctor/prescribing-oxygen](http://patient.info/doctor/prescribing-oxygen)
- "When I was instructed to use medical oxygen to do my job at the W. M. Keck Observatory from 2001 to 2006, I was never told about the legal health information that is now posted on oxygen cylinders. My memories of the green medical oxygen cylinders that we would use daily is that they had no information on them and we were never given a recognized legal oxygen administration training course for routine daily use or a medical prescription from a doctor. We were shown the three oxygen cylinders at the facility and told to use them whenever we developed headaches, which was multiple times daily. It was common to find all three oxygen cylinders in use by other very high altitude sickened workers and to have to line up to get a turn on the magical medical gas." Steven Magee CEng MIET - Q
- "When I worked on the 13,796 feet very high altitude summit of Mauna Kea we were advised to only use the medical oxygen after the daily headaches appeared and that just 15 minutes use was all that was needed to clear up the headaches for a while before we would need it again. We were not advised to use medical oxygen continuously as the Federal Aviation Regulations advises pilots to do. We were not advised to use pulse oximeters to monitor our blood oxygen levels or that the company medical oxygen should have been routinely administered only with our doctors prescription." Steven Magee CEng MIET - Q
- “At the W.M. Keck Observatory on the very high altitude summit of Mauna Kea, there was no routine monitoring of mental functioning, blood oxygen levels, blood pressure or heart rate of summit workers.” Steven Magee CEng MIET - Q
- "A healthy person that uses medical oxygen to perform their job on a daily basis should expect to eventually become a sick person." Steven Magee CEng MIET - Q
- "Working on the summit of Mauna Kea was comparable to working on the hospital pulmonary ward with sick people sucking on oxygen cylinders." Steven Magee CEng MIET - Q
- “The most unhygienic thing that I observed during my time in very high altitude astronomy was dozens of workers all sharing the same oxygen administration mask for treating their daily oxygen starvation sicknesses.” Steven Magee CEng MIET - Q
- “How long can a patient go with low oxygen of 85 to 90% saturation? I am on oxygen 24 hrs a
Home oxygen is a PALLIATIVE intervention. Is NOT curative and generally when a patient is on home Oxygen, the MEDIAN survival time is 2 years. People on Home oxygen DO NOT SURVIVE for prolonged periods. The combination of the disease process that caused the chronic hypoxia, the right heart failure, the lack of mobility and the potential for complications ie infections and most definitely DVTs and PEs put these patients at a high risk of dying.  

The Oxygen Dilemma: Can Too Much O2 Kill? Without it, cells die. With too much, they die even faster...Evidence suggests that pumping in too much oxygen too quickly can strip the molecule of a single electron, creating a free radical. Free radicals, linked to rapid aging, are highly reactive with other molecules, including vital DNA and proteins, the destruction of which can damage or kill cells. Treating with too much oxygen, therefore, could increase the production of free radicals and make a bad situation even worse. 

Oxygen Inhalation: May cause breathing difficulty. Prolonged exposure to high oxygen levels (>75%) can cause central nervous system depression: signs/symptoms can include headache, dizziness, drowsiness, poor coordination, slowed reaction time, slurred speech, giddiness and unconsciousness. May cause coughing and chest pain. May cause lung damage. May cause soreness of the throat. 

Supplying oxygen to animals has been known to produce tissue damage, with toxicity increasing with the increase of oxygen concentrations and exposure pressures. End-organ damage from hyperoxia depends on both the concentration of oxygen administered and the oxygen pressure during exposure. Prolonged exposure to hyperbaric oxygen causes central nervous system and pulmonary toxicity, which results in atelectasis, pulmonary edema, and seizures. Lung damage may occur as a result of normobaric hyperoxia. 

Oxygen therapy is like a two-edged sword, at one edge oxygen is essential for human survival, while at the other edge it may become toxic at an elevated partial pressure. This is a hazard, especially in intensive care units, where oxygen therapy may be administered over a period of days. Oxygen toxicity usually manifests in one of several forms including central nervous system manifestations, pulmonary manifestations, and ocular manifestations, especially in premature neonates. The major factors affecting the onset and the severity of the toxicity are the concentration of the gas used, the duration of the exposure, and the susceptibility of the individual person.

What Are the Side Effects of Oxygen Therapy?...Pulmonary Oxygen Toxicity. When it comes to oxygen therapy, there can be too much of a good thing. Prolonged administration of highly concentrated oxygen can potentially damage the lung lining tissues and air sacs, a condition known as pulmonary oxygen toxicity. 

Although supplemental oxygen is valuable in many clinical situations, excessive or inappropriate supplemental oxygen can be deleterious. According to human and animal studies, high concentrations of inspired oxygen can cause a spectrum of lung injury, ranging from mild tracheobronchitis to diffuse alveolar damage (DAD). The latter is histologically
indistinguishable from that observed in the acute respiratory distress syndrome (ARDS).” http://www.uptodate.com/contents/oxygen-toxicity

- “Exposure time, atmospheric pressure, and fraction of inspired O2 (FIO2) determine the cumulative O2 dose leading to toxicity.” https://www.hindawi.com/journals/nrp/2011/260482/
- “We have always known that oxygen is necessary for all animal life, and that lack of oxygen damages tissues. It is beyond argument that patients who are hypoxic must receive supplemental oxygen. What we’ve not always known is that too much oxygen can harm patients in a number of ways... These can damage tissues throughout the body, but of particular concern are lung, heart and brain tissues.” http://www.emsworld.com/article/10915304/the-dangers-of-giving-too-much-oxygen

- “Like every other drug, oxygen administration has complications. Common complications include skin irritation and breakdown as well as a drying of the mucous membranes. Less common but more serious complications include oxygen toxicity, absorbative atelectasis and carbon dioxide narcosis.” http://www.emsworld.com/article/10523286/oxygen-toxicity

- “In high altitude astronomical facilities we routinely discharged large amounts of nitrogen gas into closed spaces.  We were never informed by the astronomy management team about the abnormally low oxygen environments that the use of liquid nitrogen creates, how long term exposure to it manifests itself in human health and the resulting abnormal mental behaviors.” Steven Magee CEng MIET - Q

- “Although the body requires oxygen for metabolism, low oxygen levels normally do not stimulate breathing. Rather, breathing is stimulated by higher carbon dioxide levels. As a result, breathing low-pressure air or a gas mixture with no oxygen at all (such as pure nitrogen) can lead to loss of consciousness without ever experiencing air hunger. This is especially perilous for high-altitude fighter pilots. It is also why flight attendants instruct passengers, in case of loss of cabin pressure, to apply the oxygen mask to themselves first before helping others; otherwise, one risks losing consciousness.” https://en.wikipedia.org/wiki/Carbon_dioxide#Regulation_of_respiration

- "My memories of my time in high altitude astronomy indicate that there were no oxygen concentration monitors or alarms in the areas that liquid nitrogen was in use inside of the astronomical facilities where I had worked.” Steven Magee CEng MIET

- “Astronomy staff that routinely discharged industrial gas into the indoor environment at high altitudes did not wear oxygen deficiency monitors.” Steven Magee CEng MIET - Q

- “This fits in with what I saw in staff in astronomical facilities and was reporting to the management team: 10-14% Oxygen: Emotional upset, abnormal fatigue, disturbed respiration.” Steven Magee CEng MIET - Q http://www.centralwelding.com/MSDS-P/Nitrogen,%20Liquid.pdf

- “A good rule of thumb is that women normally need oxygen about 2,000 feet sooner than men. Of course there are exceptions.” http://www.c-f-c.com/supportdocs/abo2.htm

- “In 2001 workers were using intermittent oxygen numerous times daily on the very high altitude summit of Mauna Kea in Hawaii. By the time I left in 2006 some workers were using portable oxygen units and nasal cannula's for continuous medical oxygen administration for the treatment of altitude sickness.” Steven Magee CEng MIET - Q

- “I never met anyone in high altitude astronomy that had a prescription for daily medical oxygen use.” Steven Magee CEng MIET - Q

- “Very high altitude workers were using medical oxygen to treat numerous health conditions that
included fatigue, confusion, headaches, feeling faint and digestive issues.” Steven Magee CEng MIET - Q

- “There are numerous types of oxygen available for purchase. These are industrial oxygen – generally for welding and not suitable for human consumption, aviation oxygen – regulated by the FAA rules, medical oxygen - regulated by the FDA and DOT. It was unclear what type of oxygen was inside the oxygen cylinders that employees were using at the summit of Mauna Kea and most employees assumed it was medical oxygen for treating their medical conditions.” Steven Magee CEng MIET – Q https://www.scubaboard.com/community/threads/medical-vs-aviation-grade-o2.349095/
**Nitrogen Hazards**

- “Health effects of nitrogen - Nitrates and nitrites are known to cause several health effects. These are the most common effects: Reactions with haemoglobin in blood, causing the oxygen carrying capacity of the blood to decrease (nitrite). Decreased functioning of the thyroid gland (nitrate). Vitamin A shortages (nitrate). Fashioning of nitro amines, which are known as one of the most common causes of cancer (nitrates and nitrites)” [http://www.lenntech.com/periodic/elements/n.htm]
- “When I worked at the W. M. Keck Observatory on the 13,796 feet very high altitude summit of Mauna Kea, we would routinely be engulfed in cold clouds of helium and nitrogen gas as we discharged it into the video camera systems daily. The management team never warned us that we were in a hazardous oxygen deprived environment during this activity that was known for its ability to adversely affect physical and mental health, and possibly bring on death by asphyxiation.” Steven Magee CEng MIET - Q
- “Five technicians are asphyxiated while setting up a ground test for the space shuttle Columbia, then in preparation for STS-1, the first operational shuttle mission. Two of them die. The accident occurred during a nitrogen purge of the orbiter.” [http://www.wired.com/2009/03/march-19-1981-shuttle-columbias-first-fatalities/]
- “Nitrogen tends to displace Oxygen from the air, whenever it comes in contact with it. Thus if a continuous flow of Nitrogen is released into air, the Oxygen level in the air depletes very fast and can choke a person who is breathing this Nitrogen rich air.” [http://industrialplantsafety.com/dangers-of-nitrogen.html]
- “Being odorless, colorless, tasteless, and nonirritating, nitrogen has no properties that can warn people of its presence. Inhalation of excessive amounts of nitrogen can cause dizziness, nausea, vomiting, loss of consciousness, and death. Death may result from errors in judgment, confusion, or loss of consciousness, which prevent self-rescue.” [http://www.airproducts.com.tw/~media/downloads/article/U/en-use-nitrogen-safely-312-12-023.pdf]
- “Nitrogen Gas Safety Hazards: Nitrogen can cause oxygen deficiencies. The danger will increase if nitrogen is used in a confined space where limited air or ventilation exist. A simple safety tip for operation involving nitrogen is to measure oxygen contain in the atmosphere by using oxygen detector such as GA24XT-X form BW Technologies.” [http://chemicalengineeringmagazine.com/nitrogen-gas-safety-hazards/]
- “Failure to detect an oxygen deficient (nitrogen-enriched) atmosphere was a significant factor in several incidents.” [http://www.csb.gov/assets/1/19/SB-Nitrogen-6-11-031.pdf]
- “Nitrogen: The Silent Killer - Nitrogen is an invisible, tasteless and odorless gas that comprises about 78 percent of the air we breathe. But its potential to kill workers in or near confined spaces should never be underestimated.” [http://ehstoday.com/safety/confined-spaces/ehs_imp_38471]
- “When I worked in astronomy, I routinely observed young college and university students working with liquid nitrogen and breathing nitrogen gas as they discharged it into the indoor environment at high altitude.” Steven Magee CEng MIET - Q
- “My memories of high altitude astronomy indicate that up to four (4) liquid nitrogen flasks were left venting gas into a small indoor workshop and office area where workers were permanently stationed.” Steven Magee CEng MIET - Q
“New requirements for use and storage of liquid nitrogen, dry ice...An employee of a non-CAP-accredited laboratory in Georgia was critically injured in 2017 when an LN2 leak occurred. LN2 converts to colorless, odorless gas and replaces environmental oxygen. The unsuspecting laboratory worker was burned and then fell unconscious. One of the first responders who arrived on the scene to rescue her died of asphyxiation. The employee survived...All laboratories must know that proper ventilation and high turnover of air in storage and usage areas are imperative, he adds. Other additions to the requirement call for “training on the safe handling of LN2 and dry ice” and signs marking areas where LN2 and dry ice are used and stored. “The training referenced in the note alerts labs to provide training specific to LN2 and dry ice,” Dr. West says. “We wanted to bring attention to the need to understand certain things about safe use of LN2, including storage tanks,” for example.”...Because LN2 is a heavy gas, it falls to the floor first and fills the room from floor to ceiling. “If an alarm is six to eight feet above the floor, the entire room would have to fill with nitrogen before the alarm goes off,” he says. “If a lab worker were seated on the floor or on a low stool, the alarm would be too late for them. They could be passed out or dead by the time it sounded. Sensors must be at the height you are working, more likely waist level than eye level.””

https://www.captodayonline.com/new-requirements-use-storage-liquid-nitrogen-dry-ice/
Helium Hazards

- “After inhaling helium, the body's oxygen level can plummet to a hazardous level in a matter of seconds.” [http://www.slate.com/articles/news_and_politics/explainer/2006/06/stay_out_of_that_balloon.html](http://www.slate.com/articles/news_and_politics/explainer/2006/06/stay_out_of_that_balloon.html)
- “On February 4, 2015 it was revealed that during the recording of their main TV show on January 28, a 12-year-old member (name withheld) of Japanese all-girl singing group 3B Junior suffered from air embolism, losing consciousness and falling in a coma as a result of air bubbles blocking the flow of blood to the brain, after inhaling huge quantities of helium as part of a game. The incident was not made public until a week later. The staff of TV Asahi held an emergency press conference to communicate that the member had been taken to the hospital and is showing signs of rehabilitation such as moving eyes and limbs, but her consciousness has not been sufficiently recovered as of yet. Police have launched an investigation due to a neglect of safety measures.” [https://en.wikipedia.org/wiki/Helium](https://en.wikipedia.org/wiki/Helium)
- “Inhalation of this product may cause dizziness, an irregular heartbeat, narcosis, nausea or asphyxiation. NEVER INHALED, OR ALLOW TO BE INHALED, EVEN FOR A SHORT PERIOD, HELIUM CONTAINED IN A BALLOON, A GAS CONTAINER OR FILLING EQUIPMENT. INHALATION CAN CAUSE DEATH OR SEVERE DAMAGES.” [http://www.centralwelding.com/MSDS-P/Helium.pdf](http://www.centralwelding.com/MSDS-P/Helium.pdf)
- “Most terrestrial helium present today is created by the natural radioactive decay of heavy radioactive elements (thorium and uranium, although there are other examples), as the alpha particles emitted by such decays consist of helium-4 nuclei. This radiogenic helium is trapped with natural gas in concentrations as great as 7% by volume, from which it is extracted commercially by a low-temperature separation process called fractional distillation.” [https://en.wikipedia.org/wiki/Helium](https://en.wikipedia.org/wiki/Helium)
Carbon Dioxide Hazards

- “Snow cleaning of the world's largest telescope mirrors was an impressive sight. The optics technicians would climb into a huge telescopic boom lift and spray immense clouds of cold carbon dioxide snow and gas onto the ten meter diameter mirrors high above the floor indoors. It would cause some of the accumulated dirt to magically fall off, leaving it less dirty.” Steven Magee CEng MIET - Q
- “the telescope mirrors are periodically “dusted,” not with Windex, but with a spray of carbon dioxide snow. The carbon dioxide particles and gas, which are nondestructive, nonabrasive, residue-free and environmentally friendly, blow dust and grit from the mirror surface through a process called sublimation.”
- “Occupational CO2 exposure limits have been set in the United States at 0.5% (5000 ppm) for an eight-hour period. At this CO2 concentration, International Space Station crew experienced headaches, lethargy, mental slowness, emotional irritation, and sleep disruption. Studies in animals at 0.5% CO2 have demonstrated kidney calcification and bone loss after eight weeks of exposure. A study of humans exposed in 2.5 hour sessions demonstrated significant effects on cognitive abilities at concentrations as low as 0.1% (1000ppm) CO2 likely due to CO2 induced increases in cerebral blood flow. Another study observed a decline in basic activity level and information usage at 1000 ppm, when compared to 500 ppm.”
- “By January 1993, Biosphere 2’s carbon dioxide levels were 12 times that of the outside, and oxygen levels were what mountaineers get at 17,000 feet. The crew’s doctor was having trouble adding up simple figures and disqualified himself from duty.”
- “Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.”
- “Carbon Dioxide is an asphyxiant and a powerful cerebral vasodilator. If the concentration of Carbon Dioxide reaches 10% or more, suffocation can occur within minutes. At concentrations between 2 and 10%, Carbon Dioxide can cause nausea, dizziness, headache, mental confusion, increased blood pressure and respiratory rate. Carbon Dioxide initially stimulates respiration and then causes respiratory depression. High concentrations result in narcosis.”
- “The Link Between Carbon Dioxide Retention and Sleep…Carbon dioxide intoxication or carbon dioxide poisoning, known, respectively, as hypercapnia or hypercarbia, occurs when a person has too much of the gas in the body. This usually happens when someone is exposed to elevated levels of carbon dioxide for a long period of time...Many people have no symptoms of hypercapnia, but if they do, they're likely to feel drowsy or find it hard to think straight. Severe hypercapnia, on the other hand, can cause noticeable symptoms, such as increased heart rate, blood pressure or muscle twitches. It can lead to respiratory failure if untreated.”
- “Sleeping in a Closed Room – Indoor CO2 Analyze...Time-Graph of CO2 PPM Level while sleeping in a closed room. What you can clearly see on the chart is how each change in the rooms occupation affects the CO2 Level quite quickly. Also what is astonishing is that we passed 2000 ppm at ~1 am. This is just 2 hours after we went to sleep in a relatively fresh air. At
4.30am i woke up (i usually wake up then) and the air felt quite stuffy (maybe also because i Knew the PPM). But then i decided to open the door wide and give my wife and baby some fresh air. If i had left the door shut, the level would have easily reached 4500 ppm until 7am.”

- “Carbon Dioxide, Hypoxia, Epinephrine Cardiac "Sensitization" Tests...With high and prolonged exposures to carbon dioxide, or prolonged strenuous exercise while breathing carbon dioxide, the frequency of cardiac arrhythmias increases.”
- “Carbon Dioxide “Alarm System” Might Help Explain Anxiety Disorders...For most people, a little stale air isn’t much of a problem—a lot of carbon dioxide has to build up before they start to panic. But for some, inhaling even a whiff or two of CO2 can provoke an immediate sense of dread. In fact, a prominent psychiatric theory holds that an overly sensitive detection mechanism for the gas, or “suffocation false alarm,” makes these folks particularly susceptible to panic disorders and other anxiety problems.”
- “Carbon dioxide hypersensitivity, hyperventilation, and panic disorder...RESULTS: Some panic patients have a chronic, subtle respiratory disturbance. Acute hyperventilation is neither necessary nor sufficient for panic to occur. Respiratory abnormalities in panic patients may adaptively aim at coping with a hypersensitive CO2 chemoreceptor system. Pharmacologic panicogens also stimulate the respiratory system, causing hyperventilation. Triggering this hypersensitive respiratory control mechanism may incite panic. Antipanic medications may reset the receptor threshold. Misattribution and catastrophic interpretation of somatic symptoms or the sense of loss of control may contribute to panic symptoms. Behavioral interventions such as desensitization or breathing retraining may block the full-blown attack. Cognitive strategies through cognitive control of respiration may supplement and accentuate these interventions.”
- “Panic Attacks as a Problem of pH. Study casts new light on the brain mechanisms behind recurrent bouts of intense anxiety...Carbon dioxide acts like an acid in the body and the brain. Several of the experiments described in the Iowa paper showed that inhaling elevated concentrations of carbon dioxide triggered strong fear reactions in normal mice, and that some of these fear reactions required the presence of the acid-sensing protein in the amygdala. These experiments are especially relevant to understanding panic disorder. One of the most consistent findings in patients with panic disorder is that they are unusually sensitive to carbon dioxide inhalation and other laboratory procedures that increase brain acidity. Most patients with panic disorder will experience a panic attack when they inhale air containing 35% carbon dioxide, while most healthy volunteers will not.”
- “The Relationship between Central Carbon Dioxide Sensitivity and Clinical Features in Patients with Chronic Airways Obstruction...A technique has been developed which enables respiratory motor output to be measured independently of lung mechanics. The maximum rate of change of pressure at the mouth during initial transient occlusion of the airway, (dP/dt) max., represents the rate of isometric force development by the inspiratory muscles. This technique was used to study central CO2 sensitivity in 40 patients with chronic airways obstruction. Subnormal CO2 sensitivity was associated with chronic cough and sputum production, relatively mild dyspnoea, raised arterial CO2 tension, hypoxaemia, poly-cythaemia and cor pulmonale. Normal CO2 sensitivity was associated with severe dyspnoea, normal blood gas tensions, and allergic
“Genetic differences may alter carbon dioxide sensitivity, contribute to changes in astronauts' eyes...Genetic variation may increase susceptibility of some astronauts to develop higher-than-normal carbon dioxide levels in the blood, which may contribute to eye abnormalities, including grooved bands on the retina in the eye and swelling of the optic nerve, new research indicates.”

“Decreased Carbon Dioxide Sensitivity in Infants of Substance-Abusing Mothers...Results. The gestational ages by obstetrical dating and examination of the infants were not different, although birth weights and birth lengths were lower in the group of ISAMs. Other demographic data were not different, and there were no differences in the infants’ median ages at the time of study or in maternal use of tobacco and alcohol. The two groups had comparable baseline (room air) ET-CO2 levels, respiratory rates, tidal volumes, and minute ventilation. When compared with the group of ISAMs, the drug-free group had markedly increased tidal volume and minute ventilation on exposure to 4% carbon dioxide. These increases accounted for the difference in sensitivity to carbon dioxide, calculated as the change in minute ventilation per unit change in ET-CO2 (milliliters per kg/min per mm Hg). The sensitivity to carbon dioxide of control infants was 48.66 ± 7.14 (mean ± SE), whereas that of ISAMs was 16.28 ± 3.14.”

“Carbon dioxide sensitivity and personality...Abstract. 33 U.S. Army enlisted men underwent 3 or 4 trials of a rebreathing test for CO2 sensitivity. During each trial the increase in the S's ventilation was related to increase in alveolar CO2. Ss were also administered the MMPI. Elevations were noted on nearly all standard MMPI scales for low responders to CO2, with differences between high and low responders reaching statistical significance on several scales. Differences in personality traits between high and low responders to CO2 suggest that this test may be useful for psychosomatic investigations. The interpretation of CO2 sensitivity as an index of the excitatory level of the respiratory center in the medulla is discussed.”

“Scientists differ on climate’s carbon dioxide sensitivity...Scientists have yet to settle one of the biggest questions of warming: the climate’s carbon dioxide sensitivity. How much more carbon dioxide can the atmosphere absorb – and how will life on Earth respond – before the global temperature ticks past the political milestones of 1.5 °C and 2 °C above the average levels for most of human history?”

“Carbon Dioxide Inside Can Be Harmful Too. New studies show that CO2 inside buildings could be just as harmful as outside... scientists found impairments in cognitive function test scores at CO2 concentrations in the 950-1,000 ppm range, and significantly worse performance when CO2 rose to 1500 and 2,500 ppm. The researchers stressed that carbon dioxide levels in indoor environments, especially schools, frequently rise above 1,000 ppm.”
Industrial Gas Use In Chemical Weapons

- “A chemical weapon (CW) is a specialized munition that uses chemicals formulated to inflict death or harm on humans.” [https://en.wikipedia.org/wiki/Chemical_weapon](https://en.wikipedia.org/wiki/Chemical_weapon)
- “During World War II, naval personnel who were exposed to mustard gas during military action were found to have toxic changes in the bone marrow cells that develop into blood cells. During that same period, the US Army was studying a number of chemicals related to mustard gas to develop more effective agents for war and also develop protective measures. In the course of that work, a compound called nitrogen mustard was studied and found to work against a cancer of the lymph nodes called lymphoma. This agent served as the model for a long series of similar but more effective agents (called alkylating agents) that killed rapidly growing cancer cells by damaging their DNA.” [https://www.cancer.org/cancer/cancer-basics/history-of-cancer/cancer-treatment-chemo.html](https://www.cancer.org/cancer/cancer-basics/history-of-cancer/cancer-treatment-chemo.html)
- “Choking agents injure an individual mainly in the respiratory tract, i.e. in the nose, throat, and particularly, the lungs. In extreme cases, membranes swell, the lungs become filled with liquid and death results from lack of oxygen; thus, these agents “choke” the unprotected individuals. Fatalities of this type are referred to as ‘dry-land drownings.’” [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3148621/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3148621/)
Cryogenic & Industrial Gas Safety Courses

- “I never met anyone in astronomy that stated that they had been sent on an industry recognized training course for the safe handling and use of cryogenic liquids & industrial gas.” Steven Magee CEng MIET - Q
- “BOC Cryogenic Gas Safety Courses. All users of cryogenic gases should be fully aware of the associated risks and how they can be safely used. BOC offers workshops and online training options suitable for anyone using, handling, storing, or responsible for the safety of cryogenic gases...A half-day, instructor-led workshop at your own site. Delegates will be made aware of the hazards of cryogenic gases so they can identify the risks and adopt safe working practices.” [BOC website](https://www.boconline.co.uk/en/services/safety-training/cryogenic-gas-workshop/cryogenic-gas-safety-courses.html)
- “Cryogenics Safety Solutions, Inc. LN2 Safety Course. Cryogenic Gas Safety Awareness Training workshop. The hazards of handling and storing cryogenic gases are well known – from nasty cases of frostbite, to the problems of leaks and spills. If you could safeguard your organization and employees from unnecessary harm in just three hours – wouldn’t you?” [Cryogenics Safety Solutions](http://cryogenicsafetytraining.com/training/)
- “PGS Training Compressed & Cryogenic Gases Safety Open Workshops...This training ensures your organisation complies with obligations to train all staff exposed to risk. Attendance gives staff information to understand the specific hazards associated with compressed gases and cryogens such as cold, oxygen deficiency & enrichment and those encountered during decanting procedures, resulting in an assured workforce and a safer workplace.” [PGS Training](https://pgstraining.com/safety-training/compressed-cryogenic-gases-open-workshops/)
- “Taylor & Taylor Consultants are a leading international supplier of compressed and cryogenic gas safety solutions and training services to end-users in a broad spectrum of different industries, processes and applications. We are acutely aware of the hazards and risks associated with gases, gas cylinders, supply systems, equipment and processes.” [Taylor & Taylor Consultants](http://www.taylorandtaylorconsultants.com/index.php/services/compressed-cryogenic-gas-safety-training.html)
Professions That Breath Gas

- **Actors & Performers**
  - “Voices Fading in the Fog / Performers say chemicals in synthetic mists on stage are health risk...The citation concludes that opera employees suffered "adverse physical symptoms as a result of theatrical smoke and fog" including "coughing, sore throat, chest tightness and shortness of breath."” [https://www.sfgate.com/health/article/V oices-Fading-in-the-Fog-Performers-say-2969831.php](https://www.sfgate.com/health/article/V oices-Fading-in-the-Fog-Performers-say-2969831.php)
  - “Theatrical Haze Health Concerns and the Effect on Actors... I've often been sickened by the use of both water- and oil-based fog and want to see if there's a way to convince producers that its use is not in the best interest of either the cast or audience members.” [https://www.backstage.com/advice-for-actors/the-working-actor/theatrical-haze-health-concerns-and-the-effect-on-actors/](https://www.backstage.com/advice-for-actors/the-working-actor/theatrical-haze-health-concerns-and-the-effect-on-actors/)
  - "U2 tour: Berlin show cancelled due to Bono voice issues...She told BBC News that Bono "complained his voice had gone due to smoke from smoke machines". He said he would either cancel or take a short break, but after 30 minutes it was announced the concert was cancelled." [https://www.bbc.com/news/entertainment-arts-45386145](https://www.bbc.com/news/entertainment-arts-45386145)

- **Air Conditioning Workers**
  - “Side Effects of Breathing Freon or Other Refrigerants...Refrigerant poisoning can result from exposure, according to UMMC. Symptoms include throat swelling, difficulty breathing, severe throat pain, loss of vision, burning of the eyes, nose, lips and tongue, burns of the esophagus, vomiting blood, blood in the stool, severe abdominal pain, abnormal heart rhythm and circulatory collapse. Death is possible. Emergency medical care is required. Outcome after refrigerant poisoning depends on how severe the poisoning was, and how fast medical help began. Irreversible brain damage and severe lung damage can result.” [https://www.livestrong.com/article/174753-side-effects-of-breathing-freon-or-other-refrigerants/](https://www.livestrong.com/article/174753-side-effects-of-breathing-freon-or-other-refrigerants/)

- **Automobile Workers**
  - “5 Most Dangerous Automotive Chemicals in the Workshop...Almost all forms of solvents are toxic and this poses a great health risk to the workers in the automotive industry who use these solvents daily. Diesel fumes can also cause severe health challenges to mechanics; they can suffer from breathing problems like asthma, allergic reactions, and compromised immune systems. Brain damage has also been identified as one of the potential effects of these poisons.” [https://www.alsco.com.au/2017/06/dangerous-chemicals-automotive-workshop/](https://www.alsco.com.au/2017/06/dangerous-chemicals-automotive-workshop/)

- **Gas Workers**
  - “Threats from Fracking-Related Air Pollution...A growing body of evidence shows that people both near and far from oil and gas drilling are exposed to fracking-related air pollution that can cause at least five major types of health impacts, according to a new comprehensive analysis of scientific studies to-date by the Natural Resources Defense Council. The health impacts include respiratory problems, birth defects, blood disorders, cancer and nervous system impacts, raising serious concerns for workers and people living closest to wells, as well as entire regions with high volumes of oil and gas activity.” [https://www.nrdc.org/media/2014/141216](https://www.nrdc.org/media/2014/141216)

- **Medical Professionals**
“Environmental Hazards for the Nurse as a Worker...Exposure to waste anesthetic gases may occur in operating rooms, labor and delivery, and recovery rooms. Long-term exposure to these agents have been associated with an increased risk of renal (methoxyflurane) and hepatic (halothane) disorders and have also been correlated with an increased risk of spontaneous abortions and congenital abnormalities (nitrous oxide) in exposed workers.”
https://www.ncbi.nlm.nih.gov/books/NBK232400/

Firefighters
“After the Fire – Are You Protected From Deadly Gases?...Smoke contains many toxic gases, such as carbon monoxide (CO) and hydrogen cyanide (HCN), which are silent killers. These two compounds are known as the “Toxic Twins” because they attack the body in poisonous ways.”
http://www.indsci.com/the-monitor-blog/fire-gases/

Researchers
“Physical Hazards in the Laboratory... Commonly used cryogenic materials include the liquids nitrogen, argon, oxygen, and helium...Oxygen deficiency: If kept in an enclosed, poorly ventilated space (like a car with closed windows) the carbon dioxide evolved from dry ice can displace oxygen resulting in a suffocation hazard. Dry ice must only be kept in well ventilated areas.”

Restaurant Workers
“Dry ice – a useful form of carbon dioxide, but still dangerous...The woman was providing catering services and she had stored boxes and coolers of ice cream packed with dry ice in the back of her SUV. During her journey, the dry ice had started to turn to CO2 gas and she had failed to roll down her windows, meaning her car was not well ventilated. The CO2 displaced the oxygen in her car, causing her to pass out, and she was found in the middle of an intersection with her foot still on the gas pedal and the SUV in drive. Unconsciousness is just one of the physiological effects of CO2, as it can also cause drowsiness, reduced hearing, increased heart rate and blood pressure, headaches, tremors and dizziness, to name a few. Luckily the woman recovered from CO2 poisoning, however an increased concentration of the gas could have resulted in her death.”
https://www.analoxsensortechnology.com/blog/2016/03/10/dry-ice-co2/

Pilots, Air Cabin Crew & Frequent Fliers
“Former pilot says contaminated air on planes is 'like breathing car exhaust fumes'...Dr Susan Michaelis said air crew and frequent fliers are being let down by gaps in health and safety regulation which allow the regulators to “turn a blind eye” to the hazard of chronic exposure to low doses of poisonous chemicals in cabin air, as well as high-dose “fume events” which can leave pilots disoriented.”
http://www.heraldscotland.com/news/15540477.Former_pilot_says_contaminated_air_on_planes_is__like_breathing_car_exhaust_fumes_/
“Sewer Gas...Symptoms of headache, nausea, dizziness, or drowsiness may indicate exposure to an odorless gas like methane or carbon monoxide, or to hydrogen sulfide, which smells of rotten eggs. Anyone experiencing severe symptoms should seek immediate medical care.” https://www.dhs.wisconsin.gov/air/sewergas.htm

- **Welders**
  - “Are There Links Between Hazardous Welding Fumes and Brain Damage?...It is a well known fact that gases and fumes in welding smoke are toxic and can harm many different organs of the body. Multiple research studies show that welders have increased risk of many long-term diseases and chronic health problems, including cancer, and there definitely is evidence that brain damage is a danger.” http://kemperamerica.com/welding-fumes-brain-damage/
  - “Welding Fume Exposure Health Effects – Acute and Chronic...There is a variety of components of welded materials and welding methods that may have chronic detrimental effects, including permanent disability, to welders. They include Lead (Pb), Cadmium (Cd), Beryllium (Be), Mercury (Hg), fluorides from fluxes, Iron (Fe), Nickel (Ni), Copper (Cu), Aluminum (Al), and of course Carbon Monoxide (CO) and Carbon Dioxide (CO2). Chronic effects of exposure to the variety of welding elements can take the form of many serious illnesses.” https://www.atlenv.com/welding-fume-testing-and-hazard-assessment/
Multiple Chemical Sensitivity (MCS) From Breathing Abnormal Or Polluted Air

- “In 2019, it had emerged that I had a hypersensitivity to polluted indoor air that would cause daytime sleepiness, chronic fatigue and malaise. Thoroughly ventilating the indoor environment with fresh outdoor air daily would reduce the symptoms. The medical profession calls this Multiple Chemical Sensitivity (MCS).” Steven Magee CEng MIET - Q
- “Chemical Sensitivity Foundation” http://www.chemicalsensitivityfoundation.org/index.html
- “MULTIPLE CHEMICAL SENSITIVITY. People with multiple chemical sensitivity (MCS) are made sick by exposures to low levels of many common chemicals – such as perfume, pesticides, tobacco smoke, fresh paint, new carpets, air “fresheners,” new building materials, vehicle exhaust, solvents, industrial fumes, and many cleaning products. Many of these chemicals can make anyone sick at high levels, but chemically sensitive people can become extremely ill after exposures to even minute amounts of these substances. Reactions can occur after chemicals are inhaled, ingested, or absorbed through the skin. Chemically sensitive people also frequently react to foods, drugs, mold, pollen, and electromagnetic fields.” http://annmccampbell.com/multiple-chemical-sensitivity/
- “Multiple Chemical Sensitivity & Indoor Air Quality...Mulitple Chemical Sensitivity (MCS), once widely regarded with skepticism, is a growing health concern for many Americans. The October 2006 issue of National Geographic magazine features an in-depth article about the chemical pollution within our bodies and the increasing prevalence of MCS. Most of the problematic chemicals did not exist until after World War II, when petrochemicals (petroleum-based chemicals) were synthesized. Many pesticides, synthetic fragrances, cleaning products, and detergents are made from toxic petrochemicals. These chemicals can be found all around us, especially inside the tightly sealed walls of homes, offices, and automobiles.” https://www.achooallergy.com/learning/multiple-chemical-sensitivity-indoor-air-quality/
- “Why Air Quality Testing for VOCs Usually Isn't Helpful for People with MCS... testing to determine airborne chemical exposure levels is only useful when one's goal is to compare these values with health and safety guidelines that have been established based upon known health risk. These exposure guidelines do not take into account, however, the potential for various chemical compounds to trigger an individual hypersensitivity reaction and cannot be used to determine the acceptability of an environment for a sensitized person.” http://www.chemicalsensitivityfoundation.org/air-quality-testing.html
- “Diagnostic Markers of Multiple Chemical Sensitivity...Patients who present with complaints of MCS deserve a comprehensive objective evaluation. If this is performed, a high percentage will
be shown to have abnormal test results. This is true if the central and peripheral nervous systems as well as pulmonary and immune functions are tested. Also, anatomical changes are frequently found in the nasal passages on close inspection. By contrast, CBC and blood chemistry are usually within normal limits. So are findings on general physical examination.”

https://www.ncbi.nlm.nih.gov/books/NBK234795/

• “What Is Multiple Chemical Sensitivity (MCS)?...Symptoms can range from minor annoyances (headache, runny nose) to life-threatening reactions (seizures, anaphalaxis). They vary greatly for each patient regarding frequency, intensity, inhalation or dermal exposure. Symptoms are multi-system, have many overlaps with ME/CFS and FM, can be very debilitating and can include: Fatigue (chronic), feeling of weakness, hyperactivity, restlessness ;nausea, vomiting, diarrhea, constipation, bloating, intestinal aches/pains; anxiety, irritability, depression; variable blurred vision; headaches, dizziness, insomnia, sleepiness; irregular, skipped, rapid, or slow heart beats, chest pain, high/low blood pressure; asthma; poor memory, comprehension, concentration or physical coordination, confusion; arthritic pain in joint/s, stiffness, muscle pain, muscular exercise intolerance; sinus problems, hay fever; acne, hives, rash, bruising easily, hair loss, flushing, hot flashes, excessive sweating; anaphylaxis, asthma, chronic cough, gagging, sore throat, hoarseness, voice loss; frequent urination, frequent ‘Urinary Tract Infections’, Aching testis/ovaries; Weight problems (under/overweight), water retention; and inflamed lymph glands, frequent unknown illness or infection.” https://emerge.org.au/what-is-multiple-chemical-sensitivity-mcs/
B12 Deficiencies From Breathing Abnormal Or Polluted Air

- “Impaired vitamin B12 metabolic status in healthcare workers...Previous studies demonstrated inactivation of vitamin B12 by nitrous oxide (N2O). The intraoperative exposure to N2O was shown to induce megaloblastic anaemia and myelopathy in subjects with subclinical vitamin B12 deficiency...Exposure to N2O in healthcare workers is associated with alterations of vitamin B12 metabolic status, the extent of which depends on the level of exposure.”

- “Megaloblastic anemia (or megaloblastic anaemia) is an anemia (of macrocytic classification) that results from inhibition of DNA synthesis during red blood cell production. When DNA synthesis is impaired, the cell cycle cannot progress from the G2 growth stage to the mitosis (M) stage. This leads to continuing cell growth without division, which presents as macrocytosis. Megaloblastic anemia has a rather slow onset, especially when compared to that of other anemias. The defect in red cell DNA synthesis is most often due to hypovitaminosis, specifically a deficiency of vitamin B12 and/or folic acid.”
  [https://en.wikipedia.org/wiki/Megaloblastic_anemia](https://en.wikipedia.org/wiki/Megaloblastic_anemia)

- “Myelopathy describes any neurologic deficit related to the spinal cord. When due to trauma, it is known as (acute) spinal cord injury. When inflammatory, it is known as myelitis. Disease that is vascular in nature is known as vascular myelopathy. The most common form of myelopathy in human, cervical spondylotic myelopathy (CSM), is caused by arthritic changes (spondylosis) of the cervical spine, which result in narrowing of the spinal canal (spinal stenosis) ultimately causing compression of the spinal cord. In Asian populations, spinal cord compression often occurs due to a different, inflammatory process affecting the posterior longitudinal ligament.”
  [https://en.wikipedia.org/wiki/Myelopathy](https://en.wikipedia.org/wiki/Myelopathy)

- “B12 the Antidote...Have you been exposed to carbon monoxide, hydrogen sulphide, cyanide, natural gas, chemical toxins, heavy metals or moulds? If so your health may improve enormously with correct vitamin B12 treatment, in the form of hydroxocobalamin injections. Hydroxocobalamin is a powerful toxin scavenger and could be your route to health.”

- “Vitamin B12 Deficiency due to Chlorofluorocarbon: A Case Report...In occupational medicine, vitamin B12 deficiency has been reported with exposure to nitrous oxide in health care workers. However, not much is known about exposure to Freons in other industries and vitamin B12 deficiency. We are reporting a case of vitamin B12 deficiency in the setting of exposure to chlorofluorocarbon (CFC) gases.”
  [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3065218/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3065218/)

- “The air at very high altitude is different from the air at sea level that the sea level adapted human is accustomed to breathing.” Steven Magee CEng MIET - Q

- “Abnormally irradiated air may eventually be proven to present long term toxicity to the sea level adapted human.” Steven Magee CEng MIET - Q

- “We know that unnaturally irradiating the human makes it sick. Unnaturally irradiating the air and water seems to make them sick also.” Steven Magee CEng MIET - Q
B12 Deficiencies

- “Vitamin B12 Deficiency: Serious Consequences...there are numerous causes of deficiency. These include malabsorption syndromes, autoimmune disease, diet, drugs, chemotherapy, radiation, eating disorders, Helicobacter pylori, gastrointestinal surgeries, nitrous oxide, hepatic disease, and genetic defects.”
- “Vitamin B12 or folate deficiency anaemia can cause a wide range of symptoms. These usually develop gradually but can worsen if the condition goes untreated. Anaemia is where you have fewer red blood cells than normal or you have an abnormally low amount of a substance called haemoglobin in each red blood cell. General symptoms of anaemia may include: extreme tiredness (fatigue), lack of energy (lethargy), breathlessness, feeling faint, headaches, pale skin, noticeable heartbeats (palpitations), hearing sounds coming from inside the body, rather than from an outside source (tinnitus), loss of appetite and weight loss”
  https://www.nhs.uk/conditions/vitamin-b12-or-folate-deficiency-anaemia/symptoms/
- “B12 is involved in the metabolism of every cell in the human body. Deficiency of B12 is akin to going crazy, as it is linked to psychosis...Some researchers have even pinpointed obsessive-compulsive disorder as an early manifestation of B12 deficiency. People with OCD have dysregulation in the serotoninergic system and in the efficacy of SRIs. This lends credence to the earlier point that adequate B12 levels are vital to normal physiologic function and mood, as well as sleeping patterns.”
  https://blog.paleohacks.com/vitamin-b12/
- “Vitamin B12 deficiency harms memory and nerves...Severe vitamin B12 deficiency has clear signs of fatigue and anemia, making it relatively easy to diagnose. However, symptoms of marginal deficiency are less obvious and might go unnoticed for a long time. Since B12 deficiency is known to damage the nervous system and cause permanent impairment of short-term memory if not treated in a timely fashion, medical researchers are seeking better methods to identify marginal (subclinical) B12 status before serious damage takes place.”
  http://www.nutritionatc.hawaii.edu/HO/2012/498.htm
- “B12-deficient individuals can develop confusion and depression, but the specific problems can vary from one person to another. Some of the symptoms are similar to those of Alzheimer's disease. Since older people are at greater risk of developing both B12 deficiency and Alzheimer's disease, it is important to be careful to distinguish between the two conditions. The symptoms of B12 deficiency can be reversible if treated within six to 12 months. However, if left untreated, B12 deficiency can cause irreversible damage.”
  http://www.nutritionatc.hawaii.edu/HO/2012/498.htm
- “Reversible dementia, psychotic symptoms and epilepsy in a patient with vitamin B12 deficiency...Vitamin B12 deficiency is a common condition, typically associated with megaloblastic anaemia, glossitis and neuropsychiatric symptoms. We report the case of a patient presenting with progressive cognitive and functional deterioration, psychosis and seizures, later found to be secondary to pernicious anaemia. Importantly, the diagnosis of pernicious anaemia was only established 5 years after symptom onset and was overlooked even when the patient...
was under medical care, in part due to the lack of classic neurological and haematological signs associated with the condition. The patient had a remarkable neuropsychiatric recovery after vitamin replacement and psychopharmacological management. We discuss similar presentations of vitamin B12 deficiency found in the literature, symptom reversibility and the importance of its early recognition and treatment.”

- “Woman Who Had Dementia For 5 Years Turned Out To Have A Common And Reversible Condition...They urge clinicians to consider vitamin B12 deficiencies when diagnosing patients with psychosis and seizures, especially when seen with cognitive decline. "Our case suggests that dementia associated with vitamin B12 deficiency can still be reversed with vitamin replacement therapy, even after a prolonged deficit status."”

- “Are Your Health Problems Actually Vitamin B 12 Deficiency Symptoms?...Classic Vitamin B12 Deficiency Symptoms...Fatigue...Macrocytic Anemia...Mental Changes...Chronic Pain...Infertility...Blood Disorders...Skin and Hair Problems”

- “How I treat cobalamin (vitamin B12) deficiency...The adult patient typically comes to medical attention because of symptoms related to anemia (such as fatigue), neurologic dysfunction (usually myelopathic or neuropathic, but occasionally also cerebral or autonomic), and, rarely today, glossitis. Macrocytic anemia is the most common clinical finding, with macrocytosis preceding the anemia by months, but 13% to 27% of patients with PA have little or no anemia, and unrelated microcytosis masks the macrocytosis in 7% of anemic cases. A roughly inverse relationship often exists between hematologic and neurologic deficits. Some medical encounters occur solely because of a known predisposing gastrointestinal disease or, increasingly, an abnormal biochemical finding.”

- “B12 deficiency leads to a long laundry list of symptoms that is almost all inclusive of any disease. In other words, if you have any chronic symptoms whether or not you have been diagnosed with a disease, you could be B12 deficient. B12 deficiency syndrome may be the most misdiagnosed illness in the United States because it’s symptoms mimic so many different illnesses and diseases.”

- “If you think you may have pernicious anemia, see your physician for laboratory complete blood panel analysis. According to the National Library of Medicine, symptoms include: both diarrhea and constipation, fatigue, loss of appetite, pale skin, problems concentrating, shortness of breath especially during exercise, a swollen or particularly red tongue, bleeding gums, confusion, depression, poor balance, and numbness and/or tingling in hands and feet.”
“Vitamin B12 – The Reference Range Level is Set too Low...B12 deficiency symptoms can be seen even when B12 level in blood is within the reference range, as 200 – 900 pg/mL in the United States, and 135-650 pmol/L in Australia. In clinical practice, signs and symptoms of B12 deficiency start when plasma B12 levels are ‘normal’, and long historical studies showed that neurological symptoms of deficiency occur in patients without sign of anaemia. As a matter of fact, Japan raised its B12 reference range to 500 – 1300 Pmol in 1980s.”

“Routine evaluation of serum vitamin B12 after radiotherapy is recommended so that appropriate medication can be given, if possible before neurological symptoms appear.”

“Vitamin B12: vitally important after radiotherapy. If you have radiotherapy on your abdomen, it is quite likely that you will get malabsorption. This means that you don't take up the vitamins and minerals which your body needs, however well you are eating.”

“Adaptive response to ionizing radiation and the role of vitamin B12 in amelioration radiation protection standards...a modulatory effect was noted in Vit. B12 pre-treated irradiated groups, which suggest that Vit. B12 alone is likely to be one of the most important micronutrients which exert a vital protective role against gamma irradiation.”

“Pervasive B12 Deficiency Affects Millions – How About YOU?...Unfortunately, B12 deficiency is often unrecognized because the clinical manifestations can be very subtle. In fact, one of its manifestations -- mild memory loss -- can mimic the early stages of dementia.”

“Seven Stages of Vitamin B12 Deficiency”

“Anemia and B12 Deficiency- Historically Fatal, Still Formidable...many of the symptoms of pernicious anemia are disabling, and often confused with other conditions like clinical depression, thyroid disorder, and diabetes.”

“B12 deficiency Overview...Vitamin B12 deficiency can cause devastating neurologic disease and severe hematologic disorders....Dementia, peripheral neuropathy, depression, and other neuropsychiatric signs and symptoms may improve with vitamin B12 treatment, but treatment generally does not completely resolve the process.”

“One study entitled Vitamin B-12: Placebo or Neglected Therapeutic Tool had people who felt fatigued, but had NORMAL vitamin B12 blood levels and kept giving higher doses of supplements until they had a 'maximum feeling of well being'. And the AVERAGE dose that it took to do this was 9000 micrograms per day, that is 9 milligrams. And that was the AVERAGE dose, this means that some people needed even higher doses than this to feel well. And these were people without a diagnosed vitamin B12 deficiency! So, if you truly have Vitamin B12 deficiency, then you may need even more than these study participants!”

“Vitamin B12 deficiency was reported to be the cause of seizures for adults and for infants.”
“I was diagnosed with seizures at age of forty five.” Steven Magee CEng MIET - Q

“Absence seizures are one of several kinds of seizures. These seizures are sometimes referred to as petit mal seizures (from the French for "little illness", a term dating from the late 18th century).[1] Absence seizures are characterized by a brief loss and return of consciousness, generally not followed by a period of lethargy (i.e. without a notable postictal state).”

It was my experience with the medical profession that had years of experience treating me and knew that I was displaying symptoms that matched B12 deficiency, that they were unable to make that diagnosis.” Steven Magee CEng MIET - Q

“I discovered my B12 deficiency accidentally while experimenting with energy drinks, because I was fed up with being fatigued, sleepy and showing symptoms consistent with Dementia all the time. I bought a variety of energy drinks and the only one that I exhibited a positive response to was the one with a huge dose of vitamin B12.” Steven Magee CEng MIET - Q

“Experimentation with vitamin B12 showed that I needed to take 25,000 mcg daily, which was over a million times the recommended daily dose.” Steven Magee CEng MIET - Q

“A mental health professional stated this to me 'You are not crazy, but you may be losing your mind'. After many consultations, he unfortunately failed to diagnose the B12 deficiency that I had that is known to cause these adverse mental health symptoms.” Steven Magee CEng MIET - Q

“I had noticed the onset of sickness that was consistent with sleep disorders and B12 deficiency during working extreme nights shifts at very high altitude atop Mauna Kea in Hawaii.” Steven Magee CEng MIET - Q

“It was unfortunate that every time my vitamin B12 levels were tested that they showed values that were in the USA normal range and prevented the B12 deficiency from being diagnosed and treated.” Steven Magee CEng MIET - Q
Leukemia Hazards

- “Leukemia risk factors...Exposure to high levels of radiation: Exposure to high-energy radiation (e.g., atomic bomb explosions) and intense exposure to low-energy radiation from electromagnetic fields (e.g., power lines). Chemical exposure: Long-term exposure to certain pesticides or industrial chemicals like benzene is considered to be a risk for leukemia.”
  https://www.cancercenter.com/leukemia/risk-factors/

- “Leukemia symptoms vary, depending on the type of leukemia. Common leukemia signs and symptoms include: Fever or chills; Persistent fatigue, weakness; Frequent or severe infections; Losing weight without trying; Swollen lymph nodes, enlarged liver or spleen; Easy bleeding or bruising; Recurrent nosebleeds; Tiny red spots in your skin (petechiae); Excessive sweating, especially at night; Bone pain or tenderness”
  https://www.mayoclinic.org/diseases-conditions/leukemia/symptoms-causes/syc-20374373

- “Leukemia begins in a cell in the bone marrow. The cell undergoes a change and becomes a type of leukemia cell. Once the marrow cell undergoes a leukemic change, the leukemia cells may grow and survive better than normal cells. Over time, the leukemia cells crowd out or suppress the development of normal cells. The rate at which leukemia progresses and how the cells replace the normal blood and marrow cells are different with each type of leukemia.”
  https://www.lls.org/leukemia

- “Radiation...Large doses of Sr-90 emission from nuclear reactors, nicknamed bone seeker increases the risk of bone cancer and leukemia in animals, and is presumed to do so in people.”
  https://en.wikipedia.org/wiki/Leukemia
Radiation Researcher Sickness

- “Marie Skłodowska Curie...was a Polish and naturalized-French physicist and chemist who conducted pioneering research on radioactivity. She was the first woman to win a Nobel Prize, the first person and only woman to win twice, the only person to win a Nobel Prize in two different sciences, and was part of the Curie family legacy of five Nobel Prizes... she died at the Sancellemoz sanatorium in Passy, Haute-Savoie, from aplastic anemia believed to have been contracted from her long-term exposure to radiation. The damaging effects of ionising radiation were not known at the time of her work, which had been carried out without the safety measures later developed. She had carried test tubes containing radioactive isotopes in her pocket, and she stored them in her desk drawer, remarking on the faint light that the substances gave off in the dark. Curie was also exposed to X-rays from unshielded equipment while serving as a radiologist in field hospitals during the war. Although her many decades of exposure to radiation caused chronic illnesses (including near-blindness due to cataracts) and ultimately her death, she never really acknowledged the health risks of radiation exposure.”

https://en.wikipedia.org/wiki/Marie_Curie

- “Aplastic anemia can be caused by exposure to certain chemicals, drugs, radiation, infection, immune disease; in about half the cases, yet a definitive cause is unknown. It is not a familial hereditary condition, nor is it contagious. It can be acquired due to exposure to other conditions but if a person develops the condition, their offspring would not develop it by virtue of their gene connection. Aplastic anemia is also sometimes associated with exposure to toxins such as benzene, or with the use of certain drugs, including chloramphenicol, carbamazepine, felbamate, phenytoin, quinine, and phenylbutazone. Many drugs are associated with aplasia mainly according to case reports, but at a very low probability. As an example, chloramphenicol treatment is followed by aplasia in less than one in 40,000 treatment courses, and carbamazepine aplasia is even rarer. Exposure to ionizing radiation from radioactive materials or radiation-producing devices is also associated with the development of aplastic anemia. Marie Curie, famous for her pioneering work in the field of radioactivity, died of aplastic anemia after working unprotected with radioactive materials for a long period of time; the damaging effects of ionizing radiation were not then known.”

https://en.wikipedia.org/wiki/Aplastic_anemia

- “Pierre Curie...was a French physicist, a pioneer in crystallography, magnetism, piezoelectricity and radioactivity. In 1903 he received the Nobel Prize in Physics with his wife, Marie Skłodowska-Curie, and Henri Becquerel...Pierre Curie died in a street accident in Paris on 19 April 1906. Crossing the busy Rue Dauphine in the rain at the Quai de Conti, he slipped and fell under a heavy horse-drawn cart. He died instantly when one of the wheels ran over his head, fracturing his skull. Statements made by his father and lab assistant imply that Pierre Curie's characteristic absent-minded preoccupation with his thoughts contributed to his death. Both the Curies experienced radium burns, both accidentally and voluntarily, and were exposed to extensive doses of radiation while conducting their research. They experienced radiation sickness and Marie Curie died of leukaemia in 1934. Even now, all their papers from the 1890's, even her cookbooks, are too dangerous to touch. Their laboratory books are kept in special lead boxes and people who want to see them have to wear protective clothing. Had Pierre Curie not been killed as he was, it is likely that he would have eventually died of the effects of radiation, as did his wife, their daughter, Irène, and her husband, Frédéric Joliot.”

https://en.wikipedia.org/
“Irène Joliot-Curie...was a French scientist, the daughter of Marie Curie and Pierre Curie and the wife of Frédéric Joliot-Curie. Jointly with her husband, Joliot-Curie was awarded the Nobel Prize in Chemistry in 1935 for their discovery of artificial radioactivity...In 1956, after a final convalescent period in the French Alps, Joliot-Curie was admitted to the Curie hospital in Paris, where she died on 17 March at the age of 58 from leukaemia.”

“Leukemia, also spelled leukaemia, is a group of cancers that usually begin in the bone marrow and result in high numbers of abnormal white blood cells. These white blood cells are not fully developed and are called blasts or leukemia cells. Symptoms may include bleeding and bruising problems, feeling tired, fever, and an increased risk of infections. These symptoms occur due to a lack of normal blood cells. Diagnosis is typically made by blood tests or bone marrow biopsy. The exact cause of leukemia is unknown. Different kinds of leukemia are believed to have different causes. Both inherited and environmental (non-inherited) factors are believed to be involved. Risk factors include smoking, ionizing radiation, some chemicals (such as benzene), prior chemotherapy, and Down syndrome. People with a family history of leukemia are also at higher risk. There are four main types of leukemia — acute lymphoblastic leukemia (ALL), acute myeloid leukemia (AML), chronic lymphocytic leukemia (CLL) and chronic myeloid leukemia (CML) — as well as a number of less common types.”

“Frederic Joliot Curie was a French physicist and Nobel laureate who along with his wife Irene Joliot-Curie is credited with the discovery of artificial radioactivity...He died on August 14, 1958, at the age of 58, in Paris, France”

“Henri Becquerel was a French physicist best known for his work on radioactivity, for which he won a Nobel Prize in 1903...His work with radioactive materials, leaving him burned and scarred, may have contributed to his death.”

“Enrico Fermi was an Italian-American physicist and the creator of the world's first nuclear reactor, the Chicago Pile-1. He has been called the "architect of the nuclear age" and the "architect of the atomic bomb". He was one of the very few physicists in history to excel both theoretically and experimentally. Fermi held several patents related to the use of nuclear power, and was awarded the 1938 Nobel Prize in Physics for his work on induced radioactivity by neutron bombardment and the discovery of transuranic elements. He made significant contributions to the development of quantum theory, nuclear and particle physics, and statistical mechanics...Fermi underwent an exploratory operation in Billings Memorial Hospital on 9 October 1954, after which he returned home. Several weeks later, Fermi died at age 53 of stomach cancer in his home in Chicago, and was interred at Oak Woods Cemetery”

“Stomach cancer, also known as gastric cancer, is cancer developing from the lining of the stomach.[9] Early symptoms may include heartburn, upper abdominal pain, nausea and loss of appetite.[1] Later signs and symptoms may include weight loss, yellowing of the skin and whites of the eyes, vomiting, difficulty swallowing, and blood in the stool among others.[1] The cancer may spread from the stomach to other parts of the body, particularly the liver, lungs, bones, lining of the abdomen and lymph nodes.[10] The most common cause is infection by the bacterium Helicobacter pylori, which accounts for more than 60% of cases.[11][2][3] Certain
types of H. pylori have greater risks than others.[2] Smoking, dietary factors such as pickled vegetables, and obesity are other risk factors.[2][4] About 10% of cases run in families and between 1% and 3% of cases are due to genetic syndromes inherited from a person's parents such as hereditary diffuse gastric cancer.” [https://en.wikipedia.org/wiki/Stomach_cancer

- “Pernicious Anemia and Vitamin B-12 Deficiency...People with pernicious anemia have a slightly increased risk of stomach cancer when compared to the normal population. The incidence of stomach cancer in people with pernicious anemia is 2-3 times higher than in the general population of the same age.” [https://www.medicinenet.com/pernicious_anemia/article.htm#pernicious_anemia_definition_and_facts

- “Maria Goeppert Mayer (June 28, 1906 – February 20, 1972) was a German-born American theoretical physicist, and Nobel laureate in Physics for proposing the nuclear shell model of the atomic nucleus. She was the second woman to win a Nobel Prize in physics, after Marie Curie....In 1960, Goeppert Mayer was appointed full professor of physics at the University of California, San Diego. Although she suffered from a stroke shortly after arriving there, she continued to teach and conduct research for a number of years.[43][44] She was elected a Fellow of the American Academy of Arts and Sciences in 1965.[45] Goeppert Mayer died in San Diego, California, on February 20, 1972, after a heart attack that had struck her the previous year left her comatose. She was buried at El Camino Memorial Park in San Diego. [36]” [https://en.m.wikipedia.org/wiki/Maria_Goeppert-Mayer

- “A stroke is a medical condition in which poor blood flow to the brain results in cell death.[5] There are two main types of stroke: ischemic, due to lack of blood flow, and hemorrhagic, due to bleeding.[5] They result in part of the brain not functioning properly.[5] Signs and symptoms of a stroke may include an inability to move or feel on one side of the body, problems understanding or speaking, dizziness, or loss of vision to one side.[2][3] Signs and symptoms often appear soon after the stroke has occurred.[3] If symptoms last less than one or two hours it is known as a transient ischemic attack (TIA) or mini-stroke.[3] A hemorrhagic stroke may also be associated with a severe headache.[3] The symptoms of a stroke can be permanent.[5] Long-term complications may include pneumonia or loss of bladder control.[3]” [https://en.wikipedia.org/wiki/Stroke

- “Sir Humphry Davy, 1st Baronet PRS MRIA FGS FRS (17 December 1778 – 29 May 1829) was a Cornish chemist and inventor,[1] who is best remembered today for isolating, using electricity, a series of elements for the first time: potassium and sodium in 1807 and calcium, strontium, barium, magnesium and boron the following year, as well as discovering the elemental nature of chlorine and iodine. He also studied the forces involved in these separations, inventing the new field of electrochemistry. In 1799 Davy experimented with nitrous oxide and became astonished that it made him laugh, so he nicknamed it "laughing gas", and wrote about its potential anaesthetic properties in relieving pain during surgery.[2]...Of a sanguine, somewhat irritable temperament...Davy spent the winter in Rome, hunting in the Campagna on his fiftieth birthday. But on 20 February 1829 he had another stroke. After spending many months attempting to recuperate, Davy died in a hotel room in Geneva, Switzerland, on 29 May 1829.” [https://en.m.wikipedia.org/wiki/Humphry_Davy

- “James Clerk Maxwell FRS FRSE (13 June 1831 – 5 November 1879) was a Scottish[2][3] scientist in the field of mathematical physics.[4] His most notable achievement was to formulate the classical theory of electromagnetic radiation, bringing together for the first time electricity, magnetism, and light as different manifestations of the same phenomenon....Maxwell died in
Cambridge of abdominal cancer on 5 November 1879 at the age of 48.”

https://en.wikipedia.org/wiki/James_Clerk_Maxwell#Later_years, 1865%E2%80%931879

- “Stomach cancer, also known as gastric cancer, is a cancer that develops from the lining of the stomach.[10] Early symptoms may include heartburn, upper abdominal pain, nausea and loss of appetite.[1] Later signs and symptoms may include weight loss, yellowing of the skin and whites of the eyes, vomiting, difficulty swallowing and blood in the stool among others.[1] The cancer may spread from the stomach to other parts of the body, particularly the liver, lungs, bones, lining of the abdomen and lymph nodes...risks include...pernicious anemia”


- “Michael Faraday...English physicist and chemist whose many experiments contributed greatly to the understanding of electromagnetism...in 1839 his health broke down. For the next six years he did little creative science...About 1855, Faraday’s mind began to fail...He died in 1867.”  https://www.britannica.com/biography/Michael-Faraday

- “It is not disputed that electromagnetic fields above certain levels can trigger biological effects. Experiments with healthy volunteers indicate that short-term exposure at the levels present in the environment or in the home do not cause any apparent detrimental effects. Exposures to higher levels that might be harmful are restricted by national and international guidelines. The current debate is centred on whether long-term low level exposure can evoke biological responses and influence people's well being.”

http://www.who.int/peh-emf/about/WhatisEMF/en/index1.html

- Heinrich Rudolf Hertz was a German physicist who first conclusively proved the existence of the electromagnetic waves theorized by James Clerk Maxwell's electromagnetic theory of light. The unit of frequency — cycle per second — was named the "hertz" in his honor...In 1892, Hertz was diagnosed with an infection (after a bout of severe migraines) and underwent operations to treat the illness. He died of granulomatosis with polyangiitis at the age of 36 in Bonn, Germany in 1894, and was buried in the Ohlsdorf Cemetery in Hamburg.”

https://en.wikipedia.org/wiki/Heinrich_Hertz

- “Granulomatosis with polyangiitis (GPA), formerly known as Wegener's granulomatosis (WG), is a systemic disorder that involves both granulomatosis and polyangiitis. It is a form of vasculitis (inflammation of blood vessels) that affects small- and medium-size vessels in many organs. Damage to the lungs and kidneys can be fatal. Treatment requires long-term immunosuppression.”  https://en.wikipedia.org/wiki/Granulomatosis_with_polyangiitis

- “Nikola Tesla...was a Serbian-American inventor, electrical engineer, mechanical engineer, physicist, and futurist who is best known for his contributions to the design of the modern alternating current (AC) electricity supply system...Tesla began investigating what he referred to as radiant energy of "invisible" kinds after he had noticed damaged film in his laboratory in previous experiments (later identified as "Roentgen rays" or "X-Rays"),...Tesla claimed never to sleep more than two hours per night. However, he did admit to "dozing" from time to time "to recharge his batteries."...On 7 January 1943, at the age of 86, Tesla died alone in Room 3327 of the New Yorker Hotel. His body was later found by maid Alice Monaghan after she had entered Tesla's room, ignoring the "do not disturb" sign that Tesla had placed on his door two days earlier. Assistant medical examiner H.W. Wembley examined the body and ruled that the cause of death had been coronary thrombosis.”  https://en.wikipedia.org/wiki/Nikola_Tesla

- “Coronary thrombosis is the formation of a blood clot inside a blood vessel of the heart. This blood clot restricts blood flow within the heart. It is associated with narrowing of blood vessels subsequent to clotting. The condition is considered as a type of ischaemic heart disease, also
known as a heart attack or myocardial infarction. The main causes of coronary thrombosis are stress, smoking, high blood pressure, and lack of exercise. Symptoms are sharp pains around the chest area, breathing difficulties, dizziness, and fainting. This is treated by taking Aspirin, Nitrates, or Beta Blockers.” [10]

- “A meta-analysis of eight randomized trials found a 62% increase in cardiac deaths among women who were treated with radiation therapy. Even at lower radiation doses, there appears to be excess risk of cardiovascular disease as shown in the Japanese atomic bomb survivors...in patients treated as lately as between 1979 and 1986 the risk congestive heart failure and valvular dysfunction remained increased[12]. Radiation damage to the heart can involve the pericardium, myocardium, valves, and coronary vessels with pericardium being most frequently involved[13, 14]. Radiation damages the vascular endothelium, and hence radiation-induced vascular injury occurs in the field of radiation exposure. Damage to the capillary vessels manifests as telangiectasia, whereas thrombotic, inflammatory, and fibrogenic complications in larger vessels can result in peripheral, coronary and carotid artery disease.”[11]

- “Nikola Tesla has become something of an Internet hero. According to legend, he was a mad genius who almost never got the credit he deserved in the money-hungry world of science. It’s easy to argue that Tesla didn’t make it further because of his eccentricities: He hated everything, suffered from severe obsessive-compulsive disorder, and might have been autistic.” [12]

- “Guglielmo Marconi, 1st Marquis of Marconi (/mɑːˈrkoʊni/; [1] Italian: [ɡuˈʎɛlmo marˈkoːni]; 25 April 1874 – 20 July 1937) was an Italian inventor and electrical engineer known for his pioneering work on long-distance radio transmission and for his development of Marconi’s law and a radio telegraph system. He is credited as the inventor of radio,[7] and he shared the 1909 Nobel Prize in Physics with Karl Ferdinand Braun "in recognition of their contributions to the development of wireless telegraphy"...Marconi died in Rome on 20 July 1937 at age 63, following a series of heart attacks.” [13]

- “Brain disease, heart disease, gastrointestinal disease and blood disorders were common in the radiation pioneers.” Steven Magee CEng MIET - Q
Fall Hazards

- “I ventured up onto the domes of the world’s largest telescopes a few times. The view was impressive! The curvature of the domes means that you can only walk around on about twenty feet of the domes before developing a fear of sliding off them on the rapidly sloping surface. What amazes me today was that I was not required to wear a safety harness during the fun activity while breathing very high altitude air that was 40% deficient of oxygen that was known to make people faint. A strenuous climb up ladders was required to get to the top of the domes and a fall from that height would likely be fatal.” Steven Magee CEng MIET - Q http://www.environmentalradiation.com/We%20are%20mauna%20kea%20Steven%20Magee%20on%20Keck%20Dome.jpg

- “Fall protection, for activities not in the construction industry, is addressed in specific standards for the general industry, shipyard employment, marine terminals and longshoring industry. This section highlights OSHA standards, Federal Register notices (rules and proposed rules), the Regulatory Agenda (a list of actions being taken with regard to OSHA standards), preambles to final rules (background to final rules), directives (instruction to OSHA staff), letters of interpretation, example cases, and national consensus standards related to fall protection.” https://www.osha.gov/SLTC/fallprotection/standards.html


Extreme Night Shift Hazards

- “Can High Altitude Influence Cytokines and Sleep?..around 60% of persons subjected to altitudes of 3500 m or higher experience various sleep complaints. Recurring wakefulness is the most common characteristic due to the decreased O2 saturation, which leads to sleep fragmentation [45, 64, 65]. In addition, hypoxia can cause poor sleep quality due to slight reductions in delta sleep, relative reductions in REM sleep, and agitation during the night [63]; however, overall total sleep time (TST) is not reduced. Therefore, the reduced subjective sleep quality is due to a higher arousal frequency. Despite previous studies suggesting that the impairment of sleep persists even after a season of acclimatization [64, 65], partial recovery of the damage during sleep can occur after spending some days at high altitude [26]. This finding has been shown in animal studies in which several days were spent in hypoxic conditions but not after a sudden ascent.” [https://www.hindawi.com/journals/mi/2013/279365/]

- "The Mauna Kea night shift was an 18 hour night in wintertime at the 13,796 feet summit (before sunset to after sunrise) with insufficient time for adequate sleep before the next night shift. Night shift was between 5 and 8 nights long and we slept at 9,200 feet. We sat at a desk staring at four large computer monitors and a large cathode ray tube television. I would also use my Wi-Fi laptop computer. I would have extreme fatigue by the end of every night shift and have chapped lips which I now associate with exposure to the artificial light from the computer screens. A good day of sleep between shifts was rare and starting the next shift fatigued was normal." Steven Magee CEng MIET - Q

- "Both shift work and long work hours have been associated with health and safety risks." [http://www.cdc.gov/niosh/topics/workschedules/default.html]

- "Shift work is classified as Class 2A carcinogen by the WHO" [http://iohsad.org/12/10/women/shift-work-classified-class-2a-carcinogen-who]

- "A long-running study found that women who work overnight have as much as a 60 percent greater risk of developing type 2 diabetes due to irregular sleep patterns and poor dieting." [http://www.theatlantic.com/health/archive/2012/01/the-health-hazards-of-shift-work/251499/]

- “Overall, long-term night shift work among women increased the risk of cancer by 19 percent. When analyzing specific cancers, the researchers found that this population had an increased risk of skin (41 percent), breast (32 percent), and gastrointestinal cancer (18 percent) compared with women who did not perform long-term night shift work. After stratifying the participants by location, Ma found that an increased risk of breast cancer was only found among female night shift workers in North America and Europe.” [https://www.sciencedaily.com/releases/2018/01/180108090118.htm]


- “The graveyard shift, it turns out, is aptly named,” it says. “Those who regularly endure it are also at higher risk for depression, obesity, diabetes, and cancer. In fact, the correlation is so strong that in 2010, the World Health Organization went so far as to classify late-night work as a probable carcinogen.” [http://time.com/money/4942543/time-wake-up-productive-sleep/]

- “Make efforts, whenever feasible, to ensure that unavoidable extended work shifts and shift changes allow affected employees time for adequate rest and recovery. Extended shifts should
Environmental Radiation LLC - https://www.environmentalradiation.com

not be maintained for more than a few days, especially if they require heavy physical or mental exertion.” https://www.osha.gov/OshDoc/data_Hurricane_Facts/faq_longhours.html

- “By planning for adequate rest after every night shift, you can avoid some serious complications of chronic sleep deprivation, such as high blood pressure, cardiac disease, and depression.” https://cna.plus/surviving-night-shift-9-tips/

- “The risks of night work...Millions of American workers fight against their circadian clocks every day, putting them — and others in their paths — in danger. Psychologists are looking for solutions.” http://www.apa.org/monitor/2011/01/nite-work.aspx

- “Doctors have warned for years that Americans are not getting enough sleep, with health consequences ranging from drowsy driving and irritability to an increased risk of dementia, heart disease and early death.” http://time.com/4970767/rem-sleep-dreams-health/

- “There is now abundant evidence that poor sleep can have devastating consequences for physical, mental and psychological health.” http://www.bbc.com/future/story/20171031-why-we-still-dont-understand-sleep-and-why-it-matters

- “There's No Substitute for a Good Night's Sleep, UA Expert Says...lack of sleep affected emotional processing, judgment and decision making.” https://uaatwork.arizona.edu/lqp/theres-no-substitute-good-nights-sleep-ua-expert-says

- “2018 Goals: Get more sleep. Sleep deprivation is toxic to your health...It turns out you can only live about 11 days without sleep. You can give it a try if you don’t believe me, but, just like the other essentials, after day 11 you will probably die.” https://www.usatoday.com/story/money/columnist/2017/12/22/heres-why-sleep-deprivation-toxic-and-eventually-kill-you/967151001/

- “the Centers for Disease Control and Prevention (in the US) has looked at this and has actually proclaimed insufficient sleep a public health epidemic, so there’s increasing awareness of lack of sleep being a public health problem.” http://www.bbc.com/capital/story/20171208-what-working-through-the-dead-of-night-does-to-your-body

- “Surviving the Night Shift...What working nights does to your health and the economy...he warns that companies whose employees do night shift work could be setting themselves up for lawsuits in the future if they don’t demonstrate they are taking all reasonable measures to try and mitigate some of the problems associated with working at night.” http://www.bbc.co.uk/programmes/w3cs8w8g7

- “6 Ways to Make Working the Night Shift Less Hazardous to Your Health...A lack of sleep and disruption to your biological clock can have harmful effects.” https://health.usnews.com/health-news/family-health/sleep/articles/2009/12/04/6-ways-to-make-working-the-night-shift-less-hazardous-to-your-health

- “With regard to employer training, OSHA does not train employers on hazards related to late night and extended unusual shifts. However, OSHA encourages employers to perform a hazard analysis of its jobsite...Can OSHA train and regulate employers about the basics of minimizing light pollution from the workplace, especially with the use of blue-rich/bright white LEDs, light trespass, skyglow, glare, etc? Response: No. With respect to training, OSHA does not train employers on light pollution.” https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=29306

- “Shift changes where you have only a shift (8-12 hours) between your old and new shift are especially bad.” http://www.cannybossdothat.com/category.php?id=169

- “Impact of Sleep Deprivation on Police Performance. Sleep deprivation is comparable to
excessive drinking. A sleep deprivation study found that not sleeping for 17 hours impaired a person's motor skills to an extent equivalent to having an alcohol toxicity of 0.05 percent. Not sleeping for 24 hours was equivalent to a toxicity level of 0.10 percent.[1] This level of deprivation would impair speech, balance, coordination and mental judgment.”

- “OSHA has no regulation for sleep deprivation – but you must know who is fit for duty” [http://www.ishn.com/blogs/16-thought-leadership/post/98415-osha-has-no-regulation-for-sleep-deprivation-but-you-must-know-who-is-fit-for-duty](http://www.ishn.com/blogs/16-thought-leadership/post/98415-osha-has-no-regulation-for-sleep-deprivation-but-you-must-know-who-is-fit-for-duty)

- “Sleepy and unsafe. Why aren't workers getting enough rest? Research has shown that inadequate sleep can affect workers’ ability to remain healthy and perform their work safely – and in safety-sensitive positions, can even put others in harm’s way.” [http://www.safetyandhealthmagazine.com/articles/10412-sleepy-and-unsafe-worker-fatigue](http://www.safetyandhealthmagazine.com/articles/10412-sleepy-and-unsafe-worker-fatigue)

- “Shift work sleep disorder (SWSD) is a circadian rhythm sleep disorder characterized by insomnia and excessive sleepiness affecting people whose work hours overlap with the typical sleep period. There are numerous shift work schedules, and they may be permanent, intermittent, or rotating; consequently, the manifestations of SWSD are quite variable.” [https://en.wikipedia.org/wiki/Shift_work_sleep_disorder](https://en.wikipedia.org/wiki/Shift_work_sleep_disorder)


- “Very high altitude extreme night shift work is a class 2A carcinogen that may result in lifelong disabling sleep disorders, high cholesterol, radiation sickness, and heart, lung and brain damage.” Steven Magee CEng MIET - Q

- “One can only wonder what the motivation is for Mauna Kea astronomers to subject their nighttime support staff to extremely long and fatiguing night shifts when they are easily avoidable.” Steven Magee CEng MIET - Q

- “Extreme night shift work in high altitude astronomy is easily avoidable by using a split night shift where the first night shift starts before sunset and finishes at midnight and the second night shift starts with a new fresh person working through to after sunrise.” Steven Magee CEng MIET - Q

- “Night shift workers typically suffer from solar radiation deficiency sickness.” Steven Magee CEng MIET - Q
Sleep Disorder Hazards

- "Polysomnography is used to diagnose, or rule out, many types of sleep disorders including narcolepsy, idiopathic hypersomnia, periodic limb movement disorder (PLMD), REM behavior disorder, parasomnias, and sleep apnea. Although it is not directly useful in diagnosing circadian rhythm sleep disorders, it may be used to rule out other sleep disorders.” [https://en.wikipedia.org/wiki/Polysomnography](https://en.wikipedia.org/wiki/Polysomnography)

- "Risk factors for sleep apnea include a family history of apnea, snoring, smoking, obesity, sleeping on the back rather than on the side, and medical conditions such as heart failure and gastroesophageal reflux disease (GERD). Blacks are at higher risk than other ethnic groups in the US. Risk factors for narcolepsy have a genetic component, and the condition typically starts in the second or third decade of life. The risk factors for hypersomnia are obesity, night-shift work, major depression, and long-haul truck driving. For forms of hypersomnia other than sleep apnea, women are more at risk than men.” [http://www.mdguidelines.com/hypersomnia](http://www.mdguidelines.com/hypersomnia)

- "Obstructive sleep apnea (OSA) is the most common category of sleep-disordered breathing...It has been revealed that people with OSA show tissue loss in brain regions that help store memory, thus linking OSA with memory loss. Using magnetic resonance imaging (MRI), the scientists discovered that people with sleep apnea have mammillary bodies that are about 20 percent smaller, particularly on the left side. One of the key investigators hypothesized that repeated drops in oxygen lead to the brain injury.” [https://en.wikipedia.org/wiki/Sleep_apnea](https://en.wikipedia.org/wiki/Sleep_apnea)

- "Sleep Apnea and Cancer: Here’s What We Know About How They’re Related...Now, researchers also believe there is a link between OSA and the development of cancer—especially in women. In the new study, an international team of researchers analyzed data on nearly 20,000 Europeans who’d been diagnosed with sleep apnea. About 5,800 of the patients studied were women, and about 14,000 were men. During the study period, 2.8% of women—but only 1.7% of men—developed a serious cancer. Breast cancer was the most common cancer among these women.” [https://www.health.com/condition/cancer/sleep-apnea-cancer](https://www.health.com/condition/cancer/sleep-apnea-cancer)

- "Behaviorally induced insufficient sleep syndrome must also be considered in the differential diagnosis of secondary hypersomnia. This disorder occurs in individuals who fail to get sufficient sleep for at least three months. In this case, the patient has chronic sleep deprivation although he or she is not necessarily aware of it. This situation is becoming more prevalent in western society due to the modern demands and expectations placed upon the individual.” [https://en.wikipedia.org/wiki/Hypersomnia](https://en.wikipedia.org/wiki/Hypersomnia)

- "Sleep Disorders – ICD-10 Codes and Names” [https://www.sleepassociation.org/sleep-disorders-icd-10-codes-names/](https://www.sleepassociation.org/sleep-disorders-icd-10-codes-names/)

- “Sleep disorders are a known occupational hazard for astronomers and their nighttime support staff.” Steven Magee CEng MIET - Q

- “Astronomers do not disclose to their nighttime support staff that they are at significant risk of developing shift work sleep disorder (SWSD) and the associated range of other sleep disorders.” Steven Magee CEng MIET - Q

- “Sleep studies are tests that record the body activity during sleep. They are helpful in identification of sleep disorders.” [https://en.wikipedia.org/wiki/Sleep_study](https://en.wikipedia.org/wiki/Sleep_study)

- “A routine annual sleep study should really be required as part of their job description for astronomers and their nighttime support staff for early detection of sleep disorders and blood
• “I was sent for a sleep study in 2015 and they found that I have 9.9 arousals per hour and I stop breathing 31.9 times per hour during sleeping. They diagnosed Insomnia and Obstructive Sleep Apnea (OSA).” Steven Magee CEng MIET - Q

• “A sleep disorder, or somnopathy, is a medical disorder of the sleep patterns of a person or animal. Some sleep disorders are serious enough to interfere with normal physical, mental, social and emotional functioning.” https://en.wikipedia.org/wiki/Sleep_disorder

• “The term "sleep-disordered breathing" is commonly used in the U.S. to describe the full range of breathing problems during sleep in which not enough air reaches the lungs (hypopnea and apnea). Sleep-disordered breathing is associated with an increased risk of cardiovascular disease, stroke, high blood pressure, arrhythmias, diabetes, and sleep deprived driving accidents.” https://en.wikipedia.org/wiki/Sleep_apnea

• “Hypersomnia’ means excessive sleep or sleepiness that interferes with everyday life. It can have many possible causes, including conditions such as narcolepsy, sleep apnoea or restless legs syndrome; severe sleep deprivation; depression; certain medications (such as tranquilisers); or drug and alcohol misuse.” http://www.nhs.uk/Conditions/hypersomnia/Pages/Introduction.aspx

• “In 2017 at the age of 47 I was diagnosed with a rare and disabling sleep disorder called Idiopathic Hypersomnia. I had noticed the onset of the condition during extreme night shift work from 2003 to 2006 on the 13,796 feet very high altitude summit of Mauna Kea. After a few years of doctors visits for insomnia, fatigue, sleepiness and falling asleep at work, it was initially diagnosed as Shift Work Sleep Disorder in 2009 before being correctly diagnosed by a Multiple Sleep Latency Test several years later.” Steven Magee CEng MIET - Q

• “Idiopathic hypersomnia is a condition, thought to be a neurological disorder, which is characterized primarily by excessive daytime sleepiness (EDS). It has historically been rarely diagnosed and is often very difficult to diagnose at an early stage; it is usually a lifelong chronic disease, which is often debilitating.” https://en.wikipedia.org/wiki/Idiopathic_hypersomnia

• “What is Idiopathic Hypersomnia? The Burden of Always Feeling Sleepy” http://www.alaskasleep.com/blog/what-is-idiopathic-hypersomnia-always-feeling-sleepy

• “Idiopathic hypersomnia (IH) is a rare sleep disorder that can affect many aspects of a person's life. People with IH have a hard time staying awake during the day (chronic excessive daytime sleepiness or EDS) even though they seem to sleep well at night. They need to take long naps, but usually do not feel refreshed upon waking. The immediate need for sleep may come at anytime during the day, including while working, in class, or driving a car. Many people with IH may feel very drowsy and confused when waking up (sleep drunkeness). Other symptoms may include anxiety, feeling irritated, low energy, restlessness, slow thinking or speech, loss of appetite, and memory difficulties.” https://rarediseases.info.nih.gov/diseases/8737/hypersomnolence-idiopathic/cases/27225

• “The Multiple Sleep Latency Test (MSLT) is a sleep disorder diagnostic tool. It is used to measure the time elapsed from the start of a daytime nap period to the first signs of sleep, called sleep latency. The test is based on the idea that the sleepier people are, the faster they will fall asleep. The MSLT is used extensively to test for narcolepsy, to distinguish between physical tiredness and true excessive daytime sleepiness, or to assess whether treatments for breathing disorders are working. Its main purpose is to discover how readily a person will fall asleep in a conducive setting, how consistent or variable this is, and the way they fall asleep in terms of REM sleep and other brain patterns. This can be used to identify and differentiate between...
various sleep problems.” [https://en.wikipedia.org/wiki/Multiple_Sleep_Latency_Test](https://en.wikipedia.org/wiki/Multiple_Sleep_Latency_Test)

- “Sleep disorders are commonly misdiagnosed as mental health disorders.” Steven Magee CEng MIET - Q
- “You might already know how important sleep is, and how sleep deprivation can cause a slew of health problems. But have you thought about your dreams? Do you dream? And can you remember your dreams from last night? Whether you can or not, if you’re not dreaming—and more and more people aren’t, according to new research—you’re putting yourself at higher risk for obesity, memory loss, and inflammation throughout your body, which can lead to autoimmune troubles.” [https://www.rd.com/health/wellness/dream-sleep-deprivation/](https://www.rd.com/health/wellness/dream-sleep-deprivation/)
- “Sex-related effects of sleep deprivation on depressive- and anxiety-like behaviors in mice...In conclusion, male mice showed a significant trend to depressive-like behaviors late after sleep deprivation. Conversely, female have a strong tendency to display anxiety- and depressive-like behaviors immediately after sleep deprivation.” [https://www.ncbi.nlm.nih.gov/pubmed/26548630](https://www.ncbi.nlm.nih.gov/pubmed/26548630)
- “How Men and Women Respond Differently to Sleep Deprivation...Men were more likely to engage in risky behavior when sleep deprived, while women actually became more risk averse...Women, for example, became more altruistic when sleep deprived while men did not...While men are more susceptible to hypertension and cardiovascular disease in general, women are more likely to develop high blood pressure as a result of chronic sleep deprivation.” [https://www.chronobiology.com/how-men-and-women-respond-differently-to-sleep-deprivation/](https://www.chronobiology.com/how-men-and-women-respond-differently-to-sleep-deprivation/)
- “12 Shocking Effects Of Sleep Deprivation That Will Make You Want to Go to Bed Immediately” [https://www.nestmaven.com/sleep/sleep-deprivation-effects/](https://www.nestmaven.com/sleep/sleep-deprivation-effects/)
- “With exquisite precision, our inner clock adapts our physiology to the dramatically different phases of the day. The clock regulates critical functions such as behavior, hormone levels, sleep, body temperature and metabolism. Our wellbeing is affected when there is a temporary mismatch between our external environment and this internal biological clock, for example when we travel across several time zones and experience "jet lag". There are also indications that chronic misalignment between our lifestyle and the rhythm dictated by our inner timekeeper is associated with increased risk for various diseases.” [https://www.nobelprize.org/nobel_prizes/medicine/laureates/2017/press.html](https://www.nobelprize.org/nobel_prizes/medicine/laureates/2017/press.html)
- “Jean-Jacques d'Ortous de Mairan....His observations and experiments also inspired the beginning of what is now known as the study of biological circadian rhythms.” [https://en.wikipedia.org/wiki/Jean-Jacques_d%27Ortous_de_Mairan](https://en.wikipedia.org/wiki/Jean-Jacques_d%27Ortous_de_Mairan)
“A circadian rhythm /sɜːrˈkeɪdiən/ is any biological process that displays an endogenous, entrainable oscillation of about 24 hours. These 24-hour rhythms are driven by a circadian clock, and they have been widely observed in plants, animals, fungi, and cyanobacteria. The term circadian comes from the Latin circa, meaning "around" (or "approximately"), and diem, meaning "day". The formal study of biological temporal rhythms, such as daily, tidal, weekly, seasonal, and annual rhythms, is called chronobiology. Processes with 24-hour oscillations are more generally called diurnal rhythms; strictly speaking, they should not be called circadian rhythms unless their endogenous nature is confirmed. Although circadian rhythms are endogenous ("built-in", self-sustained), they are adjusted (entrained) to the local environment by external cues called zeitgebers (from German, "time giver"), which include light, temperature and redox cycles.”  

“Chronobiology is a field of biology that examines periodic (cyclic) phenomena in living organisms and their adaptation to solar- and lunar-related rhythms. These cycles are known as biological rhythms. Chronobiology comes from the ancient Greek χρόνος (chrónos, meaning "time"), and biology, which pertains to the study, or science, of life....Chronobiological studies include but are not limited to comparative anatomy, physiology, genetics, molecular biology and behavior of organisms within biological rhythms mechanics. Other aspects include epigenetics, development, reproduction, ecology and evolution.”

“Circadian rhythm sleep disorders (CRSD) are a family of sleep disorders affecting (among other bodily processes) the timing of sleep. People with circadian rhythm sleep disorders are unable to go to sleep and awaken at the times commonly required for work and school as well as social needs. They are generally able to get enough sleep if allowed to sleep and wake at the times dictated by their "body clocks". The quality of their sleep is usually normal unless they also have another sleep disorder. Humans, like most living organisms, have various biological rhythms. Circadian rhythms, often referred to as the body clock or the biological clock, control processes that re-occur daily, e.g. body temperature, alertness, and hormone secretion as well as sleep timing. Due to the circadian clock, sleepiness does not continuously increase throughout the day; a person's desire and ability to fall asleep is influenced both by the length of time since the person woke from an adequate sleep and by internal circadian rhythms. Thus, a person's body is ready for sleep and for wakefulness at relatively specific times of the day. Sleep researcher Yaron Dagan states that "[t]hese disorders can lead to harmful psychological and functional difficulties and are often misdiagnosed and incorrectly treated due to the fact that doctors are unaware of their existence.”

“Abnormal Sleep Causes Neurological Problems...What was making their sleep abnormal? In 2009 I accidentally discovered that all of the patients who had abnormal sleep also had vitamin D deficiency. Over time I realized that nearly everyone with abnormal sleep had a combination of both vitamin D and B vitamin deficiencies.”

“Vitamins Can Hurt You!...For my patients the Vitamin D blood level that brought “great sleep” was 60-80 ng/ml. The majority of my patients could eventually tell when their D level “wasn’t right”. But, it was still hard to know whether “not right” meant below 60 or above 80. It is keeping the vitamin D blood level in the “level to thrive” (60-80 ng/ml) AND using every other tool available to keep the sleep as perfect as possible that reverses disease. In other words it took you a long time to get here and depending on what’s wrong with you it may take a long
time to fix everything.” [1][https://drgominak.com/2017/12/16/vitamins-can-hurt-you/]

- “Are Hormones To Blame For Your Lack Of Sleep?...hormonal imbalances are a big reason for sleep disturbance. Hormone imbalances create vicious cycles—often triggered by underlying issues and then circling around to make those very same issues even worse. "The first thing I always check is the adrenal glands (which produce cortisol, DHEA, and adrenaline)," says New York Tri-State Area doctor of naturopathic medicine Dr. Doni Wilson. "And then I check the gut, because stress causes leaky gut, and leaky gut causes inflammation that affects the nervous system."” [3][https://www.mindbodygreen.com/0-28953/are-hormones-to-blame-for-your-lack-of-sleep.html]
- “Effects of a 3-week dehydroepiandrosterone administration on sleep, sex steroids and multiple 24-h hormonal profiles in postmenopausal women: a pilot study...As DHEA-induced elevations in testosterone and estradiol levels varied widely between individuals and were largely unpredictable, DHEA administration might not be the most appropriate approach to compensate for the reduction observed in androgen and oestrogen production in postmenopausal women. DHEA supplementation may result either in sleep stimulation or in inhibition, depending on the ratio between DHEA-induced increments in testosterone vs estradiol.” [4][https://www.ncbi.nlm.nih.gov/pubmed/23488643/]

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[1] Environmental Radiation LLC - [https://www.environmentalradiation.com](https://www.environmentalradiation.com)


Stimulant Hazards

- “The most stimulants that I have taken in life were during my extreme night shifts to keep me awake.” Steven Magee CEng MIET - Q
- “It was normal to drink two pots of coffee during an extreme night shift.” Steven Magee CEng MIET - Q
- “CAFFEINE...EFFECTS OF SHORT-TERM EXPOSURE: The substance may cause effects on the central nervous system and cardiovascular system, resulting in insomnia, excitement, tachycardia, polyuria....EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: Animal tests show that this substance possibly causes toxic effects upon human reproduction.” https://www.cdc.gov/niosh/ipcsneng/neng0405.html
- “Caffeine MSDS...MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: heart, gastrointestinal tract, central nervous system (CNS).” http://www.sciencelab.com/msds.php?msdsId=9927475
- “Coffee Drinkers Need Cancer Warning, Judge Rules, Giving Sellers the Jitters...“Since defendants failed to prove that coffee confers any human health benefits, defendants have failed to satisfy their burden of proving that sound considerations of public health support an alternate risk level for acrylamide in coffee,” the judge wrote.” https://www.nytimes.com/2018/03/30/business/coffee-cancer-warning.html
- “The longer I worked extreme night shifts, the less effective energy drinks became. Eventually I stopped drinking them as they would have no effect on me. I would drink one and go to sleep when home during the daytime.” Steven Magee CEng MIET - Q
- “Woman Shares What Energy Drinks Did To Her Husband While She Was 9 Months Pregnant” https://www.boredpanda.com/energy-drinks-caution-story-parents-brianna-austin/?utm_source=facebook&utm_medium=link&utm_campaign=BPFacebook
- “Energy drinks: Getting wings but at what health cost?” https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4320741/
- “The Buzz on Energy Drinks” https://www.cdc.gov/healthyschools/nutrition/energy.htm
- “Energy drinks are killing young people. It’s time to stop that.” http://blogs.berkeley.edu/2017/06/07/energy-drinks-are-killing-young-people-its-time-to-stop-that/
- “"For lots of people who do shift work, it would be really useful if they could take a pill that would help them go to sleep or stay awake at the right time," Liira said. Unfortunately, the results of this review suggest some may have serious side effects, while others should only be used for a short period. There’s no short cuts when trying to break from your natural rhythm.” http://www.medicaldaily.com/shift-work-disorder-motivates-use-modafinil-and-other-pills-may-cause-harm-297774
Sleeping Tablet Hazards

- “Trying to get a good sleep at high altitude during the daytime between extreme night shifts generally required sleeping tablets.” Steven Magee CEng MIET - Q
- "Yes, they’re a quick fix to help you get a good night’s sleep temporarily, but they’re not a long-term solution to sleep problems in general—and they can be dangerous if used incorrectly," https://www.womenshealthmag.com/health/sleeping-pill-dangers
- “Sleeping Pills Could Shorten Your Life” http://www.darksideofsleepingpills.com/
- “Shift workers often rely on sleeping pills to help them fall asleep during the day. These pills are also known as hypnotics or sedatives.” http://sleepcenter.ucla.edu/coping-with-shift-work
- “regular use of sleeping pills and other sedatives to aid sleep are not recommended because they can lead to dependency and addiction.” http://www.hse.gov.uk/humanfactors/topics/shift-workers.htm
- “Sleeping pills and unwanted sex...While I was married to my ex I was on sleeping pills. I told him not to have sex with me while I was taking them because I could not remember having sex a few times when we did, while I was on the pills. It felt strange and even wrong to have sex when I couldn't remember it.” https://www.dailystrength.org/group/sexual-abuse/discussion/sleeping-pills-and-unwanted-sex
- “Side Effects and Potential Dangers of Sleeping Pills...Low Sexual Drive: Diminished libido is counterproductive for most insomnia patients as most of them do suffer from anxiety or depression as well. And satisfactory sexual activity is always linked to relaxed body, peaceful mind and a good sleep.” http://blog.snoozester.com/side-effects-and-potential-dangers-of-sleeping-pills/
- “some users of the most widely prescribed drug, Ambien, started complaining online and to their doctors about unusual reactions ranging from fairly benign sleepwalking episodes to hallucinations, violent outbursts, nocturnal binge eating and — most troubling of all — driving while asleep.” http://www.nytimes.com/2007/03/15/business/15drug.ready.html
- “Ambien Side Effects” https://www.drugs.com/sfx/ambien-side-effects.html
- “Understanding the Side Effects of Sleeping Pills” https://www.webmd.com/sleep-disorders/guide/understanding-the-side-effects-of-sleeping-pills#1
Exposure Of Night Shift Workers To Bright Sunlight

- “After several extreme very high altitude night shifts, returning to sea level and exposure to increased oxygen and bright sunlight would bring on intestinal pains and diarrhea after eating the first large meal.” Steven Magee CEng MIET - Q
- “Does short sun exposure cause diarrhea even without stomach cramping?...This morning I was sitting indoors with the windows closed but in the sun, just getting warm. I must have sat in the sun for 1 and a half hours and it felt really good, no skin burn or anything, but about 1 hour later I had really watery diarrhea. I know it was nothing I ate because all I had was oatmeal, which is what I usually have in the morning. I didn't have a stomach ache, so where is the diarrhea coming from?” https://www.medhelp.org/posts/Undiagnosed-Symptoms/Does-short-sun-exposure-cause-diarrhea-even-without-stomach-cramping/show/1468892
- “sun and diarrhea...Just wondering if anyone here is affected by the sun shining brightly. Every time I'm in bright sunlight I need the bathroom two minutes later. I was wondering if this had to do with the crohns...I did read something about the sun having an effect on the digestive system in some people.” https://www.healingwell.com/community/default.aspx?f=17&m=1534222
Industrial High Powered LASER Hazards

- “Working the night shift exposed me to very high powered 20 watt industrial sodium LASER light. We were told that it was harmless to the naked eye if we did not look directly into the LASER beam. Walking into the observatory dome being illuminated by the bright scattered orange laser light was a common occurrence.” Steven Magee CEng MIET - Q
- “A Darker View: LASER” http://darkerview.com/wordpress/?tag=laser
- “The average power output of the Keck I and II lasers are generally 15-20 W and 20 W, respectively.” https://www2.keck.hawaii.edu/optics/lgsao/lgsbasics.html
- “Class IV: High power lasers (cw: 500 mW, pulsed: 10 J/cm2 or the diffuse reflection limit) are hazardous to view under any condition (directly or diffusely scattered) and are a potential fire hazard and a skin hazard. Significant controls are required of Class IV laser facilities.” https://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_6.html
- “You need laser safety glasses in any situation where it is possible that your eyes could be exposed to direct, reflected, or scattered laser radiation. In other words, if there’s even a remote chance that your eyes could be exposed to even a scattered reflection of the beam, you need to be wearing laser safety glasses.” http://blog.phillips-safety.com/when-do-you-need-laser-safety-glasses/
- “Keck Laser Engineer Robert Lafon volunteers his hand to demonstrate the intensity (and safety) of the Keck LGS laser. Photo Courtesy of W.M. Keck Observatory.” http://www.gemini.edu/node/128
- “I enjoyed working with Keck Laser Engineer Robert Lafon during my night shifts. If I saw him today, I would ask him this question: Do you have any health conditions that you associate with working with 20 watt high powered LASER's and very high altitude work?” Steven Magee CEng MIET - Q
- “The long term effects of exposure to high powered 20 watt sodium LASER guide stars are unlikely to be fully understood for a few more decades, as it is such a new technology and only a relatively small group of people have been exposed to it. LASER radiation safety standards appear to be where X-Ray radiation safety standards were in the 1900's.” Steven Magee CEng MIET - Q
- “Early X-ray machines needed to be set and repeatedly adjusted. To achieve this, radiographers would place their hands between the actively radiating tube and the film plate to check if the apparatus was functioning and that it was well focused on the film. By practicing this for 12 years, Dr. Kells was the first victim of dental X-ray radiation with numerous cancerous tumors on his fingers.” https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4319329/
- “She was a dental technician in the Navy and also worked for years in pediatric dental offices and orthodontics as an assistant, calming nervous children, helping them to have good dental experiences, and when she was exposing radiographs, sometimes she admits that she would make it easier on everyone if she would stay with the child while the x-rays were beaming through her hand...Even though the tumor was benign, because of the damage done, the possibility of regrowth and other factors, the decision was made for my friend to have her ring finger amputated.” http://www.dentalbuzz.com/2013/03/15/fingers-in-the-picture/
Laser safety is the safe design, use and implementation of lasers to minimize the risk of laser accidents, especially those involving eye injuries. Since even relatively small amounts of laser light can lead to permanent eye injuries, the sale and usage of lasers is typically subject to government regulations. The Laser Institute of America (LIA) is the international society for laser applications and safety. Our mission is to foster lasers, laser applications, and laser safety worldwide. Laser Bio-effects

Light causes biological damage through both temperature effects due to absorbed energy and through photochemical reactions. The chief mode of damage depends on the wavelength of the light and on the tissue being exposed. For control of hazards from lasers, the damage is believed to be due principally to temperature effects, and the critical organs are the eye and the skin. The retina represents a paradox, in that, while light and oxygen are essential for vision, these conditions also favour the formation of reactive oxygen species leading to photochemical damage to the retina. Such light damage seems to be multi-factorial and is dependent on the photoreactivity of a variety of chromophores (e.g., vitamin A metabolites, lipofuscin, melanin, flavins, porphyrins, carotenoids) endogenous to the retina. At the age of 46 I was starting to see the appearance of rainbow halos and starbursts around bright nighttime lights, problems reading small print, blurred focusing with my eyes, and image recognition issues. I had been exposed to medical oxygen, industrial gasses, solvents and bright high powered 20 watt scattered sodium LASER light a decade earlier in very high altitude astronomy.
“Seeing rainbows or halos around light indicates a problem with how light is filtering into the eye. Light is made up of different colours but the rays are normally focused on a single point so you can't distinguish them. These symptoms indicate that scattering of light is occurring on the cornea or lens” [http://www.dailymail.co.uk/health/article-2567022/Seeing-rainbows-Its-time-eyes-checked.html](http://www.dailymail.co.uk/health/article-2567022/Seeing-rainbows-Its-time-eyes-checked.html)
Mauna Kea Hazards

- “If all of your past employees were to honestly write about their experiences in your company, what would they write?” Steven Magee CEng MIET - Q
- High Altitude Health Hazards of Mauna Kea, Hawaii [http://www.environmentalradiation.com/Altitude%20chapter%20of%20health%20forensics.pdf](http://www.environmentalradiation.com/Altitude%20chapter%20of%20health%20forensics.pdf)
- Anonymous worker review 1 of the summit of Mauna Kea: "...Keck is run for the benefit for 3 or 4 key individuals who have a long history of mistreating staff. In some instances the mistreatment led to suicide. Expect to work with angry explosive hair trigger co-workers...In one incident it was necessary to post guards at headquarters to protect the hq workers from a disgruntled mountain worker...Working at altitude can have profound effects on one's health and relationships with others..." [https://www.glassdoor.com/Reviews/W-M-Keck-Observatory-Reviews-E783404.htm](https://www.glassdoor.com/Reviews/W-M-Keck-Observatory-Reviews-E783404.htm)
- Anonymous worker review 2 of the summit of Mauna Kea: "...Don't be the next victim of this toxic organization. This isn't a collegial scientific organization, its an Apartheid style old Hawaii Sugar Plantation on top of a volcano..." [https://www.glassdoor.com/Reviews/W-M-Keck-Observatory-Reviews-E783404.htm](https://www.glassdoor.com/Reviews/W-M-Keck-Observatory-Reviews-E783404.htm)
- “It is important to remember that blatant harassment of male workers by toxic female managers is also prevalent in the USA.” #MeToo Steven Magee CEng MIET - Q
- “The #MeToo movement has done an excellent job of highlighting workplace harassment of females. It is now time to expand it to represent the unwarranted workplace harassment of workers by the opposite gender.” Steven Magee CEng MIET - Q
- "The summit of Mauna Kea was definitely a place where it was better to be a hard to replace skilled engineer than an easy to replace technician. It was my experience that once you had developed Mauna Kea Sickness (MKS) that the management team would blatantly harass you out of your job using nasty inhumane human resources techniques." Steven Magee CEng MIET #MeToo - Q
- “Two aggressive female astronomy managers would take me into numerous surprise closed door meetings and jointly attempt to harass me out of my job. It was the worst experience that I have ever had in the workplace.” Steven Magee CEng MIET #MeToo - Q
- “I WANT YOUR RESIGNATION!” W. M. Keck Observatory #MeToo
- “The toxic female managers clearly stated the reason why they were harassing me for my resignation was because I had the audacity to use my earned sick time for essential surgery. It all seemed very illegal to me to harass a worker that was working while recovering from essential surgery.” Steven Magee CEng MIET #MeToo - Q
- “I found it strange that I had a large benign tumor on the tendon sheaths of the knee joint. As the tumor grows in the joint, it damages the surrounding bone and tissues if not removed promptly. I later researched the toxicity of very high altitude facilities and realized that I was working in a very abnormal biological environment that was clearly doing strange things to workers health.” Steven Magee CEng MIET - Q
- “Radiation Effects Research Foundation...Benign tumors. Information about the influence of A-bomb radiation on non-malignant, or benign, tumors comes mostly from research in the
clinical Adult Health Study (AHS). Studies have been conducted with respect to benign thyroid, parathyroid, salivary gland and uterine tumors, and gastric polyps. In each case, a relationship to radiation dose was seen.” [https://www.rerf.or.jp/radefx/late_e/benign.html]

- “In 2017 I became extremely ill with flu-like symptoms and was confined to bed for a week, 2018 was filled with colon issues that resulted in a colonoscopy removing a 5mm polyp from the sigmoid colon. Intestinal pains were a feature of high altitude workplaces and I had previously seen a gastroenterologist in 2006 for extreme intestinal pains that were so severe that I was falling over with them. The removed polyp was causing malnutrition to occur and I had been high dosing with nutritional supplements to offset it. My very high altitude coworker had died from fatal colon cancer.” Steven Magee CEng MIET - Q

- “Hypoxia is when a portion of the body doesn't have adequate oxygen supply. Hypoxia-inducible factor 1-alpha, (HIF-1-alpha,) is a protein that is encoded by the HIF1A gene, playing an essential role in cellular and systemic responses to hypoxia. Cancer cells use this protein to grow their blood supply and spread.” [https://www.envita.com/cancer/the-important-role-oxygen-plays-in-cancer-treatment]

- “Being harassed out of my job by the W. M. Keck Observatory removed me from the abnormal environmental conditions that exist at very high altitudes, which was clearly beneficial for my long term health.” Steven Magee CEng MIET #MeToo - Q

- “I found the numerous surprise meetings with the female harassers to be very unprofessional, possibly illegal, and aimed to make sure that you had no legal support in the meetings from an employment lawyer.” Steven Magee CEng MIET #MeToo - Q

- “Not content with harassing me numerous times in a private office, an aggressive female manager started extending my extreme night shifts which would make me really sick with shift work disorder, very high altitude sickness and workplace drug use.” Steven Magee CEng MIET #MeToo - Q

- “I was placed onto time off against my will by the harassing female managers.” Steven Magee CEng MIET #MeToo

- “The harassing female managers unexpectedly terminated my employment while I was away on forced time off that they initiated.” Steven Magee CEng MIET #MeToo - Q

- “The reason why I had earned so much night shift time bank was because the harassing female managers had overworked me, causing me to accumulate lots of excess work hours.” Steven Magee CEng MIET #MeToo

- “I was owed a very large sum of vacation and night shift time bank pay when I was terminated and I have no recollection of ever receiving it.” Steven Magee CEng MIET #MeToo

- “The W. M. Keck Observatory is the only employer that has surprised me during my employment with urine tests for illegal drugs.” Steven Magee CEng MIET #MeToo - Q

- “I never felt so relieved to leave a job as I did the day I left the toxic W. M. Keck Observatory.” Steven Magee CEng MIET #MeToo - Q

- “From the point that I returned to work from essential surgery to the point of being terminated, it was clear that the toxic W. M. Keck Observatory had declared war on me.” Steven Magee CEng MIET #MeToo - Q

- “It was clear to me that using your earned sick time for essential surgery would put a target on your back at the toxic W. M. Keck Observatory.” Steven Magee CEng MIET #MeToo - Q

- "I posted a truthful review of the toxic W. M. Keck Observatory on Glassdoor and got the following message back from them: ...We determined your review does not meet these
guidelines because it contains an accusation of a specific criminal activity that we don't allow on our site...Best Regards, Glassdoor” Steven Magee CEng MIET #MeToo - Q

http://www.environmentalradiation.com/Glassdoor%20w%20m%20keck%20observatory%20review%20rejection%20captioned.jpg

- "What do I need to know about…WORKPLACE HARASSMENT" #MeToo
- “Constructive Discharge: Were You Forced to Resign? If you were forced to quit your job because of intolerable working conditions, you may be able to sue.”
https://www.nolo.com/legal-encyclopedia/constructive-discharge-were-you-forced-resign.html
- “Key Facts to Know When You’ve Been Forced to Resign...Being forced to resign can be a serious blow to one’s career and self-esteem, but it doesn’t have to mean forfeiting your rights. In some instances, being forced to resign is illegal, and employees should be aware that employment discrimination laws can protect them when the circumstances signal unfairness. A resignation is a voluntary act which results in formally giving up a position of employment. However a forced resignation is often involuntary and comes as a result of some form of pressure or intimidation from supervisors, managers or even fellow members of an organizational board. A forced resignation has certain legal implications that a voluntary resignation does not have. For instance, a forced resignation based on discrimination or retaliation could trigger employment discrimination law.”
https://www.shegerianlaw.com/key-facts-youve-forced-resign/
- “Forced to resign: What are your options?...Dear Evil HR Lady, My employer asked me to resign. I had no early warnings nor complaints about my work performance. They won't tell me the reason. Should I sign the termination letter on the spot? Can I ask them if I can review it first? What questions should I ask? The first rule of signatures is you never, ever - not in a million years - sign something you don't understand. If someone shoves a resignation letter under your nose and tells you to sign it, do not sign until you not only understand it, but are willing to accept the consequences of signing it.”
- “After refusing numerous hostile demands for my resignation, the toxic management team changed my job description multiple times to be distinctly different from the rest of the team. I regarded it as a form of harassment and discrimination.” Steven Magee CEng MIET #MeToo - Q
- “To be considered a constructive discharge, the employer (or someone employed by the employer) must create intolerable working conditions. This often includes things like: Demotions, forced retirement, or job responsibility removal without reason, Pay or hour decreases without justification, Reassignment to menial work. Consistent bullying or badgering, humiliation or harassment as in the case of a hostile work environment”
- “Discrimination...In human social affairs, discrimination is treatment or consideration of, or making a distinction in favor of or against, a person based on the group, class, or category to which the person is perceived to belong rather than on individual attributes. This includes treatment of an individual or group, based on their actual or perceived membership in a certain group or social category, "in a way that is worse than the way people are usually treated". It involves the group's initial reaction or interaction going on to influence the individual's actual behavior towards the group leader or the group, restricting members of one group from opportunities or privileges that are available to another group, leading to the exclusion of the
individual or entities based on logical or irrational decision making.”

- “Discrimination by Type. Learn about the various types of discrimination prohibited by the laws enforced by EEOC. We also provide links to the relevant laws, regulations and policy guidance, and also fact sheets, Q&As, best practices, and other information. Age; Disability; Equal Pay/Compensation; Genetic Information; Harassment; National Origin; Pregnancy; Race/Color; Religion; Retaliation; Sex; Sexual Harassment” https://www.eeoc.gov/laws/types/

- “Harassment is unwelcome conduct that is based on race, color, religion, sex (including pregnancy), national origin, age (40 or older), disability or genetic information. Harassment becomes unlawful where 1) enduring the offensive conduct becomes a condition of continued employment, or 2) the conduct is severe or pervasive enough to create a work environment that a reasonable person would consider intimidating, hostile, or abusive. Anti-discrimination laws also prohibit harassment against individuals in retaliation for filing a discrimination charge, testifying, or participating in any way in an investigation, proceeding, or lawsuit under these laws; or opposing employment practices that they reasonably believe discriminate against individuals, in violation of these laws. Petty slights, annoyances, and isolated incidents (unless extremely serious) will not rise to the level of illegality. To be unlawful, the conduct must create a work environment that would be intimidating, hostile, or offensive to reasonable people.
  Offensive conduct may include, but is not limited to, offensive jokes, slurs, epithets or name calling, physical assaults or threats, intimidation, ridicule or mockery, insults or put-downs, offensive objects or pictures, and interference with work performance. Harassment can occur in a variety of circumstances, including, but not limited to, the following: The harasser can be the victim's supervisor, a supervisor in another area, an agent of the employer, a co-worker, or a non-employee. The victim does not have to be the person harassed, but can be anyone affected by the offensive conduct. Unlawful harassment may occur without economic injury to, or discharge of, the victim.” https://www.eeoc.gov/laws/types/harassment.cfm

- “Based on what I experienced at the toxic W. M. Keck Observatory, this is the Mauna Kea workplace harassing procedure: 1. Hit the worker with multiple nasty surprise resignation meetings. 2. If they do not voluntary resign, make their working conditions intolerable by repeatedly changing their working conditions on a regular basis and extend their working hours. 3. If still present, put them on leave against their will and fire them while they are away from the workplace.” Steven Magee CEng MIET #MeToo - Q

- “It is unfortunate for the toxic W. M. Keck Observatory that it failed to see that blatantly harassing a sickened worker out of their job would have long term repercussions for its ability to operate its current and future facilities atop Mauna Kea as their victim told their horror story to the world.” Steven Magee CEng MIET #MeToo - Q

- “Never harass a sickened manager out of their position that has a complete understanding of how the biologically toxic facility operates.” Steven Magee CEng MIET #MeToo - Q

- “This was my Mauna Kea experience: 1. Hire worker and do not disclose the full range of the biological toxicity of the very high altitude facility to them. 2. Let the worker get sick and start using their earned sick time. 3. Harass the sickened worker out of the company. 4. Hire an unsuspecting healthy worker to replace them.” Steven Magee CEng MIET #MeToo - Q

- “I have never had any complaints about the quality of your work, or the effort you have put in to making Keck function better - I think you have been a good & valuable employee, and done good work for Keck.” Email by senior coworker at the W. M. Keck Observatory months after the workplace harassment started.
“The W. M. Keck Foundation would be wise to establish how profound the health, safety, worker sickness and harassment issues are at the toxic W. M. Keck Observatory.” Steven Magee CEng MIET #MeToo - Q

“Five years of working at the toxic W. M. Keck Observatory was the point where I ceased to be healthy and started a daily struggle with sickness. That sickness has plagued me ever since.” Steven Magee CEng MIET - Q


"The following information really should be placed on all very high altitude job adverts and company contracts: WARNING – Very high altitude commuting presents many known health risks to sea level adapted humans. Some of the documented conditions are headaches, forgetfulness, confusion, irritability, aggression, hallucinations, visions, light headedness, fatigue, fainting, sore throats, runny noses, digestive disturbances, changed personality and panic attacks. Development of cancer, anemia, high cholesterol, heart, lung, brain, and blood oxygenation issues have occurred in very high altitude workers that have resulted in disability and premature death. The nearest fully equipped hospital accident and emergency facility is typically one to two hours away. Numerous very high altitude workers have been killed due to fatal mistakes on the job. Workers are expected to use a variety of company supplied drugs to offset the daily very high altitude sickness including "RX-Only" prescription medical oxygen. Daily long term self medication is known to damage human health. The work environment is comparable to a Faraday cage and Faraday Cage Sickness (FCS) may occur in long term workers. Radiation levels are abnormally high and long term radiation sickness may result. Blood oxygen levels are typically in the region of 80% and the medical profession regards this as a health risk. Extreme night shifts are associated with causing poor health and lifelong sleep disorders. Low oxygen environments are associated with the onset of irritability, fatigue and Sleep Apnea. Repeatedly reporting observations of abnormal behaviors in workers to upper management may result in your contract not being renewed or termination without notice. Permanently sickened workers are unlikely to qualify for corporate government disability payments, which may lead to a lifetime of extreme poverty." Steven Magee CEng MIET - Q

"If you are looking for a career that may induce a myriad of health conditions into you, I can recommend working at the 13,796 feet very high altitude summit of Mauna Kea, Hawaii, USA." Steven Magee CEng MIET - Q

“Very high altitude observatories are a known worker health hazard.” Steven Magee CEng MIET - Q

“Given that science has proven that the very high altitude summit of Mauna Kea is biologically toxic to the sea level adapted human, the only correct course of action is to bulldoze all manned facilities as soon as possible.” Steven Magee CEng MIET - Q

“I am proud to be a civil rights advocate.” Steven Magee CEng MIET - Q
Statement by Finnish Astronomers and Astrophysicists on Harassment

- “We, astronomers and astrophysicists from Finland and in Finland, strongly condemn harassment and discrimination. This includes but is not limited to harassment or discrimination based on sex, gender, sexual orientation, race, or disability. Harassment can take the form of unwanted sexual attention, bullying, coercion, or the creation of an unsafe or hostile work environment, especially in the presence of imbalances of power. Our own academic community is no exception. Harassment is a serious offence that too often goes unreported and unchallenged. When victims come forward, they must be able to rely on our support. We must address the issue head-on. Otherwise, we not only enable harassers, but also send a devastating message to the individuals who have been harassed - and whose careers are often destroyed or seriously disrupted - as well as to the whole community. Our concern and solidarity is first with victims of harassment, and with the right of all staff and students to work in a healthy and safe environment. And while we also recognise the possibility of rehabilitation, it can only be at the end of a process that begins with an acknowledgement of the offense, and taking responsibility for the harm caused. The Finnish astronomical and astrophysical community is diverse and international, and it is also deeply connected. It strives on principles of fairness and equal opportunities. Harassment or discrimination threaten our community and our way of working together. They have no place here.”

https://docs.google.com/document/d/e/2PACX-1vQSkR8OSHbqC9tEfjum3RkHbk-LEXYbv422el3bTlMeTRY1XtcDY9lKRadQnyffree1hp1Fs2pqKYMc/pub
Sonic Boom Hazards

- “When I was hired to work at the Kitt Peak National Observatory (KPNO), it was not disclosed to me that the site was being hit by powerful sonic booms from military supersonic aircraft that would shake the buildings. I had noticed that there seemed to be a significant number of staff that were having heart issues and some appeared to have had heart attacks and died prematurely. I later discovered during researching my own heart issues that it was a suspected effect of exposure to sonic booms. Regular exposure to sonic booms from military supersonic jet aircraft is suspected of increasing the incidence of vibroacoustic disease, a thickening of heart tissue which may lead to heart arrhythmia or premature death.” — Steven Magee CEng MIET

- “48 of the 50 Vieques residents tested were diagnosed as suffering from vibroacoustic disease — a thickening of heart tissue caused by exposure to sonic booms. Simultaneously, the Ponce School of Medicine conducted an independent study and found other data to confirm the presence of vibroacoustic disease: 79% of Viequenses fishermen have thickened heart tissue, which is the main symptom of vibroacoustic disease. This disease is said to lead to heart arrhythmia, or even death.”

- “Aircraft noise linked with heart problems...The results showed that the highest levels of aircraft noise had the strongest association with cardiovascular disease hospitalizations. Overall, 2.3% of hospitalizations for cardiovascular disease among older people living near airports were attributable to aircraft noise.”

- “The mission of Quiet Tucson Skies Inc. is to protect and enhance the livability of the Tucson metropolitan area by promoting limited flights of quiet, safe military aircraft and by opposing the increase of military air traffic, expanded flight paths or the introduction of aircraft that generate increased noise and air pollution, especially the F-35. Quiet Tucson Skies Inc. will educate residents and decision-makers about the dangers of military flights over our community and the threats created by the noise and air pollution they generate. Quiet Tucson Skies Inc. may work with the public and other organizations to restore the safety and serenity of our Sonoran Desert community.”

- “Aircraft noise is noise pollution produced by aircraft during the various phases of a flight...Health consequences include sleep disturbance, hearing impairment and heart disease, as well as workplace accidents caused by stress. Memory and recall can also be affected.”
Radio Frequency Hazards

- “High altitude astronomical sites are commonly also used as Radio Frequency (RF) radiation antenna parks.” Steven Magee CEng MIET -Q
  [http://www.environmentalradiation.com/RF_Steward_Observatory_captioned.jpg]
- “RF Readings At Kitt Peak National Observatory (KPNO)” https://youtu.be/HBTljT8dANs
- “Microwave and Radio Frequency Radiation”
- “Tuning in to Microwave Sickness From Wireless Radiation. How wireless technology can trigger a devastating illness...scientists have documented evidence of an illness from sub-thermal microwave exposure for decades. The condition used to be known as “microwave sickness” or “radio frequency sickness,” but today, it’s usually called electromagnetic sensitivity (ES).” [https://www.theepochtimes.com/tuning-in-to-microwave-sickness_2925499.html]
- “After almost a decade in high altitude astronomy, I went on to develop Electromagnetic Hypersensitivity.” Steven Magee CEng MIET [http://www.es-uk.info/]
- “The Robert C. Byrd Green Bank Telescope, which opened in 2001 and is operated by the National Radio Astronomy Observatory, is used to detect electromagnetic signals in deep space....Between 50 and 60 of Green Bank’s residents suffer from electromagnetic hypersensitivity (EHS), a condition purported to be a debilitating sensitivity to the electromagnetic waves emitted by Wi-Fi routers and cellphone towers. Its sufferers report experiencing headaches, nausea, nosebleeds, sleep problems and other symptoms they believe are connected to exposure to such waves.” [http://www.newsweek.com/seeking-radio-silence-west-virginias-quiet-zone-475589]
- “Curing Electromagnetic Hypersensitivity” [https://www.electricsense.com/8862/curing-electromagnetic-hypersensitivity-my-review/]
- “Cell phone radiation and electromagnetic fields (EMF’s) are the most important under-reported story of our generation. Autism and obesity is exploding, child diabetes is on an unexplainable rise, children are being medicated as never before. Does this need to be? Is this normal? No it’s not. EMFs and cell phones have got a lot to answer for, and I am not the only one saying this.” [https://www.electricsense.com/about/]
- “Seven ways EMF technology seriously threatens entire populations”
  [https://nexusnewsfeed.com/article/health-healing/seven-ways-emf-technology-seriously-threatens-entire-populations/#.Wd2CH6lIirg.facebook]
- “Small Cells, Mini Cell Towers, Wireless Facilities and Health: Letters From Scientists on the Health Risk of 5G” [https://ehtrust.org/small-cells-mini-cell-towers-health-letters-scientists-health-risk-5g/]
- "HEALTH EXEMPTION FOR FIREFIGHTERS SENDS A MESSAGE TO THE WORLD”

“Electromagnetic interference (EMI), also called radio-frequency interference (RFI) when in the radio frequency spectrum, is a disturbance generated by an external source that affects an electrical circuit by electromagnetic induction, electrostatic coupling, or conduction.[1] The disturbance may degrade the performance of the circuit or even stop it from functioning. In the case of a data path, these effects can range from an increase in error rate to a total loss of the data.[2] Both man-made and natural sources generate changing electrical currents and voltages that can cause EMI: ignition systems, cellular network of mobile phones, lightning, solar flares, and auroras (Northern/Southern Lights). EMI frequently affects AM radios. It can also affect mobile phones, FM radios, and televisions, as well as observations for radio astronomy.” [https://en.wikipedia.org/wiki/Electromagnetic_interference]

“Code of Federal Regulations, Title 47, Part 15 (47 CFR 15) is an oft-quoted part of Federal Communications Commission (FCC) rules and regulations regarding unlicensed transmissions. It is a part of Title 47 of the Code of Federal Regulations (CFR), and regulates everything from spurious emissions to unlicensed low-power broadcasting. Nearly every electronics device sold inside the United States radiates unintentional emissions, and must be reviewed to comply with Part 15 before it can be advertised or sold in the US market.” [https://en.wikipedia.org/wiki/Title_47_CFR_Part_15]

“Steven Magee Discovers That Kelp & Vitamin B12 Offset Radiation Induced Damage In Plants” Steven Magee CEng MIET [https://youtu.be/nb4mSk06eGw]

"Increased Release of Mercury from Dental Amalgam Fillings due to Maternal Exposure to Electromagnetic Fields as a Possible Mechanism for the High Rates of Autism in the Offspring: Introducing a Hypothesis...According to the World Health Organization (WHO), factors such as growing electricity demand, ever-advancing technologies and changes in social behaviour have led to steadily increasing exposure to man-made electromagnetic fields. Dental amalgam fillings are among the major sources of exposure to elemental mercury vapour in the general population. Although it was previously believed that low levels are mercury (i.e. release of mercury from dental amalgam) is not hazardous, now numerous data indicate that even very low doses of mercury cause toxicity. There are some evidence indicating that perinatal exposure to mercury is significantly associated with an increased risk of developmental disorders such as autism spectrum disorders (ASD) and attention-deficit hyperactivity disorder (ADHD). Furthermore, mercury can decrease the levels of neurotransmitters dopamine, serotonin, norepinephrine, and acetylcholine in the brain and cause neurological problems. On the other hand, a strong positive correlation between maternal and cord blood mercury levels is found in some studies. We have previously shown that exposure to MRI or microwave radiation emitted by common mobile phones can lead to increased release of mercury from dental amalgam fillings. Moreover, when we investigated the effects of MRI machines with stronger magnetic fields, our previous findings were confirmed. As a strong association between exposure to electromagnetic fields and mercury level has been found in our previous studies, our findings can lead us to this conclusion that maternal exposure to electromagnetic fields in mothers with..."
dental amalgam fillings may cause elevated levels of mercury and trigger the increase in autism rates. Further studies are needed to have a better understanding of the possible role of the increased mercury level after exposure to electromagnetic fields and the rate of autism spectrum disorders in the offspring." https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4795328/
Dirty Electricity Hazards

- “The most deformed AC voltage sine wave that I have seen in my career was at a high altitude astronomical observatory where I worked for almost three years. I eventually became so sick sitting next to the electrical room daily that I had no option but to leave.” Steven Magee CEng MIET - Q
- “The State of Arizona warns about the toxicity of sitting near to electrical rooms.” Steven Magee CEng MIET https://youtu.be/oHTXt-LMWIE?t=1h5m45s - Q
- “Dirty Electricity tells the story of Dr. Samuel Milham, the scientist who first alerted the world about the frightening link between occupational exposure to electromagnetic fields, electromagnetic pollution, and human disease. Milham takes readers through his early years and education, following the twisting path that led to his discovery that most of the twentieth century diseases of civilization, including cancer, cardiovascular disease, diabetes, and suicide, are caused by electromagnetic field exposure. “http://www.sammilham.com/
- “Here you will find an ever-expanding list of research on the subjects of electrical pollution, dirty electricity, ground currents and voltages (“stray voltage”), and studies on the application of STETZERiZER® products to remediate these electrical problems. Research is also available on how electrical pollution, dirty electricity, and ground currents and voltages affect the health of human beings and animals.” http://www.stetzerelectric.com/category/research/
- “Welcome to the PSC Stray Voltage website. The stray voltage documents listed below are a compilation of papers and other documents that relate to the topic of stray voltage.” https://psc.wi.gov/Pages/Programs/StrayVoltageHomePage.aspx
- "It's a slow, painful torturous death, is what it is for them...It's like watching someone die of AIDS." http://www.startribune.com/cows-are-dying-and-farmers-think-they-know-why/13489261/
**Faraday Cage Sickness**

- “Metal astronomical observatory domes and metal buildings are a form of the Faraday cage.”
  Steven Magee CEng MIET - Q
- “A Faraday cage or Faraday shield is an enclosure used to block electromagnetic fields. A Faraday shield may be formed by a continuous covering of conductive material or in the case of a Faraday cage, by a mesh of such materials. Faraday cages are named after the English scientist Michael Faraday, who invented them in 1836.”
  https://en.wikipedia.org/wiki/Faraday_cage
- “An emerging body of research is suggesting that soaring 35,000ft (10km) above the ground inside a sealed metal tube can do strange things to our minds, altering our mood, changing how our senses work and even making us itch more.”
- “There have been a few studies that have shown that plants can have a difficult time surviving when grown under a form of electro-magnetic shielding known as a Faraday’s Cage...They discovered that shielding plants from the Earth’s electric field using a grounded wire net had a detrimental effect on plant health, stating that the plants looked “feebly”...It turned out that the uncovered plants grew 50 to 60 percent better than the shielded plants. Furthermore, they found that flowering and fruiting processes were adversely affected by the lack of electric field exposure.”
- “Clearing Up Headaches With X-Ray Radiation”
- “Cars are a form of the Faraday cage.”
  Steven Magee CEng MIET - Q
- “An absence of natural radiation may be as harmful as an abnormally large exposure of radiation.”
  Steven Magee CEng MIET - Q
Travel Hazards

- “The most dangerous roads that I have driven on are those leading to high altitude astronomical observatories.” Steven Magee CEng MIET - Q
- “The most dangerous roads are those that provide sea level adapted humans rapid ascent to very high altitudes.” Steven Magee CEng MIET - Q
- “I lost control of the sport utility vehicle (SUV) many times at astronomical observatories. Driving down the road on two wheels like a stunt car driver after taking a corner too fast and almost rolling over at Roque De Los Muchachos, sliding uncontrollably down Kitt Peak backwards on a dangerous snowy road, and hallucinating on Mauna Kea while driving, to name just a few of the dangerous occurrences.” Steven Magee CEng MIET - Q
- “Driving judgment is compromised in the sea level adapted human when at high altitudes.” Steven Magee CEng MIET - Q
- “Workers on the 13,796’ oxygen deficient summit of Mauna Kea did not use medical oxygen when driving cars to treat the potentially dangerous adverse mental effects of Cerebral Hypoxia.” Steven Magee CEng MIET - Q
- “Falling asleep at the wheel was always a danger when working extreme night shifts.” Steven Magee CEng MIET - Q
- “There were times I would drive home after an extreme set of night shifts and have no recollection of the journey.” Steven Magee CEng MIET - Q
- “How did I get home without killing myself in a car accident was a question that I asked myself many times during working extreme night shifts.” Steven Magee CEng MIET - Q
- “Drowsy Driving: Asleep at the Wheel...Drowsy driving is a major problem in the United States. The risk, danger, and often tragic results of drowsy driving are alarming. Drowsy driving is the dangerous combination of driving and sleepiness or fatigue. This usually happens when a driver has not slept enough, but it can also happen due to untreated sleep disorders, medications, drinking alcohol, or shift work.”
  https://www.cdc.gov/features/dsdrowsydriving/index.html
- “Insufficient Sleep Is a Public Health Problem...The National Department of Transportation estimates drowsy driving to be responsible for 1,550 fatalities and 40,000 nonfatal injuries annually in the United States.”
  https://www.cdc.gov/features/dssleep/index.html
- “Sleep-deprived driving (commonly known as tired driving, drowsy driving, or fatigued driving) is the operation of a motor vehicle while being cognitively impaired by a lack of sleep. Sleep deprivation is a major cause of motor vehicle accidents, and it can impair the human brain as much as alcohol can. According to a 1998 survey, 23% of adults have fallen asleep while driving. According to the United States Department of Transportation, male drivers admit to have fallen asleep while driving twice as much as female drivers. In the United States, 250,000 drivers fall asleep at the wheel every day, according to the Division of Sleep Medicine at Harvard Medical School and in a national poll by the National Sleep Foundation, 54% of adult drivers said they had driven while drowsy during the past year with 28% saying they had actually fallen asleep while driving. According to the National Highway Traffic Safety Administration, drowsy driving is a factor in more than 100,000 crashes, resulting in 6550 deaths and 80,000 injuries annually in the USA. When a person does not get an adequate amount of sleep, his or her ability to function is affected. As listed below, their coordination is impaired, have longer reaction time, impairs judgment, and memory is impaired.”
“Fatigue – You're More Than Just Tired...We wouldn't allow a friend to drive drunk, but we rarely take the keys away from our tired friends or insist that they take a nap before heading out on the road. Drowsy driving is impaired driving. NSC has gathered research that shows: You are three times more likely to be in a car crash if you are fatigued. More than 5,000 people died in drowsy-driving related crashes in 2014. Losing even two hours of sleep is similar to the effect of having three beers. Being awake for more than 20 hours is the equivalent of being legally drunk.”

“Extreme weather in conjunction with Cerebral Hypoxia makes for a very dangerous driving experience when at high altitudes.” Steven Magee CEng MIET - Q

“Neurologic Conditions: Assessing Medical Fitness to Drive...Wisconsin laws require that drivers “retain consciousness and the ability to have bodily control of a motor vehicle.” Factors affecting consciousness (e.g., seizures, syncope, hypoglycemia and sleepiness), perception (e.g., visual acuity and field of vision), mental functioning (e.g., dementia), neuromuscular and musculoskeletal function (e.g., adequate manipulation of vehicle controls), and behavior (e.g., self and impulse control) may limit safe driving.”

“A cable car taking staff, cleaners and maintenance workers to an international astronomical observatory fell 80 metres (260ft) to the valley below...20 workers on board a cable car plunged to their deaths.”

“Initially, the state prosecutor demanded a six month prison sentence for eight maintenance workers at the observatory, for their contributing roles in the accident....Three maintenance workers at the observatory were convicted on negligence charges”

“San Jose: Lick Observatory mourns death of employee killed in Mount Hamilton crash “

“Great drive for those with a death wish”

“Route 200, known locally as Saddle Road, traverses the width of the Island of Hawai‘i, from downtown Hilo to its junction with Hawaii Route 190 near Waimea. The road was considered one of the most dangerous paved roads in the state, with many one-lane bridges and areas of marginally maintained pavement. Most of the road has now been repaved, and major parts have new re-alignments to modern standards. The highway reaches a maximum elevation of 6,632 feet (2,021 m) and is subject to fog and low visibility.”
https://en.wikipedia.org/wiki/Hawaii_Route_200

- “For some workers in very high altitude astronomy, their daily round trip commute from home to the mountain summit was approximately six hours.” Steven Magee CEng MIET - Q
- “The health and well-being of remote and mobile workers...Health effects identified included musculoskeletal symptoms associated with higher mileage and more time in a vehicle but a number of vehicle design issues were found to improve symptoms.” [https://academic.oup.com/occmed/article/61/6/385/1387389](https://academic.oup.com/occmed/article/61/6/385/1387389)
- “Motion sickness is a condition in which a disagreement exists between visually perceived movement and the vestibular system's sense of movement. Depending on the cause, it can also be referred to as seasickness, car sickness, simulation sickness or airsickness.[1] Dizziness, fatigue and nausea are the most common symptoms of motion sickness.[2] Sopite syndrome, in which a person feels fatigue or tiredness, is also associated with motion sickness. "Nausea" in Greek means seasickness (naus means ship).[3][4] If the motion causing nausea is not resolved, the sufferer will usually vomit. Vomiting often will not relieve the feeling of weakness and nausea, which means the person might continue to vomit until the cause of the nausea is treated.” [https://en.wikipedia.org/wiki/Motion_sickness](https://en.wikipedia.org/wiki/Motion_sickness)
Recommended High Altitude Road Signs

- “Roads that provide rapid ascent to high altitudes should be clearly marked with the appropriate warning signs detailing the altitude disease risks.” Steven Magee CEng MIET - Q
- “8,000 feet (2,438 meters): 20% of people who ascend to 8,000 feet (2,438 meters) develop some form of altitude disease. Descent is the recommended treatment.” Steven Magee CEng MIET
- “10,000 feet (3,048 meters): 40% of people who ascend to 10,000 feet (3,048 meters) develop some form of altitude disease. Descent is the recommended treatment.” Steven Magee CEng MIET
- “12,000 feet (3,657 meters): 60% of people who ascend to 12,000 feet (3,657 meters) develop some form of altitude disease. Descent is the recommended treatment.” Steven Magee CEng MIET
- “14,000 feet (4,267 meters) and above: Most people who ascend above 14,000 feet (4,267 meters) develop some form of altitude disease. Descent is the recommended treatment.” Steven Magee CEng MIET - Q
**Extreme Weather Hazards**

- “The most extreme weather I have experienced was on top of high altitude mountain summits at astronomical observatories.” Steven Magee CEng MIET - Q
- “Weather on Mauna Kea can be severe and may include winds over 100 miles per hour, freezing temperatures, and snow storms. "White outs" caused by blowing snow can reduce visibility to zero. Deep snow drifts, freezing fog, and ice on the road can prevent passage. In the winter, ice may form suddenly, without warning. The steep paved grades are dangerous with just a thin coat of ice or snow. Visitors trapped on the mountain under these circumstances are in a life-threatening situation--they are in danger of freezing to death. Extreme weather that prevents the rescue of trapped visitors can last for more than a week.” [http://www.ifa.hawaii.edu/info/bulletins/Mauna_Kea_Hazards.html](http://www.ifa.hawaii.edu/info/bulletins/Mauna_Kea_Hazards.html)
- “The most dangerous weather condition that I experienced at high altitude was walking out of the observatory to check on astronomers in another building during a snow blizzard. When I was returning to the observatory the conditions progressed to white out, stranding me in a nighttime snow field. I was only able to return to the safety of the observatory by following my footprints in the snow with the flashlight.” Steven Magee CEng MIET - Q
- “The primary dangers caused by bad weather center on the changes it causes in snow and rock conditions, making movement suddenly much more arduous and hazardous than under normal circumstances. Whiteouts make it difficult to retrace a route while rain may prevent taking the easiest line only determined as such under dry conditions. In a storm the mountaineer who uses a compass for guidance has a great advantage over a merely empirical observer. In large snow-fields it is, of course, easier to go wrong than on rocks, but intelligence and experience are the best guides in safely navigating objective hazards. Summer thunderstorms may produce intense lightning. If a climber happens to be standing on or near the summit, they risk being struck. There are many cases where people have been struck by lightning while climbing mountains. In most mountainous regions, local storms develop by late morning and early afternoon. Many climbers will get an "alpine start", that is, before or by first light, so as to be on the way down when storms are intensifying in activity and lightning and other weather hazards are a distinct threat to safety. High winds can speed the onset of hypothermia, as well as damage equipment such as tents used for shelter. Under certain conditions, storms can also create waterfalls which can slow or stop climbing progress. A notable example is the Föhn wind acting upon the Eiger.” [https://en.wikipedia.org/wiki/Mountaineering#Weather](https://en.wikipedia.org/wiki/Mountaineering#Weather)
**Lightning Hazards**

- “The most amazing lightning I have seen has been at high altitude astronomical observatories. Watching a nearby tree being hit by lightning is an impressive sight and the explosion of sound is awesome!” Steven Magee CEng MIET - Q
- “Lightning emits a high powered electromagnetic pulse (EMP) that induces energy into everything in the area.” Steven Magee CEng MIET - Q
- “Lightning produces afterglow of gamma radiation...Lightning can produce X-rays and gamma radiation. In the past, researchers thought that this phenomenon only lasted for a very short time, about one ten-thousandth of a second. However, the ionizing radiation of lightning appears to emit much longer than presumed. An afterglow of gamma radiation arises, which lasts up to 10,000 times longer.” [https://phys.org/news/2017-10-lightning-afterglow-gamma.html](https://phys.org/news/2017-10-lightning-afterglow-gamma.html)
- “Gamma rays from lightning found to create antimatter in the air...Lightning is one of Earth's most energetic events, but there's much more to it than just a flashing fork and the rumble of thunder. Lightning strikes have been known to generate gamma rays, and now a team of Japanese researchers has found that those bursts can create photonuclear reactions in the atmosphere, resulting in the production – and annihilation – of antimatter.” [https://newatlas.com/lightning-gamma-rays-antimatter/52312/](https://newatlas.com/lightning-gamma-rays-antimatter/52312/)
- “Long term exposure to abnormally high levels of lightning may trigger genetic adaptation processes in the human.” Steven Magee CEng MIET - Q
- “An electromagnetic pulse (EMP), also sometimes called a transient electromagnetic disturbance, is a short burst of electromagnetic radiation. Such a pulse's origination may be a natural occurrence or man-made and can occur as a radiated, electric, or magnetic field or a conducted electric current, depending on the source.” [https://en.wikipedia.org/wiki/Electromagnetic_pulse](https://en.wikipedia.org/wiki/Electromagnetic_pulse)
- “Lightning strikes the earth more than 8 million times per day. The risk of being struck is low but the consequences of lightning strike injuries are serious. During 2003–2012, lightning caused an average of 35 deaths per year in the United States.” [https://www.cdc.gov/disasters/lightning/index.html](https://www.cdc.gov/disasters/lightning/index.html)
- “Lightning tends to be a nervous system injury and may affect any or all parts of the nervous system: the brain, the autonomic nervous system, and the peripheral nervous system. When the brain is affected, the person often has difficulty with short-term memory, coding new information and accessing old information, multitasking, distractibility, irritability and personality change....Early on, survivors may complain of intense headaches, tinnitus (ringing in the ears), dizziness, nausea, vomiting and other 'post-concussion' types of symptoms. Survivors may also experience difficulty sleeping, sometimes sleeping excessively acutely after the injury but changing during the next few weeks to inability to sleep more than two or three hours at a time. A few may develop persistent seizure-like activity several weeks to months after the injury.” [http://lightninginjury.lab.uic.edu/overview.htm](http://lightninginjury.lab.uic.edu/overview.htm)
- “Atmospheric electricity is the study of electrical charges in the Earth's atmosphere (or that of another planet). The movement of charge between the Earth's surface, the atmosphere, and the...”
ionosphere is known as the global atmospheric electrical circuit. Atmospheric electricity is an interdisciplinary topic, involving concepts from electrostatics, atmospheric physics, meteorology and Earth science.” [https://en.wikipedia.org/wiki/Atmospheric_electricity](https://en.wikipedia.org/wiki/Atmospheric_electricity)

- “I don't have problems with arthritis (yet) but those that I do know both here in Colorado Springs and in Denver do have problems with barometric pressure. Whether or not that really has an medical affect (or effect) on arthritis is still up in the air as to it's validity. The thing is, those I know with joint problems (me, it's allergies), can sense a thunderstorm coming on long before it's apparent.” [http://www.city-data.com/forum/denver/310811-how-arthritis-denver.html](http://www.city-data.com/forum/denver/310811-how-arthritis-denver.html)
Sick Building Syndrome

- “Sick building syndrome (SBS) is a medical condition where people in a building suffer from symptoms of illness or feel unwell for no apparent reason.[1] The symptoms tend to increase in severity with the time people spend in the building, and improve over time or even disappear when people are away from the building. The main identifying observation is an increased incidence of complaints of symptoms such as headache, eye, nose, and throat irritation, fatigue, and dizziness and nausea.[2] These symptoms appear to be linked to time spent in a building, though no specific illness or cause can be identified. SBS is also used interchangeably with "building-related symptoms", which orients the name of the condition around patients rather than a "sick" building. A 1984 World Health Organization (WHO) report suggested up to 30% of new and remodeled buildings worldwide may be subject of complaints related to poor indoor air quality. Sick building causes are frequently pinned down to flaws in the heating, ventilation, and air conditioning (HVAC) systems. However, there have been inconsistent findings on whether air conditioning systems result in SBS or not.[4] Other causes have been attributed to contaminants produced by outgassing of some types of building materials, volatile organic compounds (VOC), molds (see mold health issues), improper exhaust ventilation of ozone (byproduct of some office machinery), light industrial chemicals used within, or lack of adequate fresh-air intake/air filtration (see Minimum efficiency reporting value)."


- “United States Environmental Protection Agency...Indoor Air Facts No. 4 (revised) Sick Building Syndrome... Introduction. The term "sick building syndrome" (SBS) is used to describe situations in which building occupants experience acute health and comfort effects that appear to be linked to time spent in a building, but no specific illness or cause can be identified. The complaints may be localized in a particular room or zone, or may be widespread throughout the building. In contrast, the term "building related illness" (BRI) is used when symptoms of diagnosable illness are identified and can be attributed directly to airborne building contaminants. A 1984 World Health Organization Committee report suggested that up to 30 percent of new and remodeled buildings worldwide may be the subject of excessive complaints related to indoor air quality (IAQ). Often this condition is temporary, but some buildings have long-term problems. Frequently, problems result when a building is operated or maintained in a manner that is inconsistent with its original design or prescribed operating procedures. Sometimes indoor air problems are a result of poor building design or occupant activities”


- “Sick Building Syndrome (Environmental Illness, Multiple Chemical Sensitivity or MCS)...Sick building syndrome is believed by some to be an illness caused by unknown agents in buildings.”

https://www.medicinenet.com/sick_building_syndrome/article.htm#sick_building_syndrome_facts

- “Although in many cases the exact mechanism by which a building, or substances within the building, are causing the occupants to become ill is unknown, the problem areas can usually be identified and remedial action taken. In many SBS cases poor building design, maintenance, and/or operation of the structure's ventilation system may be at fault...The important thing is to take action to have a suspected sick building investigated as soon as possible as it is likely that the problem will only get worse if not addressed.”

http://www.ei-resource.org/illness-
Indoor air quality (IAQ) is a term which refers to the air quality within and around buildings and structures, especially as it relates to the health and comfort of building occupants. IAQ can be affected by gases (including carbon monoxide, radon, volatile organic compounds), particulates, microbial contaminants (mold, bacteria), or any mass or energy stressor that can induce adverse health conditions. Source control, filtration and the use of ventilation to dilute contaminants are the primary methods for improving indoor air quality in most buildings. Residential units can further improve indoor air quality by routine cleaning of carpets and area rugs. Determination of IAQ involves the collection of air samples, monitoring human exposure to pollutants, collection of samples on building surfaces, and computer modelling of air flow inside buildings. IAQ is part of indoor environmental quality (IEQ), which includes IAQ as well as other physical and psychological aspects of life indoors (e.g., lighting, visual quality, acoustics, and thermal comfort). Ventilation is the intentional introduction of ambient air into a space and is mainly used to control indoor air quality by diluting and displacing indoor pollutants; it can also be used for purposes of thermal comfort or dehumidification. The correct introduction of ambient air will help to achieve desired indoor comfort levels although the measure of an ideal comfort level varies from individual to individual. Air quality is assessed (through CO2 measurement) and ventilation rates are mathematically derived using constants. Indoor Air Quality Procedure uses one or more guidelines for the specification of acceptable concentrations of certain contaminants in indoor air but does not prescribe ventilation rates or air treatment methods. This addresses both quantitative and subjective evaluations, and is based on the Ventilation Rate Procedure. It also accounts for potential contaminants that may have no measured limits, or for which no limits are not set (such as formaldehyde offgassing from carpet and furniture). ASHRAE continues to publish space-by-space ventilation rate recommendations, which are decided by a consensus committee of industry experts. The modern descendants of ASHRAE standard 62-1975 are ASHRAE Standard 62.1, for non-residential spaces, and ASHRAE 62.2 for residences. Air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80% or more) of the people exposed do not express dissatisfaction.” ASHRAE Air Quality Requirements.

“The Standards for Ventilation and Indoor Air Quality. ANSI/ASHRAE Standards 62.1 and 62.2 are the recognized standards for ventilation system design and acceptable IAQ.”

“Indoor Air Quality and the Workplace”

“Air-conditioning in all buildings causes me very bad problems with arthritis and other problems. It seems to me that businesses do not air-conditioned at such a severe cold level like the warmer states.”

“Sick building syndrome - the collection of symptoms office workers have traditionally blamed on air-conditioning, photocopiers and dusty carpets - may have another cause: the computers at which they work.”
“Dirty Electricity - An Invisible Pollutant in Schools...Abstract: Dr. Magda Havas studied a Wisconsin elementary school that had been classified as a "sick building" by the school district. The principal called in a power quality expert who discovered excessive dirty power in the building. After installing Graham/Stetzer microsurge filters in the school as part of the study, the results of the study were clear: dirty electricity is contributing to the ill health of staff and students; that elementary-aged students are the most sensitive; and that this form of pollution may be significantly compromising the learning and working environment in schools. This and other studies show that young children seem to be the most sensitive to dirty electricity and their behaviour in the classroom improves when this pollutant is removed. Many of the behavioural traits that disappear are those we associated with ADD and ADHD. Students with asthma and teachers with allergies also improve when dirty electricity is reduced in school. Sick building syndrome has been associated with poor indoor air quality but recent evidence suggests that dirty electricity may be a significant contributor to this phenomenon. Monitoring and mitigating electromagnetic pollution in schools improves the school environment and may reduce ill health and learning difficulties.”


“No, Your Patient Is Not Crazy. Radiofrequency Sickness: Symptoms, Causes, Mechanisms, Diagnosis, and Treatment...Radio frequency sickness results from overexposure to radio frequency radiation. Radio frequency sickness is not a disease. It is an environmentally induced functional impairment. Radio frequency sickness has real and disabling consequences. People with radio frequency sickness experience illness (or even death) upon exposure to radio frequency radiation. The most common sources are electrical pollution – high frequencies that travel on building wiring or through the ground– and transmitters – all wireless devices. Radio frequency sickness develops when the exposure overwhelms the body’s ability to compensate for the effects produced by the exposure, often within 3-5 years. Detrimental biological effects, distinct from tissue heating effects, have been extensively documented in studies at a range of different frequencies and at levels far below the current United States safety standard.”


“Multiple chemical sensitivity (MCS), also known as idiopathic environmental intolerances (IEI), is a disputed chronic condition characterized by symptoms that the affected person attributes to low-level exposures to commonly used chemicals. Symptoms are typically vague and non-specific. They may include fatigue, headaches, nausea, and dizziness. Commonly attributed substances include scented products, pesticides, plastics, synthetic fabrics, smoke, petroleum products, and paint fumes.”

https://en.wikipedia.org/wiki/Multiple_chemical_sensitivity

“The NASA Clean Air Study[1] was led by the National Aeronautics and Space Administration (NASA) in association with the Associated Landscape Contractors of America (ALCA). Its results suggest that certain common indoor plants may provide a natural way of removing toxic agents such as benzene, formaldehyde and trichloroethylene from the air, helping neutralize the effects of sick building syndrome. The first list of air-filtering plants was compiled by NASA as part of a clean air study published in 1989,[2][3][4] which researched ways to clean air in space stations. As well as absorbing carbon dioxide and releasing oxygen, as all plants do, these plants also eliminate significant amounts of benzene, formaldehyde and trichloroethylene. The second and third lists are from B. C. Wolverton's book[5] and paper[6] and focus on removal of specific chemicals. NASA researchers suggest efficient air cleaning is accomplished with at least one plant per 100 square feet of home or office space. Other more recent research has
shown that micro-organisms in the potting mix (soil) of a potted plant remove benzene from the air, and that some plant species also contribute to removing benzene.[7]”

https://en.wikipedia.org/wiki/NASA_Clean_Air_Study
Acclimatization

- “Most healthy people can ascend rapidly to 5,000 feet without experiencing symptoms of Acute Mountain Sickness (AMS), and then proceed to 9,000 or 10,000 feet the next day without significant difficulties. Above this altitude the pace of ascent should be slowed to 1,000 feet per day.” Going Higher. Oxygen, Man, And Mountains.
- “We can cautiously suggest that a healthy young person can go, during the course of three days, to 12,000 feet and not experience more than minor symptoms. Above this, climbing 1,000 to 1,500 feet a day, with a rest every third day, seems appropriate. Above 22,000 feet, our data confirm the belief that one does not acclimatize.” Going Higher. Oxygen, Man, And Mountains.
Law Enforcement At Very High Altitudes

- “The last thing you want when you are willfully damaging your workers health is for your biologically toxic workplace to fill up with law enforcement officers!” Steven Magee CEng MIET – Q
- “A smart sea level adapted police officer would refuse to work above 10,000 feet on the grounds of their own health and safety.” Steven Magee CEng MIET
- “A sea level adapted armed police officer that has developed altitude sickness should excuse themselves from duty and leave to sea level to treat it.” Steven Magee CEng MIET – Q
- “A sea level adapted armed police officer can legally refuse to venture above 10,000 feet in altitude on the grounds of health and safety.” Steven Magee CEng MIET – Q
- “A sea level adapted police officer with a gun above 10,000 feet in altitude is a really bad idea.” Steven Magee CEng MIET – Q
- “A sea level adapted human is not mentally fit to fire a gun above 10,000 feet in altitude.” Steven Magee CEng MIET – Q
- “A sea level adapted police officer would be wise not to venture above Hale Pohaku at 9,300-foot (2,800 m) on Mauna Kea due to altitude sickness and the associated health and safety problems that it may cause.” Steven Magee CEng MIET – Q
- “A sea level adapted armed police officer should leave to sea level at the first signs of altitude sickness.” Steven Magee CEng MIET – Q
- “A sea level adapted armed police officer can legally refuse to work at high altitude if they have pre-existing health conditions.” Steven Magee CEng MIET – Q
- “A sea level adapted armed police officer at high altitude that has developed altitude sickness can legally return to sea level to treat the condition under health and safety law.” Steven Magee CEng MIET – Q
- “As a law enforcement officer, you are at serious risk of developing High Altitude Observatory Disease (HAOD) working at the summit of Mauna Kea, Hawaii, and it is highly unlikely that you will receive disability or workers compensation payments in the future for it.” Steven Magee CEng MIET – Q
**Astronomical Incompetence**

- “Astronomers messing up the construction of the Hubble Space Telescope was a very public declaration that there were serious problems within the astronomical industry” Steven Magee CEng MIET
- “NASA and the telescope became the butt of many jokes, and the project was popularly regarded as a white elephant. For instance, in the 1991 comedy The Naked Gun 2½: The Smell of Fear, Hubble was pictured with the Lusitania, the Hindenburg, and the Edsel.”
- “Mauna Kea Observatories...In Honolulu, the governor and legislature, enthusiastic about the development, set aside an even larger area for the observatory after the initial project, causing opposition on the Big Island, in the city of Hilo. Native Hawaiians (kānaka ‘ōiwi) believed the entire site was sacred and that developing the mountain, even for science, would spoil the area. Environmentalists were concerned about rare native bird populations and other citizens of Hilo were concerned about the sight of the domes from the city. Using town hall meetings, Jefferies was able to overcome opposition by weighing the economic advantage and prestige the island would receive.[3] There has been substantial opposition to the Mauna Kea observatories that continues to grow.[23] Over the years, the opposition to the observatories may have become the most visible example of the conflict science has encountered over access and use of environmental and culturally significant sites.[24] Opposition to development grew shortly after expansion of the observatories commenced. Once access was opened up by the roadway to the summit, skiers began using it for recreation and objected when the road was closed as a precaution against vandalism when the telescopes were being built. Hunters voiced concerns, as did the Hawaiian Audubon Society who were supported by Governor George Ariyoshi.[7]:56 The Audubon Society objected to further development on Mauna kea over concerns to habitat of the endangered Palila, a species endemic to only specific parts of this mountain. The bird is the last of the finch billed honeycreeper species existing on the island. Over 50% of native bird species had been killed off due to loss of habitat from early western settlers or the introduction of non-native species competing for resources. Hunters and sportsmen were concerned that the hunting of feral animals would be affected by the telescope operations.[25] A "Save Mauna Kea" movement was inspired by the proliferation of telescopes, with opposition believing development of the mountain to be sacrilegious.[26] Native Hawaiian non-profit groups, such as Kahea, whose goals are the protection of cultural heritage and the environment, oppose development on Mauna Kea as a sacred space to the Hawaiian religion.[27] Today, Mauna Kea hosts the world's largest location for telescope observations in infrared and submillimeter astronomy. The land is protected by the United States Historical Preservation Act due to its significance to Hawaiian culture, but still allowed development.[28]”
- “The Thirty Meter Telescope (TMT) is a proposed astronomical observatory with an extremely large telescope (ELT) that has become the source of controversy over its planned location on Mauna Kea in the US state of Hawaii. Construction of the TMT on land which is sacred to Native Hawaiian culture and religion[5] attracted international coverage[6] after October 2014, when construction was temporarily halted due to protests. While construction of the telescope was set to resume on April 2 and later on June 24, 2015, it was blocked by further protests each time.[7] The Board of Land and Natural Resources approved the TMT project,[8][9] but the
State Supreme Court of Hawaii invalidated the building permits in December 2015, ruling that the board had not followed due process. Roque de los Muchachos Observatory, La Palma, Canary Islands, Spain is the alternative site if construction cannot go forward in Hawaii.[10][11][12] The TMT would become the last area on Mauna Kea on which any telescope will ever be built.” [https://en.wikipedia.org/wiki/Thirty_Meter_Telescope

- “The TMT International Observatory LLC (TIO), a non-profit organization, was established in May 2014 to carry out the construction and operation phases of the TMT Project. The Members of TIO are Caltech, the University of California, the National Institutes of Natural Sciences of Japan, the National Astronomical Observatories of the Chinese Academy of Sciences, the Department of Science and Technology of India, and the National Research Council (Canada); the Association of Universities for Research in Astronomy (AURA) is a TIO Associate. Major funding has been provided by the Gordon & Betty Moore Foundation.” [https://www.tmt.org/

- “Gordon and Betty Moore established the foundation to create positive outcomes for future generations. In pursuit of that vision, we foster path-breaking scientific discovery, environmental conservation, patient care improvements and preservation of the special character of the San Francisco Bay Area.” [https://www.moore.org/home


- “W. M. Keck Observatory...Today Keck Observatory is supported by both public funding sources and private philanthropy. As a 501(c)3, the organization is managed by the California Association for Research in Astronomy (CARA), whose Board of Directors includes representatives from the California Institute of Technology and the University of California, with liaisons to the board from NASA and the Keck Foundation.” [http://www.keckobservatory.org/

- “W. M. Keck Foundation” [http://wmkeck.org/

- “University of California” [https://www.universityofcalifornia.edu/

- “California Institute of Technology” [https://www.caltech.edu/

- “National Aeronautics and Space Administration (NASA)” [https://www.nasa.gov/

- “Jerry Nelson (astronomer)...Jerry Earl Nelson (January 15, 1944 – June 10, 2017) was an American astronomer known for his pioneering work designing segmented mirror telescopes, which led to him receiving the 2010 Kavli Prize for Astrophysics. He was the principal designer and project scientist for the Keck telescopes.” [https://en.wikipedia.org/wiki/Jerry_Nelson_(astronomer)

- “University of Hawaii” [https://www.hawaii.edu/

- “Institute for Astronomy - University of Hawaii” [http://www.ifa.hawaii.edu/

- “American Astronomical Society” [https://aas.org/

- “USA Federal Government” [https://www.usa.gov/

- “State of Hawaii” [https://portal.ehawaii.gov/

- “County of Hawaii” [http://www.hawaiicounty.gov/

- “Occupational Safety and Health Administration (OSHA)” [https://www.osha.gov/

- “United States DEPARTMENT OF LABOR (DOL)” [https://www.dol.gov/

- “U.S. Food and Drug Administration (FDA)” [https://www.fda.gov/
Social Problems in High Altitude Astronomy

- “I found that high altitude astronomy was riddled with nepotism.” Steven Magee CEng MIET - Q
- “nepotism /ˈnɛpəˌtɪzəm/ noun 1. favouritism shown to relatives or close friends by those with power or influence” http://www.dictionary.com/browse/nepotism
- “Nepotism made it extremely difficult to function as a manager in certain high altitude observatories.” Steven Magee CEng MIET - Q
- “It was who you knew and not how good you were that determined success in certain high altitude observatories.” Steven Magee CEng MIET - Q
- “When one of the workers suggested they could automate some of the manager’s job with software they could easily develop, they were instructed not to do so.” Steven Magee CEng MIET - Q
Ailments Of High Altitude Workers

- “Even after a stroke disabled him, Mr Nelson started each day at the University of California, Santa Cruz, where he taught astronomy, with the night logs from Keck, checking for the unexpected.” [https://www.economist.com/news/obituary/21724363-astronomer-and-telescope-designer-was-73-obituary-jerry-nelson-died-june-10th](https://www.economist.com/news/obituary/21724363-astronomer-and-telescope-designer-was-73-obituary-jerry-nelson-died-june-10th)
- “Very High Altitude Mauna Kea Worker Steven Magee: Insomnia, Ideopathic Hypersomnia, Amnestic Disorder, Seizures, Obstructive Sleep Apnea, Small Airways Disease of the lungs, Hole in the heart, Heart Arrhythmia’s, Erratic Low Blood Oxygen, High Cholesterol, Vitamin B12 Deficiency, Vitamin D Deficiency, Radiation Sickness Disorders.” Steven Magee CEng MIET
- “Observed health conditions in various high altitude workers were not limited to: Digestive Disorders, Heart Issues, Chronic Headaches, Strokes, Fatigue, Sleepiness, Sleep Disorders, Amnestic Disorders, Irritability, Aggressive Behaviors, Confusion, Various Mental Health Issues, Radiation Sickness including Faraday Cage Sickness, Benign Tumors and Cancers that included Throat, Lymphoma, Prostate and Colon cancer.” Steven Magee CEng MIET - Q
- “The top three symptoms that I observed in high altitude workers were: 1. Forgetfulness & Confusion; 2. Irritability; 3. Fatigue & Apathy.” Steven Magee CEng MIET - Q
- “US Flight Crew Have Higher Cancer Rates Than General Population...Our study informs future research priorities regarding the health of this understudied group of workers, who have a wide range of job-related exposures to known and probable carcinogens including cosmic ionizing radiation, circadian rhythm disruption, and possible chemical contaminants in the aircraft cabin.” [https://www.eurasiareview.com/26062018-us-flight-crew-have-higher-cancer-rates-than-general-population/](https://www.eurasiareview.com/26062018-us-flight-crew-have-higher-cancer-rates-than-general-population/)
- “The estimated incidence of melanoma was found to be significantly increased among airline pilots...The 1,066 cancer cases reported among male pilots included prostate (76), colon (20), lymphoma (13), bladder (12), leukemia (9), testes (8), kidney (7), thyroid (7), lung (7), vocal chords (6), central nervous system (5), throat (3), sarcoma (3), squamous cell (3), rectum (2), mouth (2), and one reported case in each of the following categories: breast, vallecula, esophagus, urethra, eyelid, pancreas, armpit, nose, myeloma, cheek, and stomach...Non-cancer disease cases that male pilots reported are motor neuron disease (21), cataracts (261), diabetes (78), heart disease (260), high blood pressure (713), high cholesterol (1,725), liver disease (45), and meningitis (31).” [https://public.alpa.org/portals/alpa/magazine/2001/March2001_HealthAmongPilots.htm](https://public.alpa.org/portals/alpa/magazine/2001/March2001_HealthAmongPilots.htm)
- “Both believed they had been poisoned by the toxic oil fumes that can contaminate cabin air and which regularly forces pilots to don oxygen masks in order to breathe...They say they are on the cusp of proving in a court of law the existence of “aerotoxic syndrome”, a chronic physical and neurological condition they predict will one day be seen as “the new asbestos”. Thousands of pilots are currently “unfit to fly”, one specialist doctor believes.” [http://www.express.co.uk/news/uk/373594/Dead-BA-pilots-victims-of-toxic-cabin-fumes](http://www.express.co.uk/news/uk/373594/Dead-BA-pilots-victims-of-toxic-cabin-fumes)
- “‘We are dropping like flies.’ Ex-fighter pilots push for earlier cancer screenings...Former Air Force and Navy fighter pilots are calling on the military to begin cancer screenings for aviators as young as 30 because of an increase in deaths from the disease that they suspect may be tied to radiation emitted in the cockpit. “We are dropping like flies in our 50s from aggressive cancers,” said retired Air Force Col. Eric Nelson, a former F-15E Strike Eagle weapons officer.
He cited prostate and esophageal cancers, lymphoma, and glioblastomas that have struck fellow pilots he knew, commanded or flew with.” [https://americanmilitarynews.com/2019/08/we-are-dropping-like-flies-ex-fighter-pilots-push-for-earlier-cancer-screenings/](https://americanmilitarynews.com/2019/08/we-are-dropping-like-flies-ex-fighter-pilots-push-for-earlier-cancer-screenings/)
Deaths in High Altitude Workers

- “Long term astronomical observatory worker #1: Fatal Heart Disease.” Steven Magee CEng MIET
- “Long term astronomical observatory worker #2: Fatal Heart Attack.” Steven Magee CEng MIET
- “Long term astronomical observatory worker #3: Fatal Colon Cancer.” Steven Magee CEng MIET
- “Long term astronomical observatory worker #4: Fatal Throat Cancer.” Steven Magee CEng MIET
- “Long term astronomical observatory worker #5: Suicide.” Steven Magee CEng MIET
- “Pilot's Die Sooner Than Others...The ALPA data also indicate death rates at younger ages, with an average age at death of 67, compared to 70 for the general population. The study reports that 69 percent of pilot deaths in the ALPA data occurred in the first nine years after retirement.” https://www.linkedin.com/pulse/20141206175102-4404516-pilot-s-die-sooner-than-others/
- “Retired Pilots Die Earlier Than Most, Study Says : Workplace: A global survey of fliers will look at why longevity figures for the pilots seem to be worse than for the rest of the population...60% of them would not be around when they were 65 years old.” http://articles.latimes.com/1990-04-13/business/fi-1324_1_pilot-retirement
- “Mortality from Cancer and Other Causes among Airline Cabin Attendants in Europe: A Collaborative Cohort Study in Eight Countries...There is concern about the health effects of exposure to cosmic radiation during air travel. To study the potential health effects of this and occupational exposures, the authors investigated mortality patterns among more than 44,000 airline cabin crew members in Europe. A cohort study was performed in eight European countries, yielding approximately 655,000 person-years of follow-up. Observed numbers of deaths were compared with expected numbers based on national mortality rates. Among female cabin crew, overall mortality (standardized mortality ratio (SMR) = 0.80, 95% confidence interval (CI): 0.73, 0.88) and all-cancer mortality (SMR = 0.78, 95% CI: 0.66, 0.95) were slightly reduced, while breast cancer mortality was slightly but nonsignificantly increased (SMR = 1.11, 95% CI: 0.82, 1.48). In contrast, overall mortality (SMR = 1.09, 95% CI: 1.00, 1.18) and mortality from skin cancer (for malignant melanoma, SMR = 1.93, 95% CI: 0.70, 4.44) among male cabin crew were somewhat increased. The authors noted excess mortality from aircraft accidents and from acquired immunodeficiency syndrome in males. Among airline cabin crew in Europe, there was no increase in mortality that could be attributed to cosmic radiation or other occupational exposures to any substantial extent. The risk of skin cancer among male crew members requires further attention.” https://academic.oup.com/aje/article/158/1/35/173950
- “HOW MANY PEOPLE DIE ON AIRPLANES?..."During the 12 months we were looking at for that Lancet article," Donaldson said, "I think there were something like 340 or 360 deaths due to public transport aircraft accidents. Whereas by our estimation there'd certainly be more than 500 people die on public transport aircraft every year, far and away the majority of which are cardiac."” https://www.chicagotribune.com/news/ct-xpm-1996-06-30-9606300406-story.html
Disability Hazards

- “The vast majority of initial disability applications are denied.” Steven Magee CEng MIET - Q
- “Disability denials: Congressman calls for federal investigation into eligibility decisions...Paid by the case, doctors were reviewing up to five application files per hour. Experts said such speedy review of applications, which can contain thousands of pages of medical records, isn't plausible. Lawmakers in Tennessee have already called for an investigation.” [https://www.usatoday.com/story/news/nation/2019/06/05/social-security-disability-benefits-gao-investigation-rep-john-larson/1363075001/](https://www.usatoday.com/story/news/nation/2019/06/05/social-security-disability-benefits-gao-investigation-rep-john-larson/1363075001/)
- “I had my long term health severely damaged by very high altitude astronomy and incorrectly thought that the government disability system would look after me.” Steven Magee CEng MIET - Q
- “For many sickened people the corporate government disability process takes approximately two to four years to go through. During that time you receive no disability benefits whatsoever.” Steven Magee CEng MIET - Q
- “This is how corporate government disability works for many sickened people: Year 1. Application = benefits denied; Year 2. Appeal = benefits denied; Year 3. Appeal to judge = benefits denied and the corrupt corporate government wishes you the best of luck with your disabilities and future life of extreme poverty.” Steven Magee CEng MIET = Q
- “After my three year journey through the corporate government disability system, I came to the conclusion that it is blatantly rigged to deny eligible sickened people their earned benefits.” Steven Magee CEng MIET - Q
- “There is blatant propaganda that is being presented to the general public that there are extensive fraudulent applications in the disability system, but the reality is that this ‘war on fraud’ is being used by the corrupt corporate government to deny millions of eligible sickened people their earned disability benefits.” Steven Magee CEng MIET - Q
- “My disability lawyer warned me prior to the hearing that one of the worst judges had been assigned to my case.” Steven Magee CEng MIET - Q
- “The corporate government disability system is like a lottery that really comes down to which judge you have been assigned to, regardless of how many medically diagnosed disabling health conditions you have.” Steven Magee CEng MIET - Q
- “Based on what I saw in my disability hearing, my lawyer won my case. It was very surprising to receive the disability denial letter several months later.” Steven Magee CEng MIET - Q
- “My lawyer informed me after my disability hearing that she believed that she had won my case because it was so strong.” Steven Magee CEng MIET - Q
- “The USA government seems to have conveniently forgotten that its disability system is an insurance program to award disability benefits to ALL people that can no longer be employed due to their long term sickness.” Steven Magee CEng MIET - Q
- “Getting really sick in the USA results in bankruptcy for many people.” Steven Magee CEng
“This Atlanta woman lost her home waiting for disability...For Statler, 53, the wait was financially devastating. She lost her car, her house and her savings. She cashed in her life insurance and her children’s college funds. She got worse medically as well as she was forced to put off costly treatment while her case was pending. A heart attack in September landed her in the hospital.”

“Disabled And Waiting...Overall, two out of every three people who apply for federal disability benefits are rejected by a government agency that critics say is out of date, underfunded, and incapable of serving the exploding number of disabled Americans. Waiting times for a hearing in some cities are more than three years. Linda Fullerton, an advocate for the disabled, told Keteyian: "I have people all the time writing to me, saying they are suicidal." Fullerton's online support site is home to one horror story after another.”

“There is a global correlation between disability and poverty, produced by a variety of factors. Disability and poverty may form a vicious circle, in which physical barriers and stigma of disability make it more difficult to get income, which in turn diminishes access to health care and other necessities for a healthy life.[24] The World report on disability indicates that half of all disabled people cannot afford health care, compared to a third of disabled people.[25] In countries without public services for adults with disabilities, their families may be impoverished.”

“Disability backlog tops 1M; thousands die on waitlist...Shuler was working as an airplane mechanic in Oklahoma when he was exposed to some chemicals and developed severe respiratory problems, said his wife, Elizabeth Shuler. The medicine he took for his lungs affected his bones and he eventually had two hip replacements, she said. Chris Shuler applied for Social Security disability payments in 2012 and was denied almost immediately, his wife said. He died in July 2015 from an infection that started in his hip, just before his 40th birthday.”

“Getting disability payments can be a fight to the death. Portland’s Social Security office has some of the nation’s longest delays for benefits, and in the years-long waits some die before seeing a dime...Sharyn took a 9mm Ruger from the nightstand, put the handgun to her head and pulled the trigger. Her death was ruled a suicide. Sharyn, 43, didn't leave a note. Sharyn's claim had languished nearly four years.”

“Social Security: The Hidden Dangers of Privatization...A Downward Spiral Into Poverty For Millions Of Americans...Also keep in mind that the average American has very little money, if any at all in savings accounts, in case of emergency. Most would not have enough savings to survive on for more than two months if they could no longer work....Needless to say John’s American dream has now become the American nightmare under Social Security privatization.”

“A BUMP ON THE HEAD...There is a huge shameful scandal involving this program that most Americans know nothing about unless they need to apply for this benefit themselves. This insurance is supposed to be a safety net for millions of disabled Americans, but because of continued program problems, the process of getting SSDI benefits can cause devastating, irreversible harm to your health and financial well-being, and it affects every aspect of a
claimant’s life. I know this for a fact because it happened to me! The application process to get SSDI benefits often exacerbates/creates new health issues, and many people lose all their financial resources, their homes, even their lives while waiting for approval of their claims. If you don’t suffer from depression before applying for benefits, chances are you will, in fact many contemplate or attempt suicide.” http://www.frontiernet.net/%7Elindaf1/bump.html

- “Unfit for Work. The startling rise of disability in America...There's no diagnosis called disability. You don't go to the doctor and the doctor says, "We've run the tests and it looks like you have disability." It's squishy enough that you can end up with one person with high blood pressure who is labeled disabled and another who is not....Dr. Timberlake is making a judgment call that if you have a particular back problem and a college degree, you're not disabled. Without the degree, you are.” http://apps.npr.org/unfit-for-work/

- “Long Waits And Long Odds For Those Who Need Social Security Disability...Hashmi was diagnosed with systemic lupus, a medical condition in which the body's immune system attacks its own tissues and organs. She's had surgery and other treatments, but now, at age 41, Hashmi is often bedridden. She finally had to leave her job about six years ago, but when she applied to the Social Security Administration for disability benefits, she was denied.” https://www.npr.org/sections/health-shots/2017/06/13/531207430/people-with-unseen-disabilities-could-suffer-under-new-government-rules

- “The disability system discriminates against those that are educated.” Steven Magee CEng MIET - Q

- “The corporate government disability system claiming that an extremely sickened educated person is not disabled would be akin to the scientific community falsely claiming that Albert Einstein was not a genius.” Steven Magee CEng MIET - Q

- “While the USA corporate government took three years to deny my disability application, the UK approved my pension plan early disbursement on the grounds of ill-health in just a few months from applying using the same medical information.” Steven Magee CEng MIET - Q

- “The disability system makes false assumptions to deny your payments.” Steven Magee CEng MIET - Q

- “During the time I went through the corporate government disability system, I was aware that I had a strange sickness that would eventually kill me if not properly diagnosed and treated.” Steven Magee CEng MIET - Q

- “In addition to the numerous disabling health conditions that I had been diagnosed with by the medical profession, there was a long term un-diagnosed vitamin B12 deficiency, commonly known as Pernicious Anemia, which has been historically fatal.” Steven Magee CEng MIET

- “Anemia and B12 Deficiency- Historically Fatal, Still Formidable...many of the symptoms of pernicious anemia are disabling, and often confused with other conditions like clinical depression, thyroid disorder, and diabetes.” http://b12patch.com/blog/pernicious-anemia-and-b12-deficiency-historically-fatal-still-formidable/

- “Mental Changes from B12 Deficiency. Some of the less classic, but still common, vitamin B 12 Deficiency Symptoms are Mental Changes from B12 Deficiency. These are particularly devastating because they cause so much disability, and yet are very responsive to therapy with Methylcobalamin B12 if they are caught early. Unfortunately, physicians rarely, if ever do the necessary Methylmalonic Acid Test that would allow the deficiency to be caught early and the sufferers usually go on to be diagnosed with an ‘incurable’ mental or neurologic ‘disease’. Some of these mental changes of B12 deficiency mimic problems such as: Mental Illness.
Depression. Dementia and Alzheimers Disease. Multiple Sclerosis and other "Degenerative Spinal Cord" Diseases. 'Brain Fog' or the inability to think clearly.”

- “The problem with getting old and sick is you learn that corporate government systems that you thought would protect you actually fail you.” Steven Magee CEng MIET - Q
- “As an experienced electrical engineer in the USA, I was earning in excess of $100,000 annual salary plus benefits. There was no incentive whatsoever to be disabled and in poverty on a corporate government disability program.” Steven Magee CEng MIET - Q
- “If you have a degree, an established career history prior to disability, and are under fifty years of age, getting on government disability is extremely hard no matter how sick you are.” Steven Magee CEng MIET - Q
- “It is disappointing to witness the corporate government disability system letting massive numbers of sickened people down during their greatest time of need.” Steven Magee CEng MIET - Q
- “While the corporate government wants you to believe many people that apply for disability are fraudulent, the reality is that the far bigger corporate government fraud are the massive numbers of eligible sickened people that are being denied their earned disability payments.” Steven Magee CEng MIET - Q
- “Corporate government social security left me sickened, unable to work, and without any disability income for the rest of my life.” Steven Magee CEng MIET - Q
- “Being denied disability payments shatters your faith in corporate government.” Steven Magee CEng MIET - Q
- “The corporate government is completely okay with sending sickened people into extreme poverty for the rest of their lives by blatantly denying their genuine disability claim.” Steven Magee CEng MIET - Q
- “Very high altitude workers should be aware that if they become disabled by Mauna Kea Sickness (MKS) that it is highly unlikely that they will get government disability payments.” Steven Magee CEng MIET - Q
- “If you apply for government disability, I wish you the best of luck...as you are going to need it!” Steven Magee CEng MIET - Q
- “Given that the corporate government disability system is denying sickened Mauna Kea workers their earned disability benefits, it falls back onto their very high altitude past employer to compensate them for their loss of earnings, pain and suffering.” Steven Magee CEng MIET - Q
- “3 Social Security Horror Stories”
- “ATTENTION: BE AWARE THAT WHAT YOU DON'T KNOW CAN DESTROY YOUR LIFE! AMERICANS ARE NOT GETTING THE SOCIAL SECURITY DISABILITY BENEFITS THAT THEY HAVE EARNED AND PAID FOR! SOCIAL SECURITY DISABILITY NIGHTMARE - IT CAN HAPPEN TO YOU! Before you read any further I am going to ask you a very important question, and as you read on, keep asking yourself - How long could YOU survive with ABSOLUTELY NO INCOME, if you got sick or hurt, and could no longer work? What you are about to learn may have an impact your life forever!”
who apply for disability benefits get rejected.”

“Social Security Disability Approval Rates Remain Low…Approval rates for people seeking Social Security Disability Insurance (SSDI) benefits in 2015 remained at historic lows...Only 33% of Social Security disability applicants were approved when they initially filed for benefits during fiscal year 2015. Just 45% of those who appealed and went to the hearing level were approved. In addition, hearing wait times continue to rise, reaching more than 700 days for tens of thousands of claimants.”

“The USA disability statistics clearly show that the sordid system abandons the majority of its sickened applicants in their time of greatest need.” Steven Magee CEng MIET - Q

“Social security disability payments are modest,” Jarrett says. "At the beginning of 2015, Social Security paid an average monthly disability benefit of $1,165." The payment is meant to help people meet basic living needs, and the program is designed to replace some, but not all, lost income. "It's a safety net for those who are no longer able to work on a regular basis," explains Proudian.”

“For many people, years spent voyaging through the corporate government disability system results in a blatant denial of earned benefits and an education in how legal system fraud works.” Steven Magee CEng MIET - Q

“The government disability program has developed a wide range of feeble excuses to deny you your earned benefits.” Steven Magee CEng MIET - Q

“The disability system employs ‘Expert Doctors’ that interview you and write reports that do not reflect your daily health problems in order to deny your earned disability payments.” Steven Magee CEng MIET - Q

“Several months after a judge denied my disability application, it emerged that the medical profession had set my continuous positive airway pressure (CPAP) machine to the wrong pressure. It had been set to a pressure of 7 cmH20 when it needed to be set to 13 cmH20, it had been operating for years at almost half the required pressure and not correctly treating my sleep disorders and low blood oxygen levels.” Steven Magee CEng MIET

“If you pressure is too low, you won’t be getting the treatment you need or the health benefits. You might wake up tired despite using your CPAP every night.”

“A pressure setting which is too low makes people feel like CPAP therapy is not really working. Many of the same symptoms of pre-CPAP therapy remain, such as daytime tiredness, irritability, and lack of concentration.”

“That being said, people with more severe sleep apnea do more often need higher pressures on CPAP, or even bilevel therapy...If the pressure is too low, your sleep apnea will not be adequately controlled.”
“The sleep apnea/hypopnea syndrome (SAHS) occurs in 2 to 4% of the middle aged population (1) causing impaired daytime functioning as a result of excessive daytime somnolence, cognitive impairment and altered mood.”

https://www.atsjournals.org/doi/full/10.1164/ajrccm.159.4.9807111

“The sleep cycle of alternate NREM and REM sleep takes an average of 90 minutes, occurring 4–6 times in a good night's sleep.[10][12] The American Academy of Sleep Medicine (AASM) divides NREM into three stages: N1, N2, and N3, the last of which is also called delta sleep or slow-wave sleep.[13] The whole period normally proceeds in the order: N1 → N2 → N3 → N2 → REM. REM sleep occurs as a person returns to stage 2 or 1 from a deep sleep.[1] There is a greater amount of deep sleep (stage N3) earlier in the night, while the proportion of REM sleep increases in the two cycles just before natural awakening.”

https://en.wikipedia.org/wiki/Sleep

“People with apnea may have reduced stages N3 and REM when their interrupted breathing causes sleep to be fragmented, possibly alternating between stages N1 and N2 over and over all night.”

https://www.sleephealth.org/sleep-health/importance-of-sleep-understanding-sleep-stages/

“I have a complete absence of stage N3 slow wave sleep that causes excessive daytime sleepiness, normal people spend 15-20 percent in N3. This has been repeatedly proven by the medical profession through numerous sleep studies. I spend 89 percent of the night in N2 light sleep, normal people spend only 50 percent of their night in N2. I fall asleep in one minute and have several awakenings per night. I have been diagnosed with excessive daytime sleepiness for years.”

Steven Magee CEng MIET

“I noticed that I had developed excessive daytime sleepiness after I started working extreme night shifts on the very high altitude summit of Mauna Kea in Hawaii. Staying awake during the daytime has been a problem ever since.”

Steven Magee CEng MIET - Q

“Sleeping Stage N3 is the deepest stage of sleep. Stage N3 sleep is called slow-wave sleep. Just recently Sleeping stage N4 (greater than 50% delta waves) was added to N3. N3 is acquired when only 20% of delta waves (0.5 to 2 Hz) are present. This is the stage where parasomnias such as night terrors, nocturnal enuresis, bed wetting, sleepwalking, and somniloquy occur. Slow-wave sleep is the period when a person is least affected by its outside environment. At this point it is very difficult to wake up from noise, like an alarm clock. If you are waken up during this period, you are likely to be tired. Sleep inertia is the period for 30 minutes after when you wake up in slow-wave sleep. During sleep inertia your brain activity and mental performance are slower and less accurate. If you are sleep deprived, slow-wave sleep will be longer and deeper in order to restore energy. Some of the few factors known to increase slow-wave sleep in the sleep period that follows them include body heating, high carbohydrate ingestion, and long exercise.”

http://alm7.wikispaces.com/Sleeping+Stage+N3

“Excessive daytime sleepiness (EDS) is characterized by persistent sleepiness and often a general lack of energy, even during the day after apparently adequate or even prolonged nighttime sleep. EDS can be considered as a broad condition encompassing several sleep disorders where increased sleep is a symptom, or as a symptom of another underlying disorder like narcolepsy, sleep apnea or a circadian rhythm sleep disorder. Some persons with EDS, including those with hypersomnias like narcolepsy and idiopathic hypersomnia, are compelled to nap repeatedly during the day; fighting off increasingly strong urges to sleep during inappropriate times such as while driving, while at work, during a meal, or in conversations. As the compulsion to sleep intensifies, the ability to complete tasks sharply diminishes, often mimicking the appearance of intoxication. During occasional unique and/or stimulating
circumstances, a person with EDS can sometimes remain animated, awake and alert, for brief or extended periods of time. EDS can affect the ability to function in family, social, occupational, or other settings. A proper diagnosis of the underlying cause and ultimately treatment of symptoms and/or the underlying cause can help mitigate such complications.”

https://en.wikipedia.org/wiki/Excessive_daytime_sleepiness

- “Most people do not realize how corrupt the corporate government disability system is until they become so sick that they try to use it.” Steven Magee CEng MIET - Q
- “The USA claims to be a first world country but it has the disability system of a third world country.” Steven Magee CEng MIET - Q
- “Social Security Disability Insurance...Qualification. According to the Social Security Administration (SSA) they have a physical or mental condition that prevents them from engaging in any "substantial gainful activity" ("SGA"), and the condition is expected to last at least 12 months or result in death, and they are under the age of 65, and generally, they have accumulated 20 social security credits in the last 10 years prior to the onset of disability (normally four credits per full or partial year); one additional credit is required for every year by which the worker's age exceeds 42.”


- “Permanently and Totally Disabled. Being permanently and totally disabled means that you (or your spouse) can't engage in any substantial gainful activity because of your (or your spouse's) physical or mental condition. Substantial gainful activity generally includes full-time or part-time work done for pay (or generally done for pay) that is commensurate with the minimum wage. A physician must certify that the condition has lasted or can be expected to last continuously for 12 months or more, or that the condition can be expected to result in death.”

H&R Block

- “The corporate controlled government is completely okay with your health being damaged by your employer, but shirks its responsibility to give you disability payments when you have become too sick to work.” Steven Magee CEng MIET - Q
- “One of the biggest government frauds is denying eligible sickened people their disability benefits.” Steven Magee CEng MIET - Q
- “I can sum up the corporate government disability system with two words: Toxic Bureaucrats.” Steven Magee CEng MIET - Q

- “Disabled in the USA? Congratulations, you have now obtained the secret corporate government status of ‘Garbage’.” Steven Magee CEng MIET – Q
- “After being denied my earned disability benefits, I concluded that I had nothing to lose by speaking out about the illegal workplace activities I had observed during my career.” Steven Magee CEng MIET – Q
Workers Compensation

- “Workers' compensation is a form of insurance providing wage replacement and medical benefits to employees injured in the course of employment in exchange for mandatory relinquishment of the employee's right to sue their employer for the tort of negligence. The trade-off between assured, limited coverage and lack of recourse outside the worker compensation system is known as "the compensation bargain". One of the problems that the compensation bargain solved is the problem of employers becoming insolvent as a result of high damage awards. The system of collective liability was created to prevent that, and thus to ensure security of compensation to the workers. Individual immunity is the necessary corollary to collective liability. While plans differ among jurisdictions, provision can be made for weekly payments in place of wages (functioning in this case as a form of disability insurance), compensation for economic loss (past and future), reimbursement or payment of medical and like expenses (functioning in this case as a form of health insurance), and benefits payable to the dependents of workers killed during employment. General damage for pain and suffering, and punitive damages for employer negligence, are generally not available in workers' compensation plans, and negligence is generally not an issue in the case. These laws were first enacted in Europe and Oceania, with the United States following shortly thereafter.”
- “Workers' Compensation Benefits FAQ. Frequently asked questions about workers' compensation for job-related injuries and illnesses.”
- “Can I file a workers’ comp claim after I quit? It’s possible to qualify for workers’ comp benefits if you were injured before you left your job—even if you didn’t file a claim until later—as long as you meet certain requirements.”
- “Workers' Compensation: What Happens If I'm Late Reporting My Injury?...If you have an occupational illness or a condition that develops gradually, such as arthritis or chronic obstructive pulmonary disease (COPD), the time period for notifying your employer may be longer and typically doesn’t start until you discover the condition and its connection to your work. This usually happens when a doctor tells you that your job activities caused the problem. Because your back injury worsened over time, you may still be eligible for benefits even if the deadline has passed from the date of the accident. However, now that you know your back condition is related to your job, you should report it immediately.”
- “An occupational disease is any chronic ailment that occurs as a result of work or occupational activity. It is an aspect of occupational safety and health. An occupational disease is typically identified when it is shown that it is more prevalent in a given body of workers than in the general population, or in other worker populations. The first such disease to be recognised, squamous-cell carcinoma of the scrotum, was identified in chimney sweep boys by Sir Percival Pott in 1775[citation needed]. Occupational hazards that are of a traumatic nature (such as falls by roofers) are not considered to be occupational diseases. Under the law of workers' compensation in many jurisdictions, there is a presumption that specific disease are caused by the worker being in the work environment and the burden is on the employer or insurer to show that the disease came about from another cause. Diseases compensated by national workers
Environmental Radiation LLC - https://www.environmentalradiation.com

compensation authorities are often termed occupational diseases. However, many countries do not offer compensations for certain diseases like musculoskeletal disorders caused by work (e.g. in Norway). Therefore, the term work-related diseases is utilized to describe diseases of occupational origin. This term however would then include both compensable and non-compensable diseases that have occupational origins.”

- “Workers' Compensation: Occupational Disease...Occupational diseases cause 860,000 illnesses and 60,300 deaths in the United States annually according to the American Academy of Family Physicians. Illness directly attributable to work conditions and exposures is diagnosed in approximately 10 percent of hospitalized patients.”

- “What Is An Occupational Disease in Workers’ Compensation?...occupational diseases covered by workers’ compensation are diseases caused by conditions that are characteristic with a particular trade or occupation, but excluding ordinary diseases of life to which the general public is equally exposed outside of the employment. For example, if a worker, whose job was a paint sprayer for many years, has lung damage due to him breathing a specific chemical in the paint, he would probably have an occupational disease. However, an office worker who happens to develop a lung disease that is common to the everyday public would probably not have a compensable occupational disease under workers’ compensation...1) the employee was exposed to a hazardous substance in the employment, 2) the employee developed a disease, 3) the occupation exposed the employee to a greater risk of developing the disease compared to the general public, 4) the exposure to the substance was a substantial factor in the employee developing the disease, and 5) the occupational disease caused injury or death. An occupational disease claim must be filed within two years of the diagnosis by a physician.”

- “The Doctor’s Statement of Causation...the injured worker bears the burden of proof; meaning that you must prove to the insurance company and/or the Virginia Workers’ Compensation Commission that your injuries are a result of your work place accident. It is up to the injured worker to show that timely notice of the injury was given to the employer and to prove that the accident caused your injury and disability.”

- “Injured workers seeking benefits must be evaluated and diagnosed by workers’ compensation doctors approved by the employer’s insurance company. For many injured workers, that means facing an Independent Medical Examination, or IME ordered by the workers’ compensation insurance company.”
https://www.injuryclaimcoach.com/workers-comp-doctor.html

- “Why Your Workers' Compensation Claim Could Be Denied. Here are some of the most common reasons a workers' compensation insurer would question the validity of your work injury claim.”

- “The Demolition of Workers’ Comp. Over the past decade, states have slashed workers’ compensation benefits, denying injured workers help when they need it most and shifting the costs of workplace accidents to taxpayers.”
https://www.propublica.org/article/the-demolition-of-workers-compensation

- “Except as provided in s. 102.555 with respect to occupational deafness, “time of injury”, “occurrence of injury”, or “date of injury” means: Occupational Injury or Disease Under Workers Compensation Law...1. In the case of accidental injury, the date of the accident which
caused the injury. 2. In the case of disease, the date of disability or, if that date occurs after the cessation of all employment that contributed to the disability, the last day of work for the last employer whose employment caused disability.”

- “The Fallout of Workers’ Comp ‘Reforms’: 5 Tales of Harm. Injured workers share their stories, revealing the real-life impact of rollbacks that have been spreading across the country.”
- “Worked to Death. How victims are shut out of the workers’ comp system by big bills, bad laws, and companies that will do anything but pay...When it comes to chemically induced illnesses and other job-triggered diseases that creep up over time, according to researchers and the federal agency overseeing occupational safety, workers’ comp rarely works at all.”
- “DOES THE WORKERS’ COMPENSATION SYSTEM FULFILL ITS OBLIGATIONS TO INJURED WORKERS?...Despite the sizable cost of workers’ compensation, only a small portion of the overall costs of occupational injury and illness is borne by employers. Costs are instead shifted away from employers, often to workers, their families and communities. Other social benefit systems – including Social Security retirement benefits, Social Security Disability Insurance (SSDI), Medicare, and, most recently, health care provided under the Affordable Care Act – have expanded our social safety net, while the workers’ compensation safety net has been shrinking. There is growing evidence that costs of workplace-related disability are being transferred to other benefit programs, placing additional strains on these programs at a time when they are already under considerable stress.”
- “In 2019 indoor air quality testing had revealed that Multiple Chemical Sensitivity (MCS) was present. House fresh air ventilation had to be substantially increased to reduce elevated carbon dioxide levels within the home that was causing malaise, chronic fatigue and daytime sleepiness. Several months of mercury chelation had delivered improved health, which had confirmed my suspicion of mercury poisoning. I was showing a beneficial response to radiation treatment using DHEA hormone supplementation. Based on the range of diagnosed conditions and treatments, it was clear at this point that I had developed a classic case of High Altitude Observatory Disease (HAOD) and I applied for workers compensation in March 2019 to the W. M. Keck Observatory and the Ivy League institutions of Columbia University and Dartmouth College. It had emerged that I was having chronic fatigue reactions to over the counter medications and to prescription medications and was displaying ‘Drug Intolerance.’. Drug intake reduced. Sleeping with a nighttime mouth guard to treat sensitive teeth problems.”
- “I applied directly to the W. M. Keck Observatory and the Ivy League institutions of Columbia University and Dartmouth College. for workers compensation for the long term effects of High Altitude Observatory Disease (HAOD) One month later, all of them had not supplied the requested information to enable me to apply for their Workers Compensation insurance.”
- "What To Do When Your Employer Is Uncooperative with Workers’ Comp Claim…If you get the sense that your employer is trying to cause problems for your claim – or if they simply
refuse to give you what you need – you should seek legal help as soon as possible. In many cases, the sooner you get an attorney involved, the sooner you will be able to receive the benefits you deserve.”

https://petrocohen.com/blog/what-to-do-when-your-employer-is-uncooperative-with-your-workers-comp-claim/

- “My Boss Won’t Report to Workers’ Comp”...When you report an injury to your employer, the company is required to complete an injury report and file it with the company’s workers’ compensation insurance provider. The completion of this task is important to the commencement of your treatment and timely payment of benefits. Unfortunately, it is not uncommon for employers to either refuse their cooperation in the process or employ tactics to discourage your involvement in the workers’ compensation process.”

- “Four weeks after sending letters and receiving no information from W. M. Keck Observatory and the Ivy League institutions of Columbia University and Dartmouth College regarding workers compensation for the long term effects of High Altitude Observatory Disease (HAOD), I applied directly to the government workers compensation departments of the states of Hawaii, New York and New Hampshire.” Steven Magee CEng MIET

- “I applied for workers compensation for the long term effects of High Altitude Observatory Disease (HAOD) caused by the W. M. Keck Observatory and the Ivy League institutions of Columbia University and Dartmouth College. To date, I have not received any compensation from any of them for my injuries or diseases.” Steven Magee CEng MIET -Q

- “Why Won’t my Doctor Accept Workers’ Compensation Insurance?...all health insurance policies have an exclusion for work-related injuries. That means that if you are injured during the course of your employment, your health insurance policy will not pay for any medical treatment that is determined to be made necessary by your work injury. The only exception to this rule is a situation where you are injured at work and your employer’s workers’ compensation insurer has denied payment for your medical treatment. The workers’ compensation insurer’s denial will then trigger your health insurer’s obligation to pay for the medical treatment so long as it is determined to be treatment that is reasonable and necessary.”
Workers Compensation - Occupational Diseases

- “What is an Occupational Disease? To meet the definition of an occupational disease, your condition must be contracted in the course of employment. In such a situation, the conditions of employment put the employee at a greater risk of illness than the general public. In order to receive workers’ compensation benefits, you have to establish that your illness was caused by a work-related exposure. According to OSHA, some of the most common occupational diseases are caused by exposures to: Air contaminants such as dust, gases, or fumes. Chemicals. Extreme levels of noise, vibrations, temperature, or light. Repetitive motions, heavy lifting, or other ergonomic problems. Biological hazards such as bacteria, viruses, fungi, or other living organisms. Radiation or radioactive rays.” [https://www.ohattorneys.com/occupational-disease/]

- “Handling the Occupational Disease Case...in order to establish a claim for an occupational disease, a claimant must establish that the condition is not only caused by the employment, but by a distinctive feature of the employment. As we can see from the Aldrich case it does not need to be some element found only in very unique employments, such as exposure to asbestos or silica dust, but only something that is a distinctive feature of the job, such as a nurse who has to do a great deal of walking, certainly an activity not limited to those in the nursing profession.” [https://www.lorman.com/resources/handling-the-occupational-disease-case-17233]

- “The conditions of employment, however, which distinguish occupational diseases from ordinary diseases of life need not be unusual chemicals or fumes. They may be distinctive because familiar harmful elements are present in an unusual degree. For example, exposure to change in temperature is common to all life and employment. A moderate amount of it, resulting in splotches on the legs of a theatre ticket seller, has therefore been held not to render that condition an occupational disease. 3 But in the same state the contraction of rheumatoid arthritis has been held occupational when it resulted from continued handling of ice and iced vegetables by a worker in a wholesale market.” Likewise, a butcher's pulmonary emphysema has been recognized as an occupational disease, although the disease itself is common to mankind, because of the causal relation to the employment hazard of breathing refrigerated air.” [https://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=5650&context=faculty_scholarship]

- “PSYCHIATRIC INJURIES...employees who have suffered from psychiatric injuries, such as depression or PTSD, in the course of their employment. Various injuries fall under the coverage...including psychological stress, trauma, and occupational disease.” [https://www.kfeej.com/psychiatric-injuries.html]

- "OCCUPATIONAL DISEASE...Workers’ compensation benefits include payment of medical bills for treatment associated with the occupational disease. The benefits you can expect to receive will depend on the specific facts of your claim. In general, an award can include following types of compensation: Temporary total compensation. Wage loss compensation. Percentage of permanent partial disability for residual impairment. Permanent total disability. Lump sum settlement award” [https://www.ohattorneys.com/occupational-disease/]

- “Workers' compensation allows claims for occupational disease...claims filed for compensation related to occupational diseases have been submitted successfully several years after termination of employment. Another fact that many people are not aware of is that if an individual suffers from a condition that is not work related, but is aggravated by conditions at the workplace, he or she may be eligible for compensation. Benefits for occupational diseases typically cover 66 percent of lost wages, along with associated medical expenses.
Supplementary benefits may be available in cases of death or disability.”

The following health conditions would likely be covered as a high altitude occupational disease by workers compensation:

- Heavy metal poisoning:
  - If you have handled mercury systems with no industry recognized training, no respiratory protection and no gloves and have had to chelate heavy metals to improve health, you should be eligible. Steven Magee chelated mercury to gain improved health in 2019. He had extensively handled observatory mercury systems without respiratory protection or gloves. He has many photographs of his coworkers doing the same thing.

- Multiple Chemical Sensitivy:
  - Arises from breathing low pressure abnormal air contaminated with chemicals and gasses. Steven Magee discovered that he had multiple chemical sensitivities in 2019 and now has to stay in environments below 1,000ppm of carbon dioxide.

- Lung damage:
  - High altitude exposure and chemical exposures damage the lungs. Steven Magee has small airways disease of the lungs and asthma.

- Heart damage:
  - High altitude and chemical exposure damages the heart. Steven Magee has heart arrythmias and a hole in the heart.

- Brain damage:
  - High altitude exposure and chemical exposure damages the brain. Steven Magee has extensive anxiety, memory, confusion and absence seizure problems.

- Liver damage:
  - Abnormal air, chemical exposure and abnormal radiation exposures may cause B12 deficiency, commonly known as Pernicious (fatal) Anemia. Steven Magee has to take high doses of B12 daily to treat pernicious anemia.

- Kidney damage:
  - Oxygen starvation and poisoning may cause kidney damage. The kidneys are noted to increase their urine and bicarbonate output at high altitudes. Workplace poisoning is typically filtered by the kideys and is urinated out. Steven Magee was mercury poisoned in high altitude astronomy and had to cleanse his kidneys of toxins in 2019.

- Abnormally high ultraviolet radiation (UV) exposures:
  - Damages the skin, causes premature aging and cancer. Causes low level radiation sickness to occur. Steven Magee has to take DHEA daily to offset UV radiation damage.

- Abnormally high ionizing radiation exposures:
  - Causes premature aging and cancer. Causes low level radiation sickness to occur. Steven Magee had to avoid sunlight for several months to detoxify from ionizing radiation damage.

- Skin damage:
  - High altitude exposure damages the skin causing vitamin D deficiency. Steven Magee had to dose for years with high levels of vitamin D to restore depleted levels.

- Sleep Apnea:
- High altitudes and abnormal air increases sleep disorders that result in low blood oxygen levels during sleep, daytime sleepiness, fatigue and irritability. Steven Magee is medically diagnosed with sleep apnea and is prescribed a CPAP life support machine.

- Bruxism:
  - Commonly seen in high altitude workers and causes daytime tiredness and fatigue, sensitive teeth, tooth decay and gastrointestinal issues from swallowing air during sleep. Steven Magee discovered his bruxism in 2019 and now uses a mouth guard during sleep to reduce the complications from bruxism.

- Faraday Cage Sickness:
  - Working inside of Faraday cages appears to cause radiation deficiency in the brain that eventually leads to daily headaches. Steven Magee’s daily headaches only subsided after receiving a large dose of X-Ray radiation to the brain from a CT brain scanner.

- Interference Radiation Sickness:
  - Working near to large metal structures and metal walls appears to cause ill health from exposure to abnormal interference radiation.

- Electromagnetic Radiation Sickness
  - Working with electronic products, such as computers, or sitting in electromagnetic fields from electrical rooms, dirty electricity, radio frequency transmitters, and so on, may cause Electromagnetic Radiation Sickness to occur which may lead to Electromagnetic Hypersensitivity. Steven Magee developed Electromagnetic Hypersensitivity after sitting next to an electrical room daily for years. He was able to cure the condition.

- Industrial LASER exposures:
  - Industrial sodium laser exposures may lead to burns of the eyes and skin. The long term effects are currently emerging. Steven Magee was exposed to high powered sodium laser light and now sees rainbow halos and starbursts around bright night time lights and has focusing issues that require reading glasses and cannot see things at times that are in front of him.

- Eyes
  - High altitude exposures damage the eyes. Extensive computer use causes computer vision syndrome. Steven Magee sees rainbow halos and starbursts around bright night time lights, has focusing issues that require reading glasses and cannot see things at times that are in front of him.

- Ears:
  - Barotrauma may cause damage to the ears. Hearing tests have shown degraded hearing in Steven Magee.

- Drug Intolerance:
  - Very high altitude workers are directed to use the company supplied drugs and gas to offset altitude sickness. Steven Magee discovered in 2019 that he had developed intolerance to drugs after years of company supplied drug use.

- Ill Health:
  - High altitude exposures increase the rates of ill health. Steven Magee has been awarded his UK government pension plan for ill health.

- Growths:
  - High altitude exposures increase the rates of growths on and in the body, such a skin tags and tumors. Steven Magee has developed skin tags and has had to have growths surgically
removed from his skin, colon and knee. His coworker died from colon cancer.

- **Immune system problems:**
  - High altitudes depress the immune system. Steven Magee has had numerous problems with fungal growths on the skin and nails.

- **Memory problems:**
  - High altitude exposures increase the rates of memory problems in sea level adapted human, particularly short term memory issues. Steven Magee is medically diagnosed with amnesiac disorder and cognitive decline.

- **Seizures:**
  - High altitude exposures increase the rates of seizures. Steven Magee was diagnosed with absence seizures after a decade of high altitude work up to 13,796 feet.

- **Hormones:**
  - High altitude exposures damage the hormonal system in humans, causing fatigue, sleep and gender issues. Gender changing is noted to occur in high altitude workers. Steven Magee’s coworker developed LGBT gender issues, as did two other observatory workers. Steven Magee takes DHEA and melatonin hormone supplements for fatigue and sleep disorders.

- **Depression:**
  - High altitude exposures increase the rates of depression. Steven Magee is medically diagnosed with depression and is on depression treatment.

- **Anxiety:**
  - High altitude exposures increase the rates of anxiety. Steven Magee is medically diagnosed with anxiety and is on anxiety treatment.

- **Chronic Fatigue:**
  - High altitude exposures increase the rates of chronic fatigue. Steven Magee is medically diagnosed with chronic fatigue and is on chronic fatigue treatment.

- **Suicide:**
  - High altitude exposures increase the suicide rates. Steven Magee’s very high altitude coworker committed suicide.

- **Gastrointestinal Problems:**
  - High altitude exposures increases the rates of gastrointestinal problems. Steven Magee’s very high altitude coworkers developed throat and colon cancer.

Remember that there are time limits that vary between states that require eligibility for you to claim for these conditions. 1 to 2 years from discovery or death is the typical time limit. If your condition is outside of the discovery period, you may loose all rights to workers compensation for that condition.
Workers Compensation Generic Application Letter

<YOUR ADDRESS>

<EMPLOYERS ADDRESS>

<DATE>

Dear Sir/Madam,

I was an employee of <COMPANY NAME> from <YEAR> to <YEAR> working in the <DEPARTMENT NAME> for <SUPERVISOR NAME>. I developed ill health during working for your company. For many years the root cause of this ill health was a mystery to the medical profession that treated me. Today I now understand that I have High Altitude Observatory Disease (HAOD). The wide range of health conditions that constitute a diagnosis of High Altitude Observatory Disease (HAOD) are still emerging, but are sufficiently diagnosed at this point to go ahead and apply for Workers Compensation.

As such, can you inform your Workers Compensation insurance provider that I have developed High Altitude Observatory Disease (HAOD) and I am now applying for compensation.

Please be aware that all communications regarding this matter are open for public view and may be published to the internet, in books and articles, and so on.

I look forward to hearing from you with regards to:

1. Who your Workers Compensation provider is.
2. Their full contact details.
3. The full range of literature of your Workers Compensation scheme.
4. Confirmation that my application for Workers Compensation is being processed.
5. Could you fully detail any other benefits that your company can provide for my ill health, such as ill health payments, disability payments, and so on?

Yours faithfully,

<Your Name Here>
Columbia University Workers Compensation – New York

- “Columbia University ignored my application for workers compensation for occupational disease and I had to apply through the state.” Steven Magee CEng MIET
- “Workers' Compensation...If you are injured on the job, you should complete the Board's form Employee Claim (C-3) as soon as possible to ensure your benefits are not delayed or interrupted. You must also notify your employer in writing of when, where and how you were injured or became ill...Remember: You must file a claim within two years of the accident or within two years after you knew or should have known that a contracted disease was due to the nature of your employment.” [http://www.wcb.ny.gov/content/main/onthejob/howto.jsp](http://www.wcb.ny.gov/content/main/onthejob/howto.jsp)
- “Workers' Compensation Forms for Health Care Providers” [http://www.wcb.ny.gov/content/main/forms/Forms_HEALTH_PROVIDER.jsp](http://www.wcb.ny.gov/content/main/forms/Forms_HEALTH_PROVIDER.jsp)
- “Occupational Disease. An occupational disease arises from the conditions to which a specific type of worker is exposed. The disease must be produced as a natural incident of a particular occupation, such as asbestosis from asbestos removal. A person disabled by a work-related occupational disease receives the same benefits as for an on-the job injury. However, the time limit for filing a claim is the later of two dates: Two years from the date of the disabled worker's disability; or Two years from the time the disabled worker knew or should have known that the disease was due to the nature of employment.” [http://www.wcb.ny.gov/content/main/onthejob/OccDisease.jsp](http://www.wcb.ny.gov/content/main/onthejob/OccDisease.jsp)
- “PMA appointed lawyers Stewart Greenblatt Manning & Baez to represent them.”
- “Stewart Greenblatt Manning & Baez” [https://sgmblaw.com/](https://sgmblaw.com/)
- “Stewart Greenblatt Manning & Baez were provided with signed medical release forms.” Steven Magee CEng MIET
- “Stewart Greenblatt Manning & Baez were provided a copy of ‘Open Letter To The Astronomical Community’ that was over three hundred pages of scientific research into high altitude observatory disease (HAOD).” Steven Magee CEng MIET
- “Stewart Greenblatt Manning & Baez were provided with 48 pages of mercury poisoning information, including color photographs showing the staff handling the mercury systems with no gloves or respiratory protection.” Steven Magee CEng MIET
- “Stewart Greenblatt Manning & Baez were provided with my 46 page written statement titled ‘Statement: Details Of Specific Injuries And How This Occurred At The MDM Observatory’ regarding how the mercury poisoning had occurred, including color photographs showing the staff handling the mercury systems with no gloves or respiratory protection.” Steven Magee CEng MIET
- “In April 2019, Stewart Greenblatt Manning & Baez denied my Workers' Compensation claim.” Steven Magee CEng MIET
- “I have never been compensated by Columbia University for the biological damage that high altitude work has caused to my health.” Steven Magee CEng MIET
Dartmouth College Workers Compensation – New Hampshire & Arizona

- “Dartmouth College ignored my application for workers compensation for occupational disease and I had to apply through the state.” Steven Magee CEng MIET

- “(NH) The injured worker has two (2) years from the date of injury to notify the employer of his injury in order to make a claim for benefits. In cases where an occupational illness develops gradually and an injury is not immediately recognized by the claimant, the claimant must provide notice the date he or she knows, or by reasonable diligence should have known, of the nature of the injury and its possible relationship to the employment.” https://www.nh.gov/labor/workers-comp/timeframe-claim.htm


- “I was notified by Dartmouth College and the State of New Hampshire in May 2019 that the workers compensation claim has been transferred to the state of Arizona and will be handled by Travelers Insurance.”

- “(AZ) Worker’s Report of Injury Form...An injured worker must file a workers’ compensation claim in writing with the Commission within one year after the injury occurred or when the injury becomes manifest which means that the injured worker knows or in the exercise of reasonable diligence should know that he or she has sustained a compensable work related injury.” https://www.azica.gov/forms/claims0407

- “It was interesting to note that the statute of limitations for workers compensation for occupational disease was 1 year less in Arizona.” Steven Magee CEng MIET


- “Everything You Need to Know about Workers’ Comp in Arizona...Permanent benefits. When your doctor finds that your condition is stationary, or not expected to improve any further, he or she will determine whether you have a permanent disability. If you do, the doctor will give you a percentage of disability. This number, along with your age, education and work history, and earning capacity, determines your rate of compensation.” https://www.summitinsuranceaz.com/news/2017/03/everything-you-need-to-know-about-workers-comp-in-arizona

- “Travelers contacted me in May 2019 about releasing my medical records to them. After consulting with a lawyer about signing the release forms, they notified me that my claim had been closed.” Steven Magee CEng MIET

- “Travelers were provided with signed medical release forms.” Steven Magee CEng MIET

- “Travelers were provided a copy of ‘Open Letter To The Astronomical Community’ that was 318 pages of scientific research into high altitude disease.” Steven Magee CEng MIET

- “Travelers were provided with 48 pages of mercury poisoning information, including color photographs showing the staff handling the mercury systems with no gloves or respiratory protection.” Steven Magee CEng MIET
• “In June, I found that the Arizona Corporation Commission had stopped returning my multiple phone messages regarding the workers compensation claim.” Steven Magee CEng MIET

• “In June 2019 Travelers and the State of Arizona were provided with my 46 page written statement titled “Statement: Details Of Specific Injuries And How This Occurred At The MDM Observatory” regarding how the mercury poisoning had occurred, including color photographs showing the staff handling the mercury systems with no gloves or respiratory protection.” Steven Magee CEng MIET

• “Good Afternoon, I received the additional paperwork you sent to myself and Brian. At this time your claim remains denied as I do not have any information to support an Industrial Injury. Please contact your provider and have them file necessary paperwork with the Industrial commission to get official claim filed. If you have any questions/concerns with this please contact the ICA Ombudsman at 602-542-4661. Once we are notified by the Industrial commission of Arizona and official notice will be issued and then at that time you will have 90 days to file a protest. Once protest received by the Industrial Commission of Arizona then a hearing will be set and the matter will go before a Judge. Thank you and have a great day. Lori Jensen | claim Professional, Mountain West Claim Center – Phoenix, PO Box 660456, Dallas, TX 75265-0293 W: 720-963-7179 F: 877-801-9674” https://www.travelers.com/index

• “I have never been compensated by Dartmouth College for the biological damage that high altitude work has caused to my health.” Steven Magee CEng MIET
W. M. Keck Observatory Workers Compensation - Hawaii

- “The W. M. Keck Observatory ignored my application for workers compensation for occupational disease and I had to apply through the state.” Steven Magee CEng MIET
- “(HI) Who can receive Workers Compensation (WC) benefits? Most full-time and part-time employees who suffer from any injury or disease, which results from work or working conditions, are covered. Under the law, certain kinds of employment are not covered.” [http://labor.hawaii.gov/dcd/home/aboutwc/](http://labor.hawaii.gov/dcd/home/aboutwc/)
- “After applying for Hawaii workers compensation in March 2019, I did not receive any reply from the W. M. Keck Observatory or the state of Hawaii until mid May.” Steven Magee CEng MIET
- “I was informed in Mid may that there was no open workers compensation state claim, as I had filled out the application form incorrectly. I was not surprised, as I suffer from confusion.” Steven Magee CEng MIET
- “The workers compensation state claim form was filled out per the direction of the Hawaii Government. I am now awaiting to hear more from them.” Steven Magee CEng MIET
- “I was contacted by their workers compensation insurance company HEMIC in May 2019.” Steven Magee CEng MIET
- “HEMIC appointed lawyers Adams Krek LLP to represent them in May 2019.” Steven Magee CEng MIET
- “Adams Krek LLP” [https://www.adamskrekllp.com/](https://www.adamskrekllp.com/)
- “Adams Krek LLP were provided with signed medical release forms.” Steven Magee CEng MIET
- “Adams Krek LLP were provided a copy of ‘Open Letter To The Astronomical Community’ that was over three hundred pages of scientific research into high altitude observatory disease (HAOD).” Steven Magee CEng MIET
- “In August 2019, lawyers Adams Krek LLP denied my Workers' Compensation claim.” Steven Magee CEng MIET
- “I have never been compensated by the W. M. Keck Observatory for the biological damage that very high altitude work has caused to my health.” Steven Magee CEng MIET
Workers Compensation – Problems

- “Once my medical center was aware that I was pursuing workers compensation for occupational disease, I found that they would no longer treat me. When I asked why, I was told that they do not accept workers compensation patients. It is one of the largest hospitals in Tucson, Arizona. I found myself in a medical no-man’s land where I could not get on-going treatment from my established medical center.” Steven Magee CEng MIET - Q
- “I found that there were few lawyers in Tucson, Arizona that specialized in workers compensation. The ones that I contacted were not interested in my case and that put me in the situation of having to handle my own workers compensation claim while suffering from depression, forgetfulness, confusion and absence siezures.” Steven Magee CEng MIET - Q
- “I followed up on why the lawyers were not interested in my case and found that few workers compensation claims for occupational disease are ever successful. Of the ones that do make it to a win, it has generally been handled by a workers compensation lawyer regarding a well established disease in case law.” Steven Magee CEng MIET - Q
- “It appears that workers compensation lawyers only get paid if they win their case. If your case lies outside of mainstream cases with a history of winning, they are unlikely to take it.” Steven Magee CEng MIET - Q
- “Unfortunately, the ultimate decision to incorporate occupational disease into the compensation framework, which had been designed primarily for injury, has disappointed both those seeking an economically efficient way to deal with disease and those seeking a fair one. Twenty-one states limit coverage to diseases peculiar to the workplace, thereby excluding ordinary diseases of life and eliminating coverage for a significant amount of occupationally related disease. In addition, 60 percent of disease claims are initially denied, as compared with 10 percent for accidents, placing a heavy burden on the ill worker who must establish the connection between workplace exposure and disease. This burden of proof is compounded by long latency periods, multiple causes, effects of synergism, and statutory minimum-exposure requirements, all of which combine to keep the rate of compensation for disease low. It is estimated that only 5 percent of occupational disease may be covered by workers' compensation, thus providing a possible disincentive to employers to internalize the costs of occupational disease with preventive measures.” [https://www.healthaffairs.org/doi/full/10.1377/hlthaff.7.4.73](https://www.healthaffairs.org/doi/full/10.1377/hlthaff.7.4.73)
- “I found myself alone having to navigate through a legal system that required the guidance of a lawyer to be successful, a legal system that was set up from the outset to deny your genuine claim of occupational disease.” Steven Magee CEng MIET - Q
- “Changes in state workers’ compensation programs over the past 20 years have made it increasingly difficult for injured workers to receive the full benefits to which they are entitled. Furthermore, exclusions in many state programs exempt many work-related injuries and illnesses and many workers in high-hazard occupations from receiving workers’ compensation. The result is that employers now provide only a small percentage (about 21%) of the overall financial cost of workplace injuries and illnesses through workers’ compensation. Instead, the costs of workplace injuries are borne primarily by injured workers, their families, and taxpayer-supported components of the social safety net. States are engaged in a race to the bottom over workers’ compensation benefits, and as a result working people are at great risk of falling into poverty from work-related injuries.” [https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2018/01/18/the-critical-need-to-reform-workers-](https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2018/01/18/the-critical-need-to-reform-workers-)

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"By the time I had seen the problems from applying for workers compensation for occupational disease, I had concluded that I was journeying through a third-world like system of employee protection." Steven Magee CEng MIET - Q

“I was surprised at how corrupted the USA workers compensation scheme is for workers with occupational diseases.” Steven Magee CEng MIET - Q

“Social security and workers compensation are following the policy of deny, deny, deny for occupational diseases.” Steven Magee CEng MIET - Q

“The USA has created a system of extreme poverty for the permanently disabled by allowing social security and workers compensation to deny the majority of occupational disease claims.” Steven Magee CEng MIET - Q

“If you become disabled by occupational disease in the USA, expect to be treated like garbage by social security and workers compensation.” Steven Magee CEng MIET – Q

“All USA high altitude astronomy employers denied my valid occupational disease claims for High Altitude Observatory Disease (HAOD), also known as Magee’s Disease (MD).” Steven Magee CEng MIET – Q

“Given that workers compensation is denying high altitude worker claims for occupation disease, it is common sense to never work in the biologically toxic field of astronomical observatories atop remote mountain summits.” Steven Magee CEng MIET – Q
Mauna Kea Sickness (MKS)

Mauna Kea Sickness (MKS) comprises of the long term effects of:
- Repeated poor very high altitude acclimatization.
- Breathing medical oxygen, nitrogen, helium and carbon dioxide gas.
- Breathing contaminated air.
- Breathing solvent fumes in oxygen deficient environments.
- Breathing radiation treated air.
- Drinking radiation treated fluids.
- Radiation exposure.
- Oxygen starvation.
- Low air pressure environments.
- Faraday Cage Sickness (FCS).
- Computer sickness.
- Industrial laser exposure.
- Mercury exposure.
- Car sickness.
- Motion sickness.
- Commuting sickness.
- Drinking fluids from canned and bottled supplies.
- Electrolyte imbalances.
- Isolation.
- Night shift work.
- Extremely long shifts.
- Insomnia.
- Company supplied drug use.
- Metal Interference Radiation Sickness (MIRS).
- Standing Wave Sickness (SWS).
- Metal Contact Radiation Sickness (MCRS).
- Stray Voltage Sickness (SVS).
- Electromagnetic Field Sickness (EFS).
- Electromagnetic Pulse Sickness (EPS).
- Wireless Sickness (WS).
- Dirty Electricity (DE).
- Delayed Radiation Complications (DRC).
- Continent Adaptation Disease (CAD).
- Coastal Adaptation Disease (CAD).
- Sick Building Syndrome (SBS).
- Artificial Light Adaptation Disease (ALAD).
- Processed Food Adaptation Disease (PFAD).
- Volcanic Smog (VOG).
- Indoor Adaptation Disease (IAD).
- Environmental Epigenetics (EE).

Mauna Kea Sickness (MKS) is also known as:
- High Altitude Disease (HAD).
- High Altitude Commuting Disease (HACD).
- High Altitude Observatory Sickness (HAOS).
- High Altitude Observatory Disease (HAOD).
- High Altitude Adaptation Disease (HAAD).
- Magee’s Disease (MD).
Mauna Kea Sickness (MKS) in Steven Magee

- 2001-2003: Working days with two to three days spent on the very high altitude summit of Mauna Kea: Chronic headaches, forgetfulness, confusion, runny nose, sore throat, digestive issues, loss of physical stamina, tired and fatigued after returning to sea level. Discharging industrial gas into the indoor environment, using medical oxygen and company supplied drugs to treat Mauna Kea Sickness.


- 2007-2008: Working at high altitude on Kitt Peak: Regular visits to the doctor for chronic intestinal pains, pains from head to toe, hot and painful skin, severe chest pains during exercise, fatigue, daytime sleepiness, falling asleep at work, depression, insomnia, irritability, forgetfulness & confusion. Discharging large amounts of industrial gas into the indoor environment, working with mercury and sitting next to an electrical room.


- 2010: Realized that I had Low Level Radiation Sickness (LLRS) and spent six months avoiding sunlight to detoxify from it. Aches & pains from head to toe cleared up as well as hot and painful skin.


- 2011-2014: No medical insurance. Developed Electromagnetic Hyper-Sensitivity (EHS) and cured it with lifestyle changes, supplements, and over the counter medications.

- 2015 – 2017: Mental functioning significantly degraded at age 45 and referred to mental health & neurology, they diagnosed depression, amnestic disorders & seizures. I detected low blood oxygen levels during day & night using a Spo2 pulse oximeter, followed up by medical profession to diagnose lung disease and sleep disorders, prescribed medication and CPAP life support machine. Regular heart arrhythmia's, medical profession diagnosed hole in the heart and prescribed medication. I noticed a positive response to 25,000 mcg daily doses of vitamin B12 and 65 mg of iron, medical profession following up and suspecting pernicious anemia. Taking numerous prescription medications and using a nighttime CPAP life support machine. Unable to work and denied government disability payments.

- 2018: Raising vitamin A, vitamin B12, vitamin B complex, vitamin C, vitamin D, vitamin E, vitamin K, iron, alpha lipoic acid, potassium bicarbonate and magnesium levels using supplements. Changes in diet indicate that Celiac Disease, gluten, lactose & fructose intolerance are be present. Colonoscopy removed a 5mm polyp from the sigmoid colon. Unable to work and denied government disability payments.
2019: Indoor air quality testing had revealed that Multiple Chemical Sensitivity (MCS) was present. House fresh air ventilation had to be substantially increased to reduce elevated carbon dioxide levels within the home that was causing malaise, chronic fatigue and daytime sleepiness. Several months of mercury chelation had delivered improved health, which had confirmed my suspicion of mercury poisoning. I was showing a beneficial response to radiation treatment using DHEA hormone supplementation. Based on the range of diagnosed conditions and treatments, it was clear at this point that I had developed a classic case of High Altitude Observatory Disease (HAOD) and I applied for workers compensation in March 2019 to the W. M. Keck Observatory and the Ivy League institutions of Columbia University and Dartmouth College. It had emerged that I was having chronic fatigue reactions to over the counter medications and to prescription medications and was displaying ‘Drug Intolerance.’ Drug intake reduced. Sleeping with a nighttime mouth guard to treat sensitive teeth problems. Gastrointestinal problems significantly reduced after wearing a night guard leading to the discovery that the CPAP machine was feeding pressurized air into the intestinal tract during sleep. Depression and confusion symptoms were continuing. I had encountered a treatment for high altitude depression during researching depression in the high altitude southwest USA. I started to take the recommended high altitude depression treatment of Creatine and 5-HTP daily in mid May. Unable to work, denied government disability payments and refused workers compensation for occupational disease.
The Mauna Kea Sickness (MKS) Compensation Fund for Damaged Workers

- “I observed many employees displaying Mauna Kea Sickness (MKS) on the very high altitude summit of Mauna Kea in Hawaii.” Steven Magee CEng MIET - Q
- “Employees that have developed long term Mauna Kea Sickness (MKS) typically have a myriad of health issues for the rest of their lives.” Steven Magee CEng MIET - Q
- “There is a need to set up a compensation fund for Mauna Kea Sickness (MKS) for damaged employees, their families and their survivors.” Steven Magee CEng MIET - Q
- “I propose that the sickened worker compensation fund be called 'The Mauna Kea Sickness (MKS) Compensation Fund for Damaged Workers'. All that is needed to be eligible is to medically demonstrate one health condition that is a known long term consequence of MKS.” Steven Magee CEng MIET
- “Initial funding for 'The Mauna Kea Sickness (MKS) Compensation Fund for Damaged Workers' should be set at one billion dollars to effectively compensate the decades of many workers that have passed through the known biologically toxic summit facilities.” Steven Magee CEng MIET
- “Mauna Kea Sickness (MKS) has cost me close to one million dollars in lost earnings. Long term that figure is expected to rise to four million dollars by age sixty five.” Steven Magee CEng MIET - Q
- “'The Mauna Kea Sickness (MKS) Compensation Fund for Damaged Workers' will apply to all workers and contractors on Mauna Kea.“ Steven Magee CEng MIET
- “People that have toured the summit of Mauna Kea and feel that their long term health was damaged by doing so will be eligible to apply for compensation from the 'The Mauna Kea Sickness (MKS) Compensation Fund for Damaged Workers'.“ Steven Magee CEng MIET
- “'The Mauna Kea Sickness (MKS) Compensation Fund for Damaged Workers' should include compensation for lifetime loss of earnings, pain and suffering.” Steven Magee CEng MIET
- “'The Mauna Kea Sickness (MKS) Compensation Fund for Damaged Workers' will not be allowed to issue non-disclosure agreements to claimants.” Steven Magee CEng MIET
- “'The Mauna Kea Sickness (MKS) Compensation Fund for Damaged Workers' will compensate workers that have retained the ability to work for their reduced earning capacity that MKS has brought onto them.“ Steven Magee CEng MIET
- “'The Mauna Kea Sickness (MKS) Compensation Fund for Damaged Workers' will not have any time limits for when a very high altitude worker can apply. Workers from decades ago or their survivors can apply at any time for compensation.“ Steven Magee CEng MIET
- “There will be no limits on how many times a sickened Manua Kea worker applies for compensation. A worker that may have been able to work who has been already compensated can later apply for more compensation if their sickness degrades their earning abilities further.” Steven Magee CEng MIET
- “How Much Is A Wrongful Death Lawsuit Worth? Wrongful death is a catch-all term the law uses to describe any lawsuit involving the death of a family member. Everything from intentional homicide, to avoidable medical injuries, to an accident at a construction site is referred to as a “wrongful death and survival” claim. The wrongful death claim refers to the claims of a grieving spouse and the decedent’s children, while the survival claim refers to any
painless suffering or lost lifetime wages of the decedents."

- “How much is a wrongful death case worth? According to many government agencies a life is worth anywhere from the EPA at $9.1 million for a life to the FDA who puts the value of a life at $7.9 Million. Harvard Studies put a statistical life value at $8.7 million.”

- “In the legal world, a sickened worker may be compensated far more than a killed worker.”
Steven Magee CEng MIET - Q

- “Jurors give $289 million to a man they say got cancer from Monsanto's Roundup weedkiller”

- “The Mauna Kea Sickness (MKS) Compensation Fund for Damaged Workers' will have an automatic payment of ten (10) million dollars for any worker fatality. The survivors of workers killed decades ago can apply at any time for the compensation.”
Steven Magee CEng MIET
Suggested Cancer Classification For High Altitudes

The following is the suggested cancer risk classification for long term high altitude exposure (non-pressurised) to the sea level adapted human:

- Possibly Carcinogenic - Class 2B: High altitude = 1,500–3,500 metres (4,900–11,500 ft).
- Probably Carcinogenic - Class 2A: Very high altitude = 3,500–5,500 metres (11,500–18,000 ft).
- Carcinogenic - Class 1: Extreme altitude = above 5,500 metres (18,000 ft).

The following is the suggested cancer risk classification for long term high altitude exposure (pressurised) to the sea level adapted human:

- Possibly Carcinogenic - Class 2B: Extreme altitude = above 5,500 metres (18,000 ft) (Airplanes).
- Probably Carcinogenic - Class 2A: Low earth orbit (International Space Station).
- Carcinogenic - Class 1: Space.
Steven Magee's Astronomical Observatories

- “1999 to 2001 - Roque de los Muchachos Observatory”
  [https://en.wikipedia.org/wiki/Roque_de_los_Muchachos_Observatory](https://en.wikipedia.org/wiki/Roque_de_los_Muchachos_Observatory)
  - 2,423 m / 7,949 ft Altitude.
  - No acclimatization stops up or down the mountain.
  - Some workers would sleep on the mountain summit.
  - Daily car sickness was a problem due to the steep switchback road.

- “2001 to 2006 - Mauna Kea Observatories”
  - 4,207.3 m / 13,803 ft Altitude.
  - Half hour stop at 9,200 feet on the way up, No acclimatization stop down the mountain.
  - Some workers would sleep on the mountain at 9,200 feet.

- “2006 to 2008 - Kitt Peak National Observatory”
  - 6,886 ft / 2,099 m Altitude.
  - No acclimatization stops up or down the mountain.
  - Some workers would sleep on the mountain summit.
Steven Magee's Resume

Steven Magee’s Published Articles

- “Active control systems for large segmented optical mirrors”
Research By Steven Magee That Relates To High Altitude Astronomy

- Faraday Cage Sickness (FCS) - Astronomical Research Buildings, Radiant Foil Barriers, Metal Clad Building Structures, Underground & Undersea Structures, Metal Ships, Metal Airplanes, International Space Station (ISS), Natural Radiation Deficiency
- Standing Wave Sickness (SWS) - Electromagnetic Shielding Products, Metal Fences, Metal Walls, Metal Roofs, Natural Radiation Deficiency & Overloading
- Metal Interference Radiation Sickness (MIRS) – Metal Wall Studs, Metal Roof Supports, Metal Floor Supports, Metal Furniture, Metal Street Lights, Metal Power Poles, Metal Power Lines, Metal Antenna Masts, Solar Power Systems, Wind Turbines, Groupings of Tall Metal Structures, Airplanes, Satellites, International Space Station (ISS)
- Light Interference Radiation Sickness (LIRS): International Space Station (ISS), Satellites, Airplanes, Jet Aircraft Contrails/Chemtrails, Spinning Wind Turbine Blades, Partial & Full Eclipses Of The Sun by Natural & Man-Made Objects
- Metal Contact Radiation Sickness (MCRS) – Prolonged contact with metal chairs, metal desks, metal kitchen counters, metal mattresses, metal underwired bras, metal jewelry, metal implants
- Stray Voltage Sickness (SVS) - Electrical Earthing/Grounding Systems, Electrified Ground, Electrified Swimming Pools, Electrified Trees, Electrified Metalwork, Electrified Metal Building Structures, Anti-Static Devices
- Electromagnetic Sandwich Sickness (ESS) – The human when placed between the ground and an energized conductor, such as an overhead power line or a overhead solar photovoltaic (PV) system, may become sick.
- Electromagnetic Pulse Sickness (EPS) – Flash guns, Strobe Lights, Emergency Vehicle Flashing Lights, Lightning Storms
- Motor Run Capacitor Sickness (MRCS) – Motor run capacitors are found in air conditioners, fans, heaters, most items that have an AC motor inside them, power factor correction systems, large capacitive filters, street lights, older florescent lights.
- Ground Current Sickness (GCS) – Electrical utilities passing ground currents through properties is known to cause sickness in the residents.
- Seasonal Electrical Sickness (SES) – Electrical related sickness may only appear at certain times of the year as electrical systems such as cooling air conditioners, heating systems, solar
and wind power, and so on come onto the electrical grid in large numbers.

- **Digital Dementia (DD)** – Dementia symptoms occurring decades earlier than normal in many people that use electronic products daily.
- **Energy Adaptation Disease (EAD)** – Any biological organism that spends prolonged time in an unnatural energy environment should be expected to start the biological process of adapting to it.
- **Radiation Demineralization of Water (RDW)** – Radiation exposed water takes on properties that resemble demineralized water with similar effects to growth hormone.
- **Radiation Induced Abnormal Development (RIAD)** – Various forms of radiation exposures are known to affect childhood development with Autism and Attention Deficit Disorders (ADD) being linked to it.
- **Radiation Induced Bone Damage (RIBD)** – Bone damage occurs due to long term exposure to abnormally high radiation levels. Typically shows up as brittle and weak bones that may ache and be painful.
- **Radiation Induced Chronic Fatigue Syndrome (RICFS)** – Daily chronic fatigue and narcolepsy.
- **Radiation Induced Cold Sores (RICS)** – Various forms of radiation exposures are known to cause recurrent cold sore outbreaks.
- **Radiation Induced Diarrhea (RID)** – A significant change in radiation levels may result in intestinal pains and/or diarrhea that clears up shortly afterwards as the body adjusts to the new radiation exposures.
- **Radiation Induced Deficiencies Syndrome (RIDS)** – Loss of essential minerals, vitamins & nutrients in unnatural radiation fields that results in poor health.
- **Radiation Induced Drug Alteration (RIDA)** – Various forms of radiation exposures may alter prescription drug effects on the human.
- **Radiation Induced Dizziness (RID)** – Various forms of radiation exposures may cause dizziness to occur in the human.
- **Radiation Induced Dreams (RID)** – Various forms of radiation exposures may cause dreams to occur in the human during sleep.
- **Radiation Induced Eye Irritation (RIEI)** – Various forms of radiation exposure can irritate the eyes, cause focusing problems, halos, starbursts and cataracts long term.
- **Radiation Induced Fetal Overgrowth (RIFO)** - Over-sized babies that no longer fit down the birth canal.
- **Radiation Induced Headaches (RIH)** – Various radiation exposures can induce headaches.
- **Radiation Induced Heart Arrhythmia (RIHA)** – Heart arrhythmia may occur when in or after exposure to unnatural radiation sources.
- **Radiation Induced Insomnia (RII)** – A significant increase in unnatural radiation levels may result in insomnia.
- **Radiation Induced Intestinal Pains (RIIP)** – A significant change in radiation levels may result in intestinal pains and/or diarrhea that clears up shortly afterwards as the body adjusts to the new radiation exposures.
• Radiation Induced Irritability & Aggression (RIIA) - Various forms of radiation are known to induce irritability & aggression into humans & mammals.
• Radiation Induced Life Shortening (RILS) – Dying years earlier than average from radiation induced illness and disease from high powered radiation exposures or long term exposure to abnormally low levels of natural radiation that result in radiation deficiency sickness and disease.
• Radiation Induced Lung Injury (RILI) – Radiation exposures are known to damage the lungs.
• Radiation Induced Rouloux Blood (RIRB) – Clumping of the blood cells may occur when in unnatural radiation fields.
• Radiation Induced Sexual Impotence (RISI) – Various forms of radiation exposures are known to induce sexual impotence into humans.
• Radiation Induced Skin Irritation (RISI) – Various forms of radiation exposures are known to induce skin irritation into humans with normal looking skin that feels hot, and red irritated skin being common reports.
• Radiation Modified Glass Transmission (RMGT) – The characteristics of light transmission through glass change when placed into a man-made electromagnetic radiation field.
• Radiation Modified Mental Functioning (RMMF) – Change in mental state.
• Radiation Modified Personality Disorder (RMPD) - Changed personality.
• Radiation Triggering of the Human Mating Cycle (RTHMC) – Female Hysteria, Male Hysteria, Sex Addiction, Fornication, Idolatry, Pornography Addiction.
• Radio Wave Sickness (RWS) - Has characteristics of headaches, fatigue, depression, insomnia, confusion, irritability, vertigo, digestive issues & general sickness.
• Electromagnetic Hypersensitivity (EHS) - A severe form of Radio Wave Sickness where levels of radio waves tolerated by the general population make the person really sick.
• Lightning Adaptation Disease (LAD) – People that spend time in environments with abnormally high levels of lightning may start the biological process of adapting to it.
• Low Level Radiation Syndrome (LLRS) – Long term exposure to low levels of man-made radiation or increased levels of natural radiation.
• Delayed Radiation Complications (DRC) – Health complications from radiation exposures may show up months, years or decades after the toxic exposure was received.
• Solar Radiation Overloading Sickness (SROS) – Sickness from daily overexposure to natural solar radiation resulting in accumulated systemic toxicity.
• High Altitude Solar Radiation Overloading Sickness (HASROS) – Sickness from daily overexposure to an enhanced spectrum of natural solar, Space and man-made satellite radiation that the sea level adapted human has no genetic adaptation to.
• High Altitude Snow Solar Radiation Overloading Sickness (HASSROS) – Sickness from daily overexposure to a reflected enhanced spectrum of natural solar radiation and increased Space and man-made satellite radiation that the sea level adapted human has no genetic adaptation to.
• Cloud Reflected Light Adaptation Disease (CRLAD) - Sickness from routinely being above the clouds where daily overexposure to a reflected enhanced spectrum of natural solar radiation and increased Space and man-made satellite radiation occurs that the sea level adapted human has no genetic adaptation to.
• Water Reflected Solar Radiation Overloading Sickness (WRSROS) – Sickness from daily overexposure to a water reflected enhanced power of natural solar radiation that the inland adapted human has no genetic adaptation to.
Accumulating Radiation Systemic Toxicity (ARST) – Over exposure to many forms of radiation results in accumulating systemic toxicity that may eventually result in general sickness. Left untreated, it may progress onto disease and premature death.

Solar Radiation Deficiency Sickness (SRDS) – Sickness from daily underexposure to natural solar radiation.

Natural Radiation Deficiency Sickness (NRDS) – Living in man-made environments and areas that reduce or block natural radiation exposures.

Natural Radiation Overloading Sickness (NROS) – Living in man-made environments and areas that increase natural radiation exposures.

Polar Radiation Sickness (PRS) – Solar radiation deficiency sickness may occur in people that have moved from the tropics to nearer the polar regions.

Tropical Radiation Sickness (TRS) – Solar radiation overloading sickness may occur in people that have moved from close to the polar regions to the tropics.

Continent Adaptation Disease (CAD) – Occurs in humans that have moved to a different continent with a very different set of environmental conditions.

Inland Adaptation Disease (IAD) – Occurs in coastal adapted humans that have permanently moved inland.

Coastal Adaptation Disease (CAD) - Occurs in inland adapted humans that have permanently moved to the coast.

Artificial Electromagnetic Radiation Disease (AERD) – Occurs in natural environmental radiation adapted humans that have constant exposure to many unnatural forms of man-made electromagnetic radiation.

Adverse Radiation Health Week (ARHW) – A wide range of adverse health conditions may be observed in the week after a biologically toxic radiation exposure has occurred.

Solar Adaptation Disease (SAD) - Commonly seen in workers of solar energy farms, high altitude workers, window cleaners and some solar powered home owners.

Vitamin R – The radiation (R) vitamin that is essential to life, however too much or too little will make you sick.

Vitamin S – The sunlight (S) vitamin that is essential to life, however too much or too little will make you sick.

Electromagnetic Blue Sky (EBS) – The blue sky that we see is created by solar radiation stimulation of the air in a dirty vacuum at approximately 100,000 feet.

Sonic Boom Sickness (SBS) – Regular exposure to sonic booms from military fighter jets is suspected of increasing the incidence of vibroacoustic disease, a thickening of heart tissue which may lead to heart arrhythmia or premature death.

Natural Sound Deficiency Sickness (NSDS) – Living in man-made environments devoid of natural sounds.

Extinction Silence (ES) – Any animal that devours its natural environment will eventually fall victim to the resulting silence.

Natural Smell Deficiency Sickness (NSDS) – Living in man-made environments devoid of natural smells.

Natural Pollen Deficiency Sickness (NPDS) – Living in man-made environments devoid of natural levels of pollen.

Nature Deficit Disorder (NDD) – Occurs from living in alien environments that are disconnected from the natural world.
Computer Vision Syndrome (CVS) – Staring at computer monitors for long periods daily is known to induce sickness into the human.

Toxic Light (TL) – Unnatural Spectrum of Light, Insufficient Brightness, Too Bright, Light Filtering, Polarization, Scattering, Refraction, Diffraction, Interference, Flicker, Light Modulation.

Multiple Sun Effect (MSE) – Reflective architecture may create ground level solar radiation power that exceeds that found in Space.

Extinction Wavelength of Light (EWL) – The addition of pollution to the atmosphere and water bodies that causes one of the wavelengths of light that is critical to life to be diminished or a substantial increase in one of the wavelengths of light that is harmful to life, causing a mass extinction event.

Refraction Extinction (RE) – The addition of pollution to water and air causes the light to change direction (refract) and living species have no adaptation to this man-made change, leading to extinction.

Diffraction & Interference Light Extinction (DILE) – The placement of water, land and air borne man-made objects causes light to reflect & diffract around them, leading to interference waves that living species have no adaptation to which may bring about extinction.

Diffraction & Interference Metal Extinction (DIME) – The placement of water, land and air borne man-made metal objects causes electromagnetic waves to reflect & diffract around them, leading to interference waves that living species have no adaptation to which may bring about extinction.

Satellite Extinction (SE) – A large object going into orbit around the Earth may cause a mass extinction event. Tens of thousands of smaller satellites in orbit around the Earth may have a similar effect.

Radiation Extinction (RE) – Mankind changes the environment so much that radiation induced cancers kill off the future generations.

Genetic Extinction (GE) - Mankind changes the environment so much that catastrophic cascading genetic errors kill off the future generations.

Infertility Extinction (IE) – Subjecting biological organisms to abnormal environmental conditions may lead to permanent infertility after several generations which leads to extinction.

Aggression Extinction (AE) – The changed environment induces aggression into animals that leads to them attacking each other and their own offspring through involuntary violent behaviors.

Dementia Extinction (DE) - The changed environment induces early onset dementia into animals that leads to their brain functioning failing before reproductive age.

Ground Extinction (GE) – The energy being radiated from the ground becomes toxic to biological life, eventually leading to extinction.

Birth Extinction (BE) – The changed environment induces oversize offspring that no longer fit down the birth canal in female animals that leads to them dying during childbirth, leading to extinction.

Fatigue Extinction (FE) – The changed environment induces chronic fatigue into biological organisms and they lie down and die from atrophy & starvation.

Fog Extinction (FE) – The changed environment induces a light scattering fog into the atmosphere that animals have no genetic adaptation to, leading to their extinction.

Water Vapor Extinction (WVE) – The addition of large amounts of water vapor to the
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atmosphere causes strange optical effects to occur on a global scale that animals have no genetic adaptation to, leading to their extinction.

- Water Extinction (WE) - Abnormal structuring of the water eventually leads to extinction in those that live in it or consume it.
- Air Extinction (AE) – Abnormal structuring of the air eventually leads to extinction in those that breath it.
- Carbon Extinction (CE) – Massive amounts of carbon are artificially deposited into the atmosphere, land and water bodies to the point of causing a mass extinction.
- Atmospheric Voltage Extinction (AVE) – The electrical properties of the atmosphere are changed through pollution and the natural direct and alternating voltages and currents (DC & AC) change so much that they cause a mass extinction event.
- Lightning Extinction (LE) - The environment is changed so much that lightning rates are either substantially increased or decreased. Either event may cause a mass extinction.
- Storm Extinction (SE) – The environment is changed so much that massive storms wreak havoc on the Earth, causing a mass extinction event.
- Heat Extinction (HE) – Global warming is making the world a hotter place and may cause mass extinctions in species that cannot adapt.
- Changed Seasons Extinction (CSE) – Global warming and climate change are changing the seasons throughout the world and may cause mass extinctions in species that cannot adapt.
- Earthquake Light (EL) – Localized solar diffraction and interference effects in the atmosphere are suspected to be linked to the creation of earthquakes in the ground below.
- Low-E Adaptation Disease (LEAD) – Excessive filtering from energy saving Low-E glass windows causes wavelengths of light to be reduced or removed and this may induce long term sickness into the human that has no genetic adaptation to this strange man-made window light.
- Artificial Light Adaptation Disease (ALAD) – Results from the human switching its genetic outdoor natural light exposures to artificial man-made light sources.
- Nighttime Adaptation Disease (NAD) – The human is genetically a daytime active animal that sleeps during the night. Switching the human to a nighttime active schedule and daytime sleeping is known to increase disease in the human. Night shifts are a class 2A carcinogen.
- Nighttime Diffraction & Interference Radiation (NDIR) – The dark side of the Earth has diffraction and interference solar radiation waves passing over it that are generated by the Earth eclipsing the Sun.
- Moon Reflected Artificial Light Adaptation Disease & Extinction (MRALADE) – The moon is reflecting artificial light emitted by modern cities back to Earth during nighttime. Living species have no genetic adaptation to this reflected man-made light which may bring about disease and extinction.
- Extinction Energy (EE) – The reduction of environmental energy that is essential to life or the increase of environmental energy that is harmful to life which causes a mass extinction event to occur.
- Extinction Suicide (ES) – Any living organisms that willfully collectively engage in behaviors that the long term effects are known to cause their species extinction.
• Environmental Radiation (ER) – Loss Of Atmospheric DC Voltage, Light Filtering & Polarization & Scattering & Diffraction & Interference, Radiation Transmission From Space To The Ground, Radiation Transmission From Earth's Core To The Ground, Surface Radiation Waves, Lightning, St. Elmo's Fire, Global Atomic Bomb Fallout Radiation, Impacts Of Nuclear Energy Disasters, Climate Change, Global Warming, Biological Evolution.
• Pollution – Effects on natural atmospheric AC and DC voltage, natural ground AC and DC voltage, lightning strikes, atmospheric and water electrical conductivity, increasing carbon content of atmosphere and water bodies, atmospheric and ground electrical currents, increasing man-made radio frequencies (RF), water structuring, air structuring, increasing atmospheric water vapor, stressed and dying trees and coral reefs.
• Oxygen Deficient Environments (ODE) - Known to cause behavioral changes, illness, injury and death in humans.
• Oxygen Excess Environments (OEE) – Known to cause oxygen toxicity in the human and may damage the central nervous system (CNS), brain, lungs, heart and eyes.
• Drug Adaptation Disease (DAD) – Feeding the human a daily cocktail of man-made drugs should be expected to cause the body to start adapting to them.
• Processed Food Adaptation Disease (PFAD) – Eating a diet comprised primarily of processed foods with long shelf lives of years may lead to sickness.
• Space Adaptation Disease (SAD) – Astronauts can only stay in Space for about a year until they become so sick that they have to return to Earth for extensive rehabilitation.
• High Altitude Gas Health Effects (HAGHE) – Breathing medical and industrial gas at high altitudes is known to adversely affect human mental and physical health and can be fatal.
• High Altitude Disease (HAD) – Spending significant time above 10,000 feet is known to induce long term health problems into sea level adapted humans such as oxygen starvation, lung issues, heart issues, Pulmonary Hypertension, blood oxygen issues, brain issues, eye issues, radiation sickness, problems from breathing radiation treated air and drinking radiation treated water.
• High Altitude Commuting Disease (HACD) – Workers that go from sea level to high altitudes daily develop degraded health over time. Known to occur in pilots, aircraft cabin crew, frequent fliers, astronomy observatory workers and ski resort workers.
• High Altitude Observatory Sickness (HAOS) – A range of sickness that is unique to high altitude observatory workers that inappropriately acclimatize and spend their time in low oxygen Faraday cage environments breathing medical and industrial gas and solvents and taking drugs.
• Airplane Adaptation Disease (AAD) – The very unnatural environment of extreme altitude modern jet aircraft causes those who spend significant inside of them to start biologically adapting to it.
• High Altitude Adaptation Disease (HAAD) – Occurs in sea level adapted humans that have permanently moved to high altitude.
• Open Drain Sickness (ODS) – Dried out drain traps & faulty sewer air admittance valves (AAV) that vent sewer gas into the home may make the residents sick.
• Insulation Adaptation Disease (IAD) – Results from the human switching its genetic outdoor exposures to a man-made heavily insulated home that is silent and devoid of natural sounds.
• Ventilation Adaptation Disease (VAD) – Results from living in unnatural modern energy efficient homes that are sealed up and are devoid of sufficient natural outdoor air ventilation, smells and airborne pollen levels.
• Dominant Smell (DS) – The material that is out-gassing the most in a home becomes the Dominant Smell (DS). Elimination of the DS requires removal of the DS material, the installation of a higher out-gassing alternate DS (such as an air freshener) or increased outdoor ventilation.
• Sick Building Syndrome (SBS) – Many toxic homes, offices and workplaces have been constructed that long term exposure to these make the occupants sick.
• Car Adaptation Disease (CAD) – Many toxic cars have been constructed that have very unnatural environments inside of them. Those that spend prolonged time within them may start the biological process of adapting to them.
• Pollution Adaptation Disease (PAD) – Living in a polluted area is known to cause long term health degradation as the body tries to adapt to the unnatural environment.
• Volcanic Smog (VOG) - Vog is a form of air pollution that results when sulfur dioxide and other gases and particles emitted by an erupting volcano react with oxygen and moisture in the presence of sunlight. Headaches, watery eyes, sore throat, breathing difficulties (including inducing asthma attacks), flu-like symptoms, and general lethargy are commonly reported. Cardiac issues, including increased pulse rates associated with thickened blood from PM 2.5 particles.
• Atmospheric Radiation Absorption (ARA) – The atmosphere when filled with pollution typically absorbs more solar radiation and reduces the natural radiation at sea level.
• Indoor Adaptation Disease (IAD) – Results from the human switching its healthy genetic outdoor lifestyle to an abnormal irradiated lazy indoor cancer society that is disconnected from nature.
• Human Adaptation Disease (HAD) – Any human that is placed in an abnormal environment should be expected to start the process of biologically adapting to that alien environment.
• Environmental Epigenetics (EE) – Cascading genetic errors caused by biologically toxic environmental exposures.
• Multiple Chemical Sensitivities (MCS) – People who become reactive to household & workplace chemicals.
• Man-Made Environmental Sickness (MMES) – Humans that are locked inside of a man-made environment typically become sick after 1-2 years inside of that alien environment and have to be removed from it.
• Primary Cause of Cancer (PCC) - Incorrect human environmental conditions.
• Preventing Cancer (PC) - Correct human environmental conditions.
• Radiation Nutrition (RN) – The human mind and body requires regular environmental radiation exposures daily to stay healthy.
• Interference Green Light (IGL) – The tree canopy generates interference green light that is beneficial to biological organisms underneath it.
Recommended Medical Screening Of Very High Altitude Workers

Steven Magee CEng MIET recommends:

- A complete warning given to all new hires about the diverse range of health problems that are known to have occurred in high altitude employees, including diseases and fatalities.
- Sleep study of all high altitude workers is to be performed prior to working at high altitudes to establish their sleep, heart, lung, brain and blood oxygen baseline values at sea level. [https://en.wikipedia.org/wiki/Sleep_study](https://en.wikipedia.org/wiki/Sleep_study)
- Cardiac Stress Test of all high altitude workers is to be performed prior to working at high altitudes to establish their heart and blood oxygen baseline values during physical activity at sea level. [https://en.wikipedia.org/wiki/Cardiac_stress_test](https://en.wikipedia.org/wiki/Cardiac_stress_test)
- Mandatory full medical screening of all new very high altitude workers on their first day at the summit facility by a certified medical doctor that specializes in high altitude disease and low level radiation sickness. The doctor is to issue a medical prescription for daily medical oxygen use and train that worker in the correct administration of oxygen using a pulse oximeter. The doctor is to warn the worker of the hazards that long term oxygen administration are known to present. The worker is to be issued with their own pulse oximeter that can record a complete workday of readings.
- Mandatory full medical screening of any very high altitude worker that is showing mental or physical distress at the summit facility by a certified medical doctor that specializes in high altitude disease and low level radiation sickness, including a full inspection of that workers environmental working conditions and abnormal exposures.
- Very high altitude workers should be screened at the summit facility every three months by a certified medical doctor that specializes in high altitude disease and low level radiation sickness for the following conditions:
  - Low level radiation sickness.
  - Headaches.
  - Irritability.
  - Aggressive behaviors.
  - Forgetfulness.
  - Confusion.
  - Fatigue.
  - Sleepiness.
  - Apathy.
  - A review of the company supplied drugs that the worker is taking.
  - A review of an 8 hour summit work day of pulse oximeter readings or a full night of pulse oximeter readings for night shift workers.
  - A review of pulse oximeter readings for a full day of sleep at high altitude for night shift workers.
  - Revised medical prescription issued for daily medical oxygen use.
- Very high altitude workers should be screened at the summit facility annually by a certified medical doctor that specializes in high altitude disease and low level radiation sickness for the following conditions:
  - Vitamin B12 deficiency.
  - Vitamin D deficiency.
○ Anemia.
○ Leukemia.
○ High cholesterol.
○ Low level radiation sickness.
○ Fatigue.
○ Headaches.
○ SPO2 blood oxygen levels at rest.
○ A cardiac stress test: https://en.wikipedia.org/wiki/Cardiac_stress_test
○ Heart disorders.
○ A mental status examination: https://en.wikipedia.org/wiki/Mental_status_examination
○ A Mini–Mental State Examination: https://en.wikipedia.org/wiki/Mini%E2%80%93Mental_State_Examination
○ Brain disorders.
○ Sleep disorders including sleep apnea.
○ Hearing loss.
○ Digestive disorders.
○ Lung disorders.
○ Kidney disorders.
○ Liver disorders.
○ Lactose, fructose and gluten intolerance.
○ Cancer screening: https://en.wikipedia.org/wiki/Cancer_screening
○ Bisphenol A (BPA) https://en.wikipedia.org/wiki/Bisphenol_A

- All high altitude workers should be sent on an annual sleep study for early detection of sleep disorders, heart, lung, brain and blood oxygenation issues.
- Government supervision of all health inspections should be legally required to ensure compliance.
- Any company official that bypasses the medical screening process and harasses a sickened worker out of their job should be fired.
- Any very high altitude worker that fails the summit screening process should be offered a permanent transfer to the lower altitude office or be placed on the company disability plan.
- The company should be legally required to compensate a permanently sickened high altitude worker for their lifetime loss of earnings, pain and suffering.
Recommended Medical Treatment Of Very High Altitude Sickened Workers

Steven Magee CEng MIET recommends that doctors consider this treatment plan for very high altitude sickened workers:

- Send worker for sleep study.
- Examination of 24 hours of SPO2 blood oxygen and heart beat readings.
- Comprehensive blood tests.
- Comprehensive urine tests.
- Test for IgG and/or IgA antibody responses to gluten, and gluten-containing grains.
- Cancer screening.
- Radiation exposure screening.
- Place on a comprehensive multivitamin.
- Place on a comprehensive triple omega 3-6-9 oil supplement.
- Place on regular high dose vitamin B12 injections for 6 months to see if they respond to it.
- Place on daily B100 complex supplements to see if they respond to it.
- Place on daily 65mg iron supplements to see if they respond to it.
- Place on daily Vitamin A 10,000 IU supplements to see if they respond to it.
- Place on daily Vitamin C 3,000 mg supplements to see if they respond to it.
- Place on daily Vitamin E 400 mg supplements to see if they respond to it.
- Place on daily Vitamin K 550 mcg supplements to see if they respond to it.
- Place on daily Alpha Lipoic Acid 600 mg supplements to see if they respond to it.
- Place on daily Selenium supplements to see if they respond to it.
- Place Potassium Bicarbonate supplements.
- Place on daily lactose free, fructose free and gluten free diet to see if they respond to it.
- Place on daily DHEA (Dehydroepiandrosterone) supplements to see if they respond to it.
- Place on a sunlight avoidance program for six months if they are reporting hot skin or aches and pains throughout their body.
- Referrals for:
  - Sleep.
    - Sleep study.
  - Neurology.
    - Screen for Amnesiac disorders.
    - Screen for seizures.
    - Screen for early onset Dementia.
    - High resolution brain CT & MRI scan.
  - Mental Health.
    - Screen for depression.
    - Screen for oxygen starvation disorders.
    - Screen for brain damage.
    - Screen for prolonged over the counter drug abuse.
  - Audiology:
    - Screen for hearing loss.
  - Pulmonology.
    - Screen for throat & lung disease.
Screen for oxygen starvation disorders.
Screen for industrial gas exposures.
Screen for medical oxygen exposures.
High resolution lung MRI scan.
Screen for sensitivities to oxygen, carbon dioxide, helium and nitrogen gas.

○ Cardiology.
  ▪ Screen for heart problems.
  ▪ Echo-cardiogram bubble study of heart looking for holes.

○ Hematology.
  ▪ Screen for Anemia disorders.
  ▪ Screen for Leukemia.
  ▪ Screen for low blood oxygen disorders.

○ Gastroenterology:
  ▪ Screen for lactose, fructose and gluten intolerance.
  ▪ Screen for Celiac Disease.
  ▪ Screen for vitamin and mineral deficiencies.
  ▪ Colonoscopy.
  ▪ Endoscopy.

○ Low Level Radiation Sickness.
  ▪ Screen for general body aches & pains.
  ▪ Screen for skin disorders.
  ▪ Screen for eye disorders.
  ▪ Screen for headaches.
  ▪ Test DHEA levels.
  ▪ Test melatonin levels.
Recommended Books For Treating Damaged High Altitude Workers

- Altitude Illness: Prevention & Treatment by Stephen Bezruzhka. [https://www.amazon.com/Altitude-Illness-Prevention-Treatment-Mountaineers/dp/0898866855/ref=pd_sim_14_1?pd_rd_i=0898866855&pd_rd_r=2cfca58a-863e-11e9-8887-9b31b6cb4217&pd_rd_w=YJslD&pd_rd_wg=AR9B3&pf_rd_p=90485860-83e9-4fd9-b838-b28a9b7fda30&pf_rd_r=JP60PJ9ACYYXJJ1X68B&psc=1&refRID=JP60PJ9ACYYXJJ1X68B](https://www.amazon.com/Altitude-Illness-Prevention-Treatment-Mountaineers/dp/0898866855/ref=pd_sim_14_1?pd_rd_i=0898866855&pd_rd_r=2cfca58a-863e-11e9-8887-9b31b6cb4217&pd_rd_w=YJslD&pd_rd_wg=AR9B3&pf_rd_p=90485860-83e9-4fd9-b838-b28a9b7fda30&pf_rd_r=JP60PJ9ACYYXJJ1X68B&psc=1&refRID=JP60PJ9ACYYXJJ1X68B)
- Altitude Acclimatization and Illness Management by Headquarters Department of the Army. [https://www.amazon.com/Altitude-Acclimatization-Illness-Management-Medical/dp/1534679294/ref=pd_sim_14_15?_encoding=UTF8&pd_rd_i=1534679294&pd_rd_r=2cfca58a-863e-11e9-8887-9b31b6cb4217&pd_rd_w=YJslD&pd_rd_wg=AR9B3&pf_rd_p=90485860-83e9-4fd9-b838-b28a9b7fda30&pf_rd_r=JP60PJ9ACYYXJJ1X68B&psc=1&refRID=JP60PJ9ACYYXJJ1X68B](https://www.amazon.com/Altitude-Acclimatization-Illness-Management-Medical/dp/1534679294/ref=pd_sim_14_15?_encoding=UTF8&pd_rd_i=1534679294&pd_rd_r=2cfca58a-863e-11e9-8887-9b31b6cb4217&pd_rd_w=YJslD&pd_rd_wg=AR9B3&pf_rd_p=90485860-83e9-4fd9-b838-b28a9b7fda30&pf_rd_r=JP60PJ9ACYYXJJ1X68B&psc=1&refRID=JP60PJ9ACYYXJJ1X68B)
- Mercury Poisoning: The Undiagnosed Epidemic by David Hammond. [https://www.amazon.com/Mercury-Poisoning-Undiagnosed-David-Hammond/dp/1494747898/ref=sr_1_1?keywords=mercury+poisoning&qid=1559593244&s=books&sr=1-1](https://www.amazon.com/Mercury-Poisoning-Undiagnosed-David-Hammond/dp/1494747898/ref=sr_1_1?keywords=mercury+poisoning&qid=1559593244&s=books&sr=1-1)
- Mercury Detoxification Simplified Paperback by William W. Rasmussen. [https://www.amazon.com/Mercury-Detoxification-Simplified-William-Rasmussen/dp/0975459546/ref=pd_sim_14_5/137-0093847-7340902?_encoding=UTF8&pd_rd_i=0975459546&pd_rd_r=9592499f-863d-11e9-8ec8-f37f2ab7fd5a&pd_rd_w=G89tK&pd_rd_wg=Vh42S&pf_rd_p=90485860-83e9-4fd9-b838-b28a9b7fda30&pf_rd_r=AS3YETEQ30KNAJV76BG8&psc=1&refRID=AS3YETEQ30KNAJV76BG8](https://www.amazon.com/Mercury-Detoxification-Simplified-William-Rasmussen/dp/0975459546/ref=pd_sim_14_5/137-0093847-7340902?_encoding=UTF8&pd_rd_i=0975459546&pd_rd_r=9592499f-863d-11e9-8ec8-f37f2ab7fd5a&pd_rd_w=G89tK&pd_rd_wg=Vh42S&pf_rd_p=90485860-83e9-4fd9-b838-b28a9b7fda30&pf_rd_r=AS3YETEQ30KNAJV76BG8&psc=1&refRID=AS3YETEQ30KNAJV76BG8)
- Brain Longevity: The Breakthrough Medical Program that Improves Your Mind and Memory by Dharma Singh Khalsa. [https://read.amazon.com/kp/embed?asin=B000Q9EX4E&preview=newtab&linkCode=kpe&ref_=cm_sw_r_kb_dp_KJ1tCbQTVSHMH](https://read.amazon.com/kp/embed?asin=B000Q9EX4E&preview=newtab&linkCode=kpe&ref_=cm_sw_r_kb_dp_KJ1tCbQTVSHMH)
- Brain Maker by Dr. Perlmutter. [https://www.drperlmutter.com/learn/books/](https://www.drperlmutter.com/learn/books/)
- The Better Brain Book: The Best Tool for Improving Memory and Sharpness and Preventing Aging of the Brain Paperback by David Perlmutter. [https://read.amazon.com/kp/embed?asin=B000PC71SC&preview=newtab&linkCode=kpe&ref_=cm_sw_r_kb_dp_VG1tCb71M57W9](https://read.amazon.com/kp/embed?asin=B000PC71SC&preview=newtab&linkCode=kpe&ref_=cm_sw_r_kb_dp_VG1tCb71M57W9)
- No Grain, No Pain by Dr. Peter Osborne. [https://nograinnopainbook.com/](https://nograinnopainbook.com/)
- The Complete Low-FODMAP Diet: A Revolutionary Plan for Managing IBS and Other Digestive Disorders by Sue Shepherd PhD and Peter Gibson MD. [http://a.co/d/55GiiI1s](http://a.co/d/55GiiI1s)
- The Plant Paradox - The Hidden Dangers in “Healthy” Foods That Cause Disease and Weight
Environmental Radiation LLC - https://www.environmentalradiation.com

- Gain by Dr. Steven Gundry. https://gundrymd.com/books2/
- Wheat Belly by Dr. William Davis. https://www.wheatbelly.com/
Repairing Altitude Brain Damage

- “Fixing Your Brain: A Guide to Balancing Neurotransmitters. Understanding, Troubleshooting, and Addressing a major component in Mental Illness and Chronic Conditions...Neurotransmitters are signaling chemicals in our brains. They are responsible for our moods, motivation, energy, learning ability, and much, much more. When our neurotransmitters become unbalanced, we experience some of the worst states of being known to man. When neurotransmitters become unbalanced, we may experience depression and anxiety (serotonin,) sloth, anger and lack of motivation (dopamine,) panic attacks, stress, and inability to calm down (GABA,) heart problems, burnout, and intolerance to exercise (noradrenaline,) and memory and focus problems (acetylcholine.)”
  https://medium.com/publishous/fixing-your-brain-a-guide-to-balancing-neurotransmitters-72649aab40b1
- “Amino Acids & Brain Chemistry...Amino acids are often described as the building blocks for protein-based tissues and compounds in your body such as muscles fiber, skin, hair and enzymes. However, amino acids are also needed to make neurotransmitters, which are chemicals in the brain that either excite or inhibit neurons. Amino acids that are able to cross the blood-brain barrier stimulate the synthesis of most neurotransmitters, which affects brain chemistry and impacts mood.”
- “Grow New Brain Cells...Taurine, a little-known amino acid, can do the seemingly impossible: stimulate new brain cells to grow in adult brains. This capability creates an entirely new paradigm for the ways we think about age-related cognitive decline, and even major neurodegenerative diseases like Parkinson’s and Alzheimer’s...Taurine also has a fundamental connection with longevity, particularly related to cardiovascular disorders. Animal studies demonstrate protection against heart disease with taurine supplementation, and human studies show that supplementation produces dramatic improvements in heart and blood vessel function.”
- “Eat protein to heal a damaged brain...A diet of chicken, fish and protein shakes might do wonders for people with brain injuries. Akiva Cohen of the University of Pennsylvania in Philadelphia and his colleagues mimicked brain injury in mice by injecting fluid through a hole drilled in their skull... After seven days, the brain-injured mice had much lower levels of three branched-chain amino acids (BCAAs), leucine, isoleucine and valine, compared with control mice. These are found in protein-rich food and are known for their ability to build muscle. The team then fed another set of brain-injured mice either plain water or water enriched with BCAAs. Five days later, those that had taken BCAAs had normal levels of the amino acids and performed better on a learning task.”
- “With Amino Acid Diet, Improvement After Brain Injury. Animal Study May Set Stage for Treating Brain Damage in People...Cohen’s study team first created standardized brain injuries in mice, and one week later compared the animals’ conditioned fear response to that of uninjured mice. A week after receiving a mild electric shock in a specific cage, normal mice tend to “freeze” when placed in the same cage, anticipating another shock. The brain-injured mice demonstrated fewer freezing responses—a sign that they had partially lost that piece of learning. On the other hand, brain-injured mice that received a diet of BCAAs showed the same
normal response as the uninjured mice. The BCAA cocktail had restored their learning ability.”

“Amino Acid and Protein Requirements: Cognitive Performance, Stress, and Brain Function...Given the importance of optimal cognitive function to soldiers and the documented relationship between several amine acids and brain function, studies to quantify CNS requirements for specific amine acids under conditions of metabolic, environmental, and psychological stress are required. Such studies could provide the basis for optimizing the amine acid content of field rations intended for use in extremely stressful combat conditions. Development of methods to evaluate CNS requirements for specific amine acids under normal and adverse circumstances is also necessary. Consideration should be given to conducting further animal research using techniques such as microdialysis to assess release of brain transmitters under various environmentally and nutritionally stressful conditions, including undernutrition, thermal stress, hypoxia, and psychological stress.”
U.S. Food and Drug Administration (FDA)

- “FDA Radiological Health Program. The mission of the FDA’s radiological health program is to protect the public from hazardous or unnecessary radiation exposure from radiation-emitting electronic products.”
  https://www.fda.gov/Radiation-EmittingProducts/FDARadiologicalHealthProgram/default.htm
- “Radiation-Emitting Products” https://www.fda.gov/Radiation-EmittingProducts/default.htm
- “Drugs” https://www.fda.gov/Drugs/default.htm
- “Medical Devices” https://www.fda.gov/MedicalDevices/default.htm
- “Contact FDA” https://www.fda.gov/AboutFDA/ContactFDA/default.htm
The United States Pharmacopoeia (USP)

- “Contact Information” http://www.usp.org/contact-us
Federal Aviation Administration (FAA)

- “Federal Aviation Administration”  [https://www.faa.gov/](https://www.faa.gov/)
- “FAA Regulations”  [https://www.faa.gov/regulations_policies/faa_regulations/](https://www.faa.gov/regulations_policies/faa_regulations/)
- “Who to Contact if You're Impacted by Aircraft Noise”  [https://www.faa.gov/about/office_org/headquarters_offices/apl/noise_emissions/airport_aircraft_noise_issues/noise/](https://www.faa.gov/about/office_org/headquarters_offices/apl/noise_emissions/airport_aircraft_noise_issues/noise/)
- “Policy, International Affairs and Environment - Contact Us”  [https://www.faa.gov/about/office_org/headquarters_offices/apl/contact_us/](https://www.faa.gov/about/office_org/headquarters_offices/apl/contact_us/)
US Department of Labor

- “UNITED STATES DEPARTMENT OF LABOR” [https://www.dol.gov/]
- “Termination...If you've lost your job, you have certain rights, such as the right to continue your health care coverage and, in some cases, the right to unemployment compensation.” [https://www.dol.gov/general/topic/termination]
- “The Whistle-blower Protection Programs” [https://www.whistleblowers.gov/]
- “Workplace Posters” [https://www.dol.gov/general/topics/posters]
- “Unemployment Insurance. The Department of Labor's Unemployment Insurance (UI) programs provide unemployment benefits to eligible workers who become unemployed through no fault of their own, and meet certain other eligibility requirements.” [https://www.dol.gov/general/topic/unemployment-insurance]
- “Harassment” [https://www.eeoc.gov/laws/types/harassment.cfm]
- “Prohibited Employment Policies/Practices” [https://www.eeoc.gov/laws/practices/]
- “Constructive Discharge/Forced To Resign. Discriminatory practices under the laws EEOC enforces also include constructive discharge or forcing an employee to resign by making the work environment so intolerable a reasonable person would not be able to stay.” [https://www.eeoc.gov/laws/practices/]
- “Terms & Conditions Of Employment. The law makes it illegal for an employer to make any employment decision because of a person's race, color, religion, sex (including gender identity, sexual orientation, and pregnancy), national origin, age (40 or older), disability or genetic information. That means an employer may not discriminate when it comes to such things as hiring, firing, promotions, and pay. It also means an employer may not discriminate, for example, when granting breaks, approving leave, assigning work stations, or setting any other term or condition of employment - however small.” [https://www.eeoc.gov/laws/practices/]
U.S. Equal Employment Opportunity Commission

- “Employees & Job Applicants” https://www.eeoc.gov/employees/
- “Harassment” https://www.eeoc.gov/laws/types/harassment.cfm
- “FAQ“ https://eeoc.custhelp.com/app/answers/list
- “Contact EEOC” https://www.eeoc.gov/contact/index.cfm
Armed Forces Radiobiology Research Institute

- “The AFRRI mission is to preserve and protect the health and performance of U.S. military personnel through research and training that advance understanding of the effects of ionizing radiation. This mission includes education and training to maintain a pool of qualified radiation biologists; and basic and applied research to identify and perform early development of measures to prevent, assess and treat radiation injury. AFRRI research thrusts include medical countermeasures, diagnosis of injury (biodosimetry), low dose/low dose rate/late effects, internalized radionuclides, and combined injury...AFRRI scientists publish original research articles in scientific journals, contributing to the general knowledge of the effects of ionizing radiation on living organisms. The research is critical to the Department of Defense for force protection and also contributes to the health and well-being of the population at large. The articles appear in preeminent scientific journals, such as PLoS One, Radiation Research, International Journal of Radiation Biology, Journal of Radiation Research, Cytokine, FASEB Journal, International Journal of Toxicology, Health Physics, etc....The institute’s most active research involves external penetrating ionizing radiation. The scientific efforts focus on discovering mechanisms of radiation injury in a search for potential drug targets and to guide medical treatment, assessing radiation injury severity, discovering and developing early preclinical radiation countermeasure candidates, and studying mechanisms and countermeasures for radiation combined with other injury...Development of a panel of seven efficacious radiation countermeasure candidates against acute radiation syndrome (ARS). These agents have low toxicity and practical routes of administration. They are ready for advanced development by other DOD agencies when resources become available. All are at Technology Readiness Level (TRL) 3 or above. This is the level for which AFRRI is funded (DOD S&T activities 6.2 and 6.3). One candidate (genistein or BIO-300) is at TRL 5, and another (5-AED) is at TRL 6. Five of these countermeasure candidates were conceived at AFRRI, and research and development initiated at AFRRI. These are 5-AED, tocols, genistein (BIO 300), ciprofloxacin (CIPRO), and ghrelin. Two were researched at early stages in collaboration with companies: Ex-Rad® and CDX-301. Three have FDA Investigational New Drug (IND) status for ARS: 5-AED, genistein (BIO 300), and Ex-Rad®. Six have human safety trials: 5-AED, genistein (BIO 300), Ex-Rad®, CDX-301, C PRO, and Ghrelin. The seventh (tocols) has very low toxicity in non-GLP studies (administered in a manner suitable for an ARS countermeasure). All enhance survival in irradiated animals in robust studies repeated multiple times. Four of these countermeasure candidates are dual use, i.e., approved or being developed for mainstream medical indications: CIPRO: antibiotic. Ghrelin: cachexia, hemodialysis, seizures, gastroparesis. CDX-301: hematopoietic stem cell transplantation. BIO 300: lung cancer, prostate cancer.” https://www.usuhs.edu/afrri/
US Army Research Institute of Environmental Medicine (USARIEM)

- “US Army Research Institute of Environmental Medicine (USARIEM)”
  http://www.usariem.army.mil/
- “Thermal & Mountain Medicine Division”
  http://www.usariem.army.mil/index.cfm/about/divisions/tmmd
- “Altitude Acclimatization Guide”
- “ALTITUDE ACCLIMATIZATION AND ILLNESS MANAGEMENT”
Altitude Research Centers

- “Altitude Research Center, University of Colorado.”
  http://www.ucdenver.edu/academics/colleges/medicalschool/centers/AltitudeResearch/Pages/Altitude%20Research%20Center.aspx
- “CCAMM (the clinical unit of the Altitude Research Center), University of Colorado.”
  https://com-cam.org/entity/altitude-research-center-arc/
- “Altitude Research Center, Aurora, Colorado.”
  https://www.facebook.com/Altitude-Research-Center-172672682782948/
- “The Institute for Altitude Medicine”
  http://www.altitudemedicine.org/
- “High Altitude Research Center (HARC) at St. Anthony Summit Medical Center”
  https://www.centura.org/care-and-health/high-altitude-health
- “United States Army Pikes Peak Research Laboratory”
  https://en.wikipedia.org/wiki/United_States_Army_Pikes_Peak_Research_Laboratory
- “Swiss Committee on Polar and High Altitude Research”
  http://www.polar-research.ch/e/index.php
- “White Mountain Research Center, University of California”
  https://www.wmrc.edu/
Future Large Telescopes

- “The TMT International Observatory LLC (TIO) – Currently scheduled for completion in 2027.” [https://www.tmt.org/](https://www.tmt.org/)
Occupational Safety and Health Administration (OSHA)

- “Know Your Rights. Under federal law, you are entitled to a safe workplace. Your employer must provide a workplace free of known health and safety hazards. If you have concerns, you have the right to speak up about them without fear of retaliation. You also have the right to: Be trained in a language you understand. Work on machines that are safe. Be provided required safety gear, such as gloves or a harness and lifeline for falls. Be protected from toxic chemicals. Request an OSHA inspection, and speak to the inspector. Report an injury or illness, and get copies of your medical records. See copies of the workplace injury and illness log. Review records of work-related injuries and illnesses. Get copies of test results done to find hazards in the workplace.” [https://www.osha.gov/workers/index.html](https://www.osha.gov/workers/index.html)

- “How to File a Safety and Health Complaint. The Occupational Safety and Health Act of 1970 gives employees and their representatives the right to file a complaint and request an OSHA inspection of their workplace if they believe there is a serious hazard or their employer is not following OSHA standards. Workers do not have to know whether a specific OSHA standard has been violated in order to file a complaint. The complaint should be filed as soon as possible after noticing the hazard or lack of compliance because OSHA citations may only be issued for violations that currently exist or existed in the past 6 months. Complaints from workers or their representatives are taken seriously by OSHA. OSHA will keep your information confidential.” [https://www.osha.gov/workers/file_complaint.html](https://www.osha.gov/workers/file_complaint.html)

- “File A Complaint. File a discrimination complaint if your employer has retaliated against you for exercising your rights as an employee. If you have been punished or retaliated against for exercising your rights under the OSH Act, you must file a complaint with OSHA within 30 days of the alleged reprisal. In states with approved state plans, employees may file a complaint under the OSH Act (Section 11(c)) with both the State and Federal OSHA.” [https://www.whistleblowers.gov/complaint_page](https://www.whistleblowers.gov/complaint_page)

- “Contact OSHA. To ask about a health and safety issue at your workplace, discuss your rights, or learn more about OSHA, please contact us. Your information will be kept confidential. Call us toll-free at 1-800-321-6742 (OSHA)” [https://www.osha.gov/html/RAmap.html](https://www.osha.gov/html/RAmap.html)

- “Top 10 Most Frequently Cited Standards...The following is a list of the top 10 most frequently cited standards following inspections of worksites by federal OSHA. OSHA publishes this list to alert employers about these commonly cited standards so they can take steps to find and fix recognized hazards addressed in these and other standards before OSHA shows up. Far too many preventable injuries and illnesses occur in the workplace.” [https://www.osha.gov/Top_Ten_Standards.html](https://www.osha.gov/Top_Ten_Standards.html)

- “OSHA Frequently Asked Questions” [https://www.osha.gov/OSHA_FAQs.html#infoworkers](https://www.osha.gov/OSHA_FAQs.html#infoworkers)

- “Human beings must breathe oxygen . . . to survive, and begin to suffer adverse health effects when the oxygen level of their breathing air drops below [19.5 percent oxygen]. Below 19.5 percent oxygen . . . , air is considered oxygen-deficient. At concentrations of 16 to 19.5 percent, workers engaged in any form of exertion can rapidly become symptomatic as their tissues fail to obtain the oxygen necessary to function properly (Rom, W., Environmental and Occupational Medicine, 2nd ed.; Little, Brown; Boston, 1992). Increased breathing rates, accelerated heartbeat, and impaired thinking or coordination occur more quickly in an oxygen-deficient environment. Even a momentary loss of coordination may be devastating to a worker if it occurs while the worker is performing a potentially dangerous activity, such as climbing a
ladder. Concentrations of 12 to 16 percent oxygen cause tachypnea (increased breathing rates),
tachycardia (accelerated heartbeat), and impaired attention, thinking, and coordination (e.g., Ex. 25-4),
even in people who are resting. At oxygen levels of 10 to 14 percent, faulty judgment,
intermittent respiration, and exhaustion can be expected even with minimal exertion (Exs. 25-4
and 150). Breathing air containing 6 to 10 percent oxygen results in nausea, vomiting, lethargic
movements, and perhaps unconsciousness. Breathing air containing less than 6 percent oxygen
produces convulsions, then apnea (cessation of breathing), followed by cardiac standstill. These
symptoms occur immediately. Even if a worker survives the hypoxic insult, organs may show
evidence of hypoxic damage, which may be irreversible (Exs. 25-4 and 150; also reported in
Rom, W. [see reference in previous paragraph])….OSHA's experience confirms the record
evidence that most work at higher altitudes is performed by fully acclimated workers (Exs. 54-
6, 54-208). These provisions will allow acclimated workers to continue to perform their work
without oxygen-supplying respirators, at any altitude up to 14,000 feet altitude, as long as the
ambient oxygen content remains above 19.5% and the employee has no medical condition that
would require the use of supplemental oxygen. (Federal Register, Vol. 63, p. 1203.) Therefore,
in addition to the protection afforded to them by altitude acclimation, OSHA's Respiratory
Protection Standard ensures that employees working under oxygen-deficient conditions at
altitude will have an adequate and reliable breathing supply consisting of 19.5 percent oxygen,
an oxygen content that will provide the employees exposed to these conditions with a
substantial margin of safety.”

“DEPARTMENT OF LABOR Occupational Safety and Health Administration 29 CFR Parts
1910 and 1926 [Docket No. H-049] RIN 1218-AA05 Respiratory Protection...SUMMARY:
This final standard, which replaces the respiratory protection standards adopted by OSHA in
1971 (29 CFR 1910.134 and 29 CFR 1926.103), applies to general industry, construction,
shipyard, longshoring, and marine terminal workplaces. The standard requires employers to
establish or maintain a respiratory protection program to protect their respirator-wearing
employees. The standard contains requirements for program administration; worksite-specific
procedures; respirator selection; employee training; fit testing; medical evaluation; respirator
use; respirator cleaning, maintenance, and repair; and other provisions. The final standard also
simplifies respirator requirements for employers by deleting respiratory provisions in other
OSHA health standards that duplicate those in the final standard and revising other respirator-
related provisions to make them consistent. In addition, the standard addresses the use of
respirators in Immediately Dangerous to Life or Health (IDLH) atmospheres, including interior
structural firefighting. During interior structural firefighting (an IDLH atmosphere by
definition), self-contained breathing apparatus is required, and two firefighters must be on
standby to provide assistance or perform rescue when two firefighters are inside the burning
building. Based on the record in this rulemaking and the Agency's own experience in enforcing
its prior respiratory protection standards, OSHA has concluded that compliance with the final
rule will assist employers in protecting the health of employees exposed in the course of their
work to airborne contaminants, physical hazards, and biological agents, and that the standard is
therefore necessary and appropriate. The final respiratory protection standard covers an
estimated 5 million respirator wearers working in an estimated 1.3 million workplaces in the
covered sectors. OSHA's benefits analysis predicts that the standard will prevent many deaths
and illnesses among respirator-wearing employees every year by protecting them from exposure
to acute and chronic health hazards. OSHA estimates that compliance with this standard will
avert hundreds of deaths and thousands of illnesses annually. The annual costs of the standard are estimated to be $111 million, or an average of $22 per covered employee per year.“  

Breaking State or Federal Laws Leading To Fines Or Jail

- “Yes, OSHA violations can send you to jail...Can mis-steps with OSHA land you in jail? Several recent cases are a reminder that the risk is real. While OSHA rarely makes a criminal case out of safety violations, it does pursue criminal charges when people mislead the agency through false statements, falsified records, or destroyed documents. A company that does not take great care in handling an investigation risks such costly errors, leading to criminal prosecution and stiff penalties under federal law.”

- “Criminal Prosecutions Of Workplace Fatalities...Since the creation of the federal Occupational Safety and Health Administration (OSHA) 32 years ago, there have been more than 200,000 workplace-related deaths. However, OSHA has referred only 151 cases to the Justice Department for criminal prosecution -- and the maximum penalty companies face for a "willful violation" of OSHA laws is a misdemeanor. Federal prosecutors have declined to pursue two-thirds of these cases, and only eight of them have resulted in prison sentences for company officials. Here's a look at those eight cases.”

- “OSHA Criminal Referrals on the Rise...Section 17(e) of the Occupational Safety and Health Act (“OSH Act”) provides for a Class B misdemeanor criminal penalty, including imprisonment up to six months and substantial monetary fines if an employer’s willful violation of any OSHA standard causes the death of an employee.”
  [https://www.oshalawupdate.com/2012/12/18/osha-criminal-referrals-on-the-rise/](https://www.oshalawupdate.com/2012/12/18/osha-criminal-referrals-on-the-rise/)

- “Is OSHA Going to Put You in Jail?...Title 29 U.S.C. § 666(e) provides criminal penalties for any employer who willfully violates a safety standard prescribed pursuant to the Occupational Safety and Health Act, where that violation causes the death of any employee. Four elements must be proved in order to establish a criminal violation of 29 U.S.C. § 666(e). The government must prove that: (1) the defendant is an employer engaged in a business affecting commerce; (2) the employer violated a "standard, rule or order" promulgated pursuant to 29 U.S.C. § 665, or any regulation prescribed under the Act; (3) the violation was willful, and (4) the violation caused the death of an employee.”

- “Criminal Penalties For Violating OSHA Standards...VIOLATIONS THAT RESULT IN SERIOUS DEATH OR INJURY UNDER LABOR CODE § 6425 Willful Violation Of Standard Causing Death Or Serious Injury To Employee. Any contractor who willfully violates an OSHA standard is guilty of a public offense and may be subject to severe penalties if the violation causes death or serious injury to any employee.”

- “OSHA and MSHA Criminal Prosecutions – DOJ Announces New Procedures After CEO Verdict...criminal prosecution can also occur under general federal criminal law for making false statements to a government investigator, obstruction of justice (usually through document or evidence destruction), witness tampering, and conspiracy. These general federal criminal law provisions are felonies that can carry 25-year prison sentences.”
“Consequences of Violating Employees Rights...When an employer violates the rights of employees, she exposes herself to penalties ranging from minimal corrective measures to stiff monetary fines and, under unusual circumstances, jail and prison sentences. Worker rights to health and safety, fair pay, freedom from retaliation and a non-discriminatory workplace are a few of the rights covered by federal law.” [smallbusiness.chron.com/consequences-violating-employees-rights-14037.html](https://smallbusiness.chron.com/consequences-violating-employees-rights-14037.html)

“Labor Law: Violations and Penalties...Violating labor and employment laws comes with a price, and often a price that's both tangible and intangible. Aside from possible liability for monetary payments, court costs and attorneys' fees, companies embroiled in legal defense of their actions can suffer intangible damages to reputation and corporate citizenship. Small businesses aren't always exempt from the law because many laws apply to employers with just a handful of workers.” [yourbusiness.azcentral.com/labor-law-violations-penalties-15635.html](https://yourbusiness.azcentral.com/labor-law-violations-penalties-15635.html)
Government Health & Safety Websites

- Canada: “Canadian Centre for Occupational Health and Safety (CCOHS)” [https://www.ccohs.ca/](https://www.ccohs.ca/)
- USA: “Occupational Safety and Health Administration (OSHA)” [https://www.osha.gov/](https://www.osha.gov/)
**Health & Safety Books**

- “Operating Safely in Hazardous Environments By Cocciardi“ [https://books.google.com/books?id=vBNLrm6CS3EC&pg=PA33&lpg=PA33&dq=organs+may+show+evidence+of+hypoxic+damage&source=bl&ots=ZxhJXhhOHQ&sig=ZKtzSwg_yNRbSvVngt5gcSf1hk&hl=en&sa=X&ved=0ahUKEwiS9Mafxo_aAhUD5WMKHW_wBd8Q6AEldDAI#v=onepage&q=organs%20may%20show%20evidence%20of%20hypoxic%20damage&f=false](https://books.google.com/books?id=vBNLrm6CS3EC&pg=PA33&lpg=PA33&dq=organs+may+show+evidence+of+hypoxic+damage&source=bl&ots=ZxhJXhhOHQ&sig=ZKtzSwg_yNRbSvVngt5gcSf1hk&hl=en&sa=X&ved=0ahUKEwiS9Mafxo_aAhUD5WMKHW_wBd8Q6AEldDAI#v=onepage&q=organs%20may%20show%20evidence%20of%20hypoxic%20damage&f=false)
- “Nutritional Needs in Cold and High-Altitude Environments” [https://www.nap.edu/download/5197](https://www.nap.edu/download/5197)
- “The excellent book ‘Going Higher. Oxygen, Man, And Mountains.’ should be compulsory reading for all high altitude workers.” Steven Magee CEng MIET – Q
- “Altitude Illness: Prevention & Treatment (Mountaineers Outdoor Expert) by Stephen Bebruchka” [https://www.amazon.com/gp/product/0898866855/ref=pe_2640190_232748420_pd_te_o_ch_tie2?_encoding=UTF8&pd_rd_i=0898866855&pd_rd_r=1PKYQ082WPGADNBNC9MY&pd_rd_w=CsoNn&pd_rd_wg=TzqNC](https://www.amazon.com/gp/product/0898866855/ref=pe_2640190_232748420_pd_te_o_ch_tie2?_encoding=UTF8&pd_rd_i=0898866855&pd_rd_r=1PKYQ082WPGADNBNC9MY&pd_rd_w=CsoNn&pd_rd_wg=TzqNC)
- "Ernsting's Aviation and Space Medicine by David Gradwell, David J. Rainford" [https://www.amazon.com/Ernstings-Aviation-Space-Medicine-5E/dp/1444179942/ref=dp_bxgy_14_3/137-0093847-7340902?_encoding=UTF8&pd_rd_i=1444179942&pd_rd_r=3838121c-8501-472f-9466-dedd4ed4e397&pd_rd_w=MiYtu&pd_rd_wg=JvZXG&pf_rd_p=a2006322-0bc0-4db9-a08e-d168e18ce6f0&pf_rd_r=5DVSNQAV75R71W81FHV1&psc=1&refRID=5DVSNQAV75R71W81FHV1](https://www.amazon.com/Ernstings-Aviation-Space-Medicine-5E/dp/1444179942/ref=dp_bxgy_14_3/137-0093847-7340902?_encoding=UTF8&pd_rd_i=1444179942&pd_rd_r=3838121c-8501-472f-9466-dedd4ed4e397&pd_rd_w=MiYtu&pd_rd_wg=JvZXG&pf_rd_p=a2006322-0bc0-4db9-a08e-d168e18ce6f0&pf_rd_r=5DVSNQAV75R71W81FHV1&psc=1&refRID=5DVSNQAV75R71W81FHV1)
- "Life of Man on the High Alps by Angelo Mosso" [https://www.amazon.com/Life-High-Angelo-1846-1910-Mosso/dp/1371231877/ref=tmm_pap_title_0?_encoding=UTF8&qid=&sr=](https://www.amazon.com/Life-High-Angelo-1846-1910-Mosso/dp/1371231877/ref=tmm_pap_title_0?_encoding=UTF8&qid=&sr=)
- "Barometric Pressure: Researches in Experimental Physiology by Paul Bert" [https://www.amazon.com/Barometric-Pressure-Researches-Experimental-Physiology/dp/0260226114/ref=sr_1_1?keywords=paul+bert+barometric+pressure&qid=1566324652&sr=8-1](https://www.amazon.com/Barometric-Pressure-Researches-Experimental-Physiology/dp/0260226114/ref=sr_1_1?keywords=paul+bert+barometric+pressure&qid=1566324652&sr=8-1)
- "The Respiratory Function of the Blood by Joseph Barcroft"

- "I have no recollection of seeing books on high altitude diseases at remote astronomical observatories atop mountain peaks." Steven Magee CEng MIET – Q
Health & Safety Websites

- “EHS Today” http://www.ehstoday.com/
- “Safety+Health magazine” http://www.safetyandhealthmagazine.com/
Demolition Of The Mauna Kea Observatories

- "Biological science clearly states that it is impossible to make the summit of Mauna Kea safe for the sea level adapted workers. As such, the Mauna Kea Observatories should be demolished as soon as possible to protect the health and safety of the unsuspecting workers."  Steven Magee CEng MIET - Q
- “The cat is out of the bag: The very high altitude summit of Mauna Kea is biologically toxic to the sea level adapted workers. It is time to demolish the Mauna Kea Observatories.”  Steven Magee CEng MIET - Q
- "Based on the medical evidence that clearly states being above 10,000 feet is hazardous to the health of sea level adapted humans, it is clear that all of the manned facilities on top of the 13,796 feet very high altitude Mauna Kea summit in Hawaii should be removed and the summit restored back to its native environment."  Steven Magee CEng MIET - Q
- “The summit of Mauna Kea should never have been developed as it is not safe for humans up there. I am now locked into an endless loop of doctors visits for what appears to be classic very high altitude heart, lung & brain damage because I was unfortunate enough to have worked there.”  Steven Magee CEng MIET - Q
- “The very high altitude Mauna Kea Observatories (MKO) are unsafe for sea level adapted humans to work in. They always have been hazardous to health and always will be.”  Steven Magee CEng MIET - Q
- “Mauna Kea Sickness (MKS) needs to be thoroughly researched and characterized by the medical profession before any more very high altitude workplaces are built on the summit. It is likely that once Mauna Kea Sickness is well characterized, that all of the manned summit facilities would need to be removed on the grounds of health and safety.”  Steven Magee CEng MIET - Q
- “I am looking forward to attending the bulldozing ceremony for the removal of all very high altitude manned facilities atop the known biologically toxic summit of Mauna Kea.”  Steven Magee CEng MIET - Q
- “Never underestimate the power of an educated person that has committed to shutting down your biologically toxic enterprise.”  Steven Magee CEng MIET - Q
- “Dear Mauna Kea Observatories, I know that telescopes do not belong on sacred sites. I also know that you are willfully damaging your workers health by building astronomical observatories in known biologically toxic environments. As such, I now respectfully request your resignation from the very high altitude sacred mountain of Mauna Kea. Sincerely, Steven Magee, Damaged Mauna Kea Worker.”  Steven Magee CEng MIET - Q
- “Astronomy needs to clean up its act and the first step in the right direction is the demolition of the biologically toxic Mauna Kea Observatories.”  Steven Magee CEng MIET - Q
- “The fact that the USA government is denying damaged Mauna Kea workers their earned disability payments is reason enough to demolish the biologically toxic Mauna Kea Observatories.”  Steven Magee CEng MIET - Q
- "There is only so much abuse a worker will take before they decide to shut your biologically toxic operation down with legal science."  Steven Magee CEng MIET - Q
- "The development of the biologically toxic Mauna Kea Observatories (MKO) is the fruition of professional astronomers behaving badly."  Steven Magee CEng MIET - Q
• "The simplest way to shut down a known biologically toxic facility is to trawl the internet for scientific papers that prove the toxicity." Steven Magee CEng MIET - Q
• “Why object to one very high altitude telescope when you can use science to object to them all.” Steven Magee CEng MIET - Q
• “It was astronomical science that built the Mauna Kea Observatories (MKO) and I have every expectation that it will be biological science that demolishes them.” Steven Magee CEng MIET - Q
• “Biological science is clear that the Mauna Kea Observatories must be shut down to protect the long term health of the summit workers. It will be interesting to see how long astronomers willfully ignore the science.” Steven Magee CEng MIET - Q
• “If I can stay alive long enough to see the demolition of the biologically toxic Mauna Kea Observatories (MKO), then I will consider my life to be complete.” Steven Magee CEng MIET - Q
Shutting Down The Biologically Toxic Space Industry.

• "Shutting down the biologically toxic Mauna Kea Observatories is the short term goal. The long term goal is shutting down the biologically toxic Space industry." Steven Magee CEng MIET - Q
• "The most dangerous job by far in the USA is an astronaut." Steven Magee CEng MIET - Q
• "When I see the President of the USA promoting the development of Space, I see an incompetent that does not understand the biological toxicity of the Space industry to over seven billion humans on planet Earth." Steven Magee CEng MIET - Q
• "Airplanes are the poor man’s satellites." Steven Magee CEng MIET - Q
• "Mother nature took millions of years to remove all but one satellite, the Moon, from Earth’s orbit. The modern human has undone that process since the launch of the first Sputnik satellite in 1957." Steven Magee CEng MIET – Q
• "Since 1957 the modern human has filled the sky with tens of thousands of satellites without examining the reason why Earth previously only had one satellite, called the Moon." Steven Magee CEng MIET - Q
• "Fifty years after landing on the Moon, we have learned that the Space industry is biologically toxic to over seven billion people on planet Earth." Steven Magee CEng MIET - Q
• "Steven Magee Photographs Altitude Interference Radiation (AIR)" http://www.environmentalradiation.com/Airplane%20shadow%20interference%20ring%20titled%20environmentalradiation.jpg
• "Steven Magee Video Records Altitude Interference Radiation (AIR)" https://youtu.be/xQnRi-pS6CY
• "Astronomy group calls for urgent action on SpaceX Starlink satellites...The visible light isn’t the only problem: the satellites use radio signals to communicate, which could interfere with observations in those frequencies. “Recent advances in radio astronomy, such as producing the first image of a black hole… were only possible through concerted efforts in safeguarding the radio sky from interference,” the IAU statement says. Too many satellites emitting radio waves could endanger future studies." https://www.newscientist.com/article/2205172-astronomy-group-calls-for-urgent-action-on-spacex-starlink-satellites/
• "Global Union Against Radiation Deployment from Space (GUARDS). GUARDS is an international coalition against global WiFi from space, a complex technology of radiation and toxic chemicals endangering all life on Earth...Planned Global WiFi from Space Will Destroy Ozone Layer, Worsen Climate Change, and Threaten Life on Earth. Thirteen companies are competing to cover the entire Earth with high-speed wireless Internet from low-orbit satellites within one to two years. This would be an ecological and public health nightmare. The biggest players are SpaceX (12,000 satellites), OneWeb (4,560 satellites) and Boeing (2,956 satellites). The recent finding, in 2018, that stratospheric ozone is still declining despite the Montreal Protocol took everyone by surprise. The increasing pace of ever-more-powerful rocket launches is a likely factor. Inminent plans for beaming high-speed Internet from space would require the launching of large rockets almost daily. This is expected to alter, if not destroy, the ozone layer and contribute significantly to climate change. Although many new rockets burn liquid fuel containing no ozone-destroying chlorine, the assumption that this is environmentally friendly is proving wrong." http://stopglobalwifi.org/
"INTERNATIONAL APPEAL. Stop 5G on Earth and in Space. We the undersigned scientists, doctors, environmental organizations and citizens from (__) countries, urgently call for a halt to the deployment of the 5G (fifth generation) wireless network, including 5G from space satellites. 5G will massively increase exposure to radio frequency (RF) radiation on top of the 2G, 3G and 4G networks for telecommunications already in place. RF radiation has been proven harmful for humans and the environment. The deployment of 5G constitutes an experiment on humanity and the environment that is defined as a crime under international law." [link to appeal]
Astronomy Health & Safety

- “To speak out or not to speak out, that is the question.” Steven Magee CEng MIET - Q
- “My interest in astronomy has been replaced by my fascination with the biological damage that occurs in very high altitude workers.” Steven Magee CEng MIET - Q
- “Having extensively researched the toxicity of high altitude astronomy, I consider myself lucky that the astronomy management teams did not murder me.” Steven Magee CEng MIET - Q
- “I am blowing the whistle on high altitude astronomy because it is well overdue.” Steven Magee CEng MIET - Q
- “Researching the high altitude workplace damage to my health has turned into a fascinating voyage of astronomical discovery.” Steven Magee CEng MIET - Q
- “Astronomy’s dirty secrets are in the process of coming to light.” Steven Magee CEng MIET - Q
- “The biggest mistake that I made in high altitude astronomy was not realizing that the onset of sickness I saw at the first astronomical observatory were the initial signs of High Altitude Observatory Disease (HAOD).” Steven Magee CEng MIET - Q
- “While altitude sickness was disclosed to the astronomy workers, high altitude observatory disease (HAOD) was not disclosed.” Steven Magee CEng MIET - Q
- “High altitude astronomy is a catch 22: Stay inside the observatory and get high altitude observatory disease (HAOD) or go outside and get radiation sickness. Either way, the sea level adapted human may develop disease.” Steven Magee CEng MIET - Q
- “The science clearly states that it is impossible not to damage the long term health of a sea level adapted human that spends its life going from near sea level up to very high altitude on a daily basis.” Steven Magee CEng MIET - Q
- “If you are a sea level adapted human, then your health is at risk by working at the biologically toxic Mauna Kea Observatories.” Steven Magee CEng MIET - Q
- “There is ample evidence that all very high altitude manned astronomical facilities should be shut down that use sea level adapted workers.” Steven Magee CEng MIET - Q
- "The lasting physical and mental health effects of long term very high altitude exposure appear to be remarkably similar to daily heavy smoking." Steven Magee CEng MIET - Q
- “I was trained by senior managers to instruct high altitude workers to discharge large amounts of industrial gas into the indoor environment without respiratory protection and without oxygen deficiency monitors.” Steven Magee CEng MIET - Q
- “High altitude astronomy is a strange world of oxygen starvation, sleep deprivation and radiation sickness.” Steven Magee CEng MIET - Q
- “Poisoning puts you into a mental state of wondering if you are alive or dead, as you are trapped in an intermediate state of mind.” Steven Magee CEng MIET - Q
- “The various forms of radiation exposures are far more harmful to long term health than what the corporate governments are telling their mass populations.” Steven Magee CEng MIET - Q
- “When I started to research what had made me sick, I had no idea that it would turn me into an expert on inconvenient truths.” Steven Magee CEng MIET - Q
- “During death I have every expectation that I will be accompanied by spirits, as that is what happened when my brain was in oxygen starvation at very high altitudes.” Steven Magee CEng MIET - Q
“Over time, it became clear that my invisible friend and the Hawaiian visions were arising out of erratic low blood oxygen levels, company supplied drugs, malnutrition, abnormal electromagnetic radiation exposures, very high altitude damage, pernicious anemia, altered hormones, sleep apnea, bruxism and food intolerance.” Steven Magee CEng MIET - Q
“The senior managers would advise their staff to take a break and breath oxygen when they started to exhibit ‘Summit Brain’.” Steven Magee CEng MIET - Q
“The senior astronomy managers were aware of ‘Summit Brain’ and did not disclose to workers that it may lead to permanent damage to mental functioning.” Steven Magee CEng MIET - Q
“There are no doubts that the Mauna Kea management teams knew that summit workers were suffering from the serious effects of oxygen starvation to the brain and body.” Steven Magee CEng MIET - Q
“It was with the benefit of hindsight that I realized the extensive behavioral issues that I had been documenting in high altitude workers was a known aspect of the biological toxicity of astronomical observatories.” Steven Magee CEng MIET - Q
“If you are going to go crazy, go inconveniently crazy.” Steven Magee CEng MIET - Q
“The only known way for a sea level adapted human to avoid lifelong high altitude induced disease is to not venture to high altitudes.” Steven Magee CEng MIET - Q
“Sleep disorders are a known occupational hazard for astronomers and their support staff.” Steven Magee CEng MIET - Q
“I was aware of many workers that were showing behavioral problems during my time in high altitude astronomy.” Steven Magee CEng MIET - Q
“With the benefit of hindsight, it was clear that astronomy management teams were lying through silence to their workers regarding the toxicity of their high altitude astronomical facilities.” Steven Magee CEng MIET - Q
“With the benefit of hindsight, I realized that astronomers had successfully avoided fully researching the harmful biological effects that their high altitude facilities were having on their workers health and safety.” Steven Magee CEng MIET - Q
“Since 1996 the W. M. Keck Observatory has been observing what happens to workers that spend their time in and around two massive Faraday cages.” Steven Magee CEng MIET - Q
“High altitude observatories are commonly constructed with few to no windows, meaning that their staff are typically natural light deprived during their work day.” Steven Magee CEng MIET - Q
“Every observatory summit office that I was based in had no windows in high altitude astronomy. My workdays were spent bathing in artificial florescent light.” Steven Magee CEng MIET - Q
“Health and safety is challenging in an environment where the workers are suffering from oxygen starvation, sleep deprivation and the side effects of company supplied drugs and gas.” Steven Magee CEng MIET - Q
“It is time to stop the abusive workplace practices of very high altitude astronomy.” Steven Magee CEng MIET - Q
“My message to the high altitude astronomy community is this: You need to start abiding by the laws and regulations of the government and stop the abuse and harassment of workers.” Steven Magee CEng MIET - Q
“High altitude astronomy is a sad story of a myriad of environmental toxins that should have been avoided by the unsuspecting sea level adapted workers.” Steven Magee CEng MIET - Q
“My dislike of the W. M. Keck Observatory, Columbia University and Dartmouth College is based on unpleasant experiences in their employment.” Steven Magee CEng MIET - Q

“When diagnosing my long term health problems, it was logical to inspect the environmental exposures that occurred at the workplaces where I saw the onset of each particular health issue.” Steven Magee CEng MIET - Q

"As a manager in high altitude astronomy, if you report to the upper management team that their staff appear sick and that they are displaying behavioral problems, it was my experience that they respond by notifying you that your contract will not be renewed and that you will be terminated without notice if anyone complains about you! High altitude astronomy is a very shady industry that only functions by ignoring worker health and safety issues." Steven Magee CEng MIET - Q

“If the astronomy management team becomes aware that you have developed long term high altitude sickness, then it is reasonable to think that you may be terminated soon.” Steven Magee CEng MIET - Q

“The USA is turning into a Nazi like country where sick people are treated like garbage.” Steven Magee CEng MIET - Q

“After a decade of mal-acclimatization, Steven Magee’s body will no longer acclimatize to any altitude.” Steven Magee CEng MIET - Q

“It has been my experience that the astronomical industry will not rehire past staff members whose health they know was damaged by their biologically toxic high altitude workplaces.” Steven Magee CEng MIET - Q

“I remember how excited I was to work for the Ivy League. By the time I left, I would not advise anyone to work for them.” Steven Magee CEng MIET - Q

“Out of all of my employers, the Ivy League was by far the worst.” Steven Magee CEng MIET - Q

“You have to be careful about damaging workers health because those damaged workers may publicly research your toxic workplace to discover what made them sick.” Steven Magee CEng MIET - Q

“All high altitude workers have a right to be fully informed about the complete range of environmental toxins that they are being exposed to and the known health issues in current and past workers, including what workers have died from.” Steven Magee CEng MIET - Q

“After a decade in high altitude astronomy, I had come to the conclusion that the primary purpose of the human resources department was to facilitate the company objectives at the expense of the employees.” Steven Magee CEng MIET - Q

“By the time I left high altitude astronomy I had formed the opinion that the human resources department was the shadiest.” Steven Magee CEng MIET - Q

“It should be standard practice in the medical profession to send a sickened very high altitude worker on a sleep study and put them onto high dose vitamin B12 injections for six months to see if they respond to it.” Steven Magee CEng MIET - Q

“The medical profession seem incompetent at diagnosing Low Level Radiation Sickness (LLRS).” Steven Magee CEng MIET - Q

“It was my experience that the medical profession could not correctly diagnose me. It fell onto me to discover the low level radiation sickness (LLRS), low blood oxygen levels during sleep, B12 deficiency, food intolerance, multiple chemical sensitivity(MCS), DHEA (Dehydroepiandrosterone) deficiency, bruxism and mercury poisoning.” Steven Magee CEng
"The more that I research very high altitude astronomy, the more I feel the need to advise sea level adapted people to avoid it for health and safety reasons.” Steven Magee CEng MIET - Q

“If a workplace makes you sick enough to self medicate on a daily basis, then you should aim to leave at the earliest opportunity to safeguard your long term health.” Steven Magee CEng MIET - Q

“There really needs to be a thorough review of current long term summit staff and past summit employees to characterize the long term health effects and fatalities that Mauna Kea Sickness (MKS) causes.” Steven Magee CEng MIET - Q

“Manua Kea’s summit astronomical facilities were run by incompetents for the benefit of incompetents.” Steven Magee CEng MIET - Q

“There is a lot of willful irresponsibility in professional astronomy.” Steven Magee CEng MIET - Q

“It is absolutely scandalous that the astronomical community are trying to build the world’s largest telescope atop the known biologically toxic very high altitude summit of Mauna Kea.” Steven Magee CEng MIET - Q

“High altitude astronomy is a very unprofessional profession.” Steven Magee CEng MIET - Q

"Never trust a high altitude astronomer." Steven Magee CEng MIET - Q

"the hashtag #WeAreMaunaKea…and the hashtag #ProtectMaunaKea have seen big jumps in use this week." http://www.bbc.com/news/blogs-trending-32239000

“If I were asked ‘Is it safe?’ by a person considering working atop the summit of Mauna Kea in Hawaii, my response would be ‘It is a biologically unsafe workplace for sea level adapted humans.’” Steven Magee CEng MIET - Q

“La Palma or Hawaii for the Thirty Meter Telescope (TMT)? Hawaii is far more hazardous for the health and safety of sea level adapted summit workers.” Steven Magee CEng MIET - Q

“The Thirty Meter Telescope (TMT) atop Mauna Kea will never meet this USA legal requirement: ‘Under federal law, you are entitled to a safe workplace. Your employer must provide a workplace free of known health and safety hazards.’” Steven Magee CEng MIET - Q


“Should the Thirty Meter Telescope Be Built?” http://pbshawaii.org/insights-on-pbs-hawaii-should-astronomy-related-development-on-mauna-kea-continue/

“To build the Thirty Meter Telescope (TMT) atop Mauna Kea requires a willful ignorance to Mauna Kea Sickness (MKS) by the many people involved with the project.” Steven Magee CEng MIET - Q

“When I saw how many people were objecting to the construction of the Thirty Meter Telescope atop Mauna Kea, I realized that there needed to be an open and honest discussion about the toxicity of the 13,796 feet very high altitude summit and the health and safety issues of astronomical observatories.” Steven Magee CEng MIET - Q

“The Thirty Meter Telescope (TMT) is just a small part of a very large problem.” Steven Magee CEng MIET - Q

“The Thirty Meter Telescope (TMT) atop Mauna Kea is highlighting the biological damage that corrupt governments and harmful corporations engage in with unsuspecting workers to progress the toxic Space industries.” Steven Magee CEng MIET - Q
“I expect that the 2019 attempt to construct the Thirty Meter Telescope (TMT) atop Mauna Kea will be remembered for desecration of the native Hawaiian’s beliefs, a commitment to damaging very high altitude workers health, and a continuation of the willful ignorance to the laws in the USA.” Steven Magee CEng MIET - Q

“The Thirty Meter Telescope (TMT) atop Mauna Kea will only get built if corrupt government officials blatantly ignore the fundamental health and safety issues of the very high altitude mountain and the biological toxicity of astronomical observatories.” Steven Magee CEng MIET - Q

“The next time you look at a wonderful astronomical picture taken from the summit of Mauna Kea, you must remember that workers health was damaged in order to obtain it.” Steven Magee CEng MIET - Q

"The electrical, electronics and wireless radio frequency (RF) industries are creating an increasingly high radiation environment for the human. This is comparable to the elevated radiation environment found at high altitudes and smart health researchers would be wise to contrast high altitude diseases to the epidemics of our time, such as Autism, Attention Deficit Disorder (ADD), Fibromyalgia, Electromagnetic Hypersensitivity (EHS), and so on." Steven Magee CEng MIET - Q http://www.emfscientist.org/index.php/emf-scientist-appeal

“At the age of 47, the medical profession had me on four RX-Only prescription drugs for lung and heart problems, an RX-Only prescription continuous positive airway pressure (CPAP) life support machine during sleep, two brain RX-Only prescriptions, a brain supplement, and high cholesterol medication. I am still in the process of being fully diagnosed by the medical profession and this drugs list may increase.” Steven Magee CEng MIET - Q

“Continuous positive airway pressure (CPAP) is a form of positive airway pressure ventilator, which applies mild air pressure on a continuous basis to keep the airways continuously open in people who are able to breathe spontaneously on their own.” https://en.wikipedia.org/wiki/Continuous_positive_airway_pressure

“I had observed similar problems in numerous poor performing high altitude workers that I supervised to the ill health that I displayed at age 48.” Steven Magee CEng MIET - Q

“At the age of 49, I had been in the X-Ray radiation computerized tomography (CT) scanner for two brain scans, one nasal scan, and four lung scans.” Steven Magee CEng MIET - Q

“After developing serious mental and physical health issues during and after a decade in high altitude astronomy, I decided to dedicate my mind and body to medical research for the biological science of High Altitude Observatory Disease (HAOD).” Steven Magee CEng MIET - Q

“As a manager in high altitude astronomy, I found poor performing employees to be a feature of remote observatories.” Steven Magee CEng MIET - Q

"I have worked with many of the greatest minds in astrophysics and it is now clear that they were the dunces of astrobiology.” Steven Magee CEng MIET - Q

“There is a lot of willful incompetence in high altitude astronomy that is in the process of coming to light.” Steven Magee CEng MIET - Q

“I will use science to shut down the toxic Thirty Meter Telescope (TMT) project atop Mauna Kea in Hawaii.” Steven Magee CEng MIET - Q

“Time's up for very high altitude astronomy.” Steven Magee CEng MIET - Q

“It is time to end the insanity that calls itself very high altitude astronomy.” Steven Magee CEng MIET - Q
“I'm just a sickened person that researches the toxicity of the many dubious things that I was exposed to.” Steven Magee CEng MIET - Q

“It really should not fall onto a sickened Mauna Kea Observatories (MKO) manager to research the biological toxicity of the very high altitude summit research facilities.” Steven Magee CEng MIET - Q

“I guess when it come to corporate government science interests, the inconvenience of worker sickness will be covered up.” Steven Magee CEng MIET - Q

“The biggest threat to the future of very high altitude manned astronomy is a full understanding of what Mauna Kea Sickness (MKS) really is.” Steven Magee CEng MIET - Q

“Mauna Kea Sickness (MKS) left me appearing alive on the outside and feeling dead on the inside.” Steven Magee CEng MIET - Q

“Mauna Kea Sickness (MKS) in the summit workers is the inconvenient truth of the Mauna Kea Observatories (MKO).” Steven Magee CEng MIET - Q

“When I worked in high altitude astronomy, I had no idea how dangerous the management teams were.” Steven Magee CEng MIET - Q

“I can assure you that after developing workplace mercury poisoning, the astronomy management team will not renew your contract.” Steven Magee CEng MIET - Q

“When I reflect on my time working for the W. M. Keck Observatory, Columbia University and Dartmouth College, my memories are not of brilliant minds advancing science, but rather of shady people damaging their workers health in order to obtain tainted astronomical data.” Steven Magee CEng MIET - Q

"The biggest surprise that I had during my time in high altitude astronomy was being prevented from arranging a free Occupational Safety & Health Administration (OSHA) onsite evaluation to assist with bringing the observatory into OSHA compliance by the upper management team that I reported to." Steven Magee CEng MIET - Q [https://www.osha.gov/]

“When the National Optical Astronomy Observatory (NOAO) found out that Occupational Safety and Health Administration (OSHA) were going to visit the site to assist in bringing it into legal compliance, they freaked out! They insisted that the visit had to be canceled and the result was that I eventually became so sick from the toxic workplace environment that I had no option but to leave.” Steven Magee CEng MIET - Q [https://en.wikipedia.org/wiki/National_Optical_Astronomy_Observatory]

“When sending your children to an Ivy League school, you must remember that some schools prevent Occupational Safety & Health Administration (OSHA) from visiting their training and research facilities.” Steven Magee CEng MIET - Q [https://en.wikipedia.org/wiki/Ivy_League]

“I advise people to avoid workplaces that prevent Occupational Safety & Health Administration (OSHA) visits.” Steven Magee CEng MIET - Q

“If you have arranged a free OSHA assistance visit to your facility and the management team insists on its cancellation, you are likely working in a known biologically toxic environment.” Steven Magee CEng MIET - Q

“During almost a decade in high altitude astronomy, I developed a strong dislike for the upper management teams through experience.” Steven Magee CEng MIET - Q

“Researching the toxicity of high altitude astronomy led me to the conclude that it is primarily driven by astronomical greed.” Steven Magee CEng MIET - Q

“In high altitude astronomy, it is time for the old guard to be replaced with new blood that fully understands the law, health and safety, and the full range of toxicity that astronomical
observatories present to their workers.” Steven Magee CEng MIET - Q

- “Be careful, as once you lose your health, it may be gone forever.” Steven Magee CEng MIET - Q
- “The general public should be outraged by how poorly the very high altitude astronomy industry treats their unsuspecting sea level adapted workers.” Steven Magee CEng MIET - Q
- “I can assure you that there is a very large group of people that are completely okay with damaging your health as long as they can obtain their precious data by doing so.” Steven Magee CEng MIET - Q
- “The biggest discoveries of the Mauna Kea Observatories (MKO) are not going to come from astronomy, they are going to come from understanding Mauna Kea Sickness (MKS) in the sea level adapted workers.” Steven Magee CEng MIET - Q
- “The modern human has two options: Understand and treat environmental illness, or live life in a sickened state and die prematurely from environmental disease.” Steven Magee CEng MIET - Q
- “Do not get mad, get science.” Steven Magee CEng MIET - Q
- “Smart people use real science to shut down bad science.” Steven Magee CEng MIET - Q
- “With the benefit of hindsight, I realized that there was a blatant disregard for worker health and safety by the astronomical management teams that I worked for in the USA.” Steven Magee CEng MIET - Q
- “Professors are typically in their own little worlds, doing their own thing and thinking that the laws do not apply to them.” Steven Magee CEng MIET - Q
- “The mad scientist has gone crazy for a reason, and that reason typically lies in biologically toxic environmental exposures.” Steven Magee CEng MIET - Q
- “I was severely under-informed about the known toxicity of the very high altitude Mauna Kea Observatories (MKO) and what working there does to long term health.” Steven Magee CEng MIET - Q
- “During my time in high altitude astronomy, I was never informed that I was working in an abnormal radiation environment for the sea level adapted human.” Steven Magee CEng MIET - Q
- “The more I research high altitude astronomy, the more troubling I find the long term detrimental biological effects are.” Steven Magee CEng MIET - Q
- “It is through sickening experiences that I concluded that high altitude astronomy is hazardous to sea level adapted workers.” Steven Magee CEng MIET - Q
- “After a decade in high altitude astronomy, I concluded that astronomical observatories atop remote mountains are biologically harmful to sea level adapted humans.” Steven Magee CEng MIET - Q
- “Damage my health and I will hunt you down with science.” Steven Magee CEng MIET - Q
- “I always suspected that improvements in health would come from researching the biological toxicity of high altitude to the sea level adapted human.” Steven Magee CEng MIET - Q
- “As a manager in professional astronomy, I was keeping daily records on the abnormal behavioral problems in the staff. When the senior management team became aware of the records, they instructed me to destroy them.” Steven Magee CEng MIET - Q
- “The time has arrived for governments to start locking up very high altitude astronomy managers that have willfully damaged their sea level adapted civilian workers health in order to obtain tainted astronomical data.” Steven Magee CEng MIET - Q

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“If we do not see any high altitude astronomy managers go to jail for willfully damaging their workers health, it will confirm that the corporate government systems of health and safety are blatantly fraudulent.” Steven Magee CEng MIET - Q

“I expect a lack of willing very high altitude workers that are prepared to sacrifice their long term health will eventually shut down manned astronomy on the summit of Mauna Kea.” Steven Magee CEng MIET - Q

“We are approaching a time where the masses will become wise and stop supporting the toxic pursuit of knowledge of Space and instead demand the closure of these biologically harmful industries.” Steven Magee CEng MIET - Q

“The professional astronomy cover-up of their sickened high altitude observatory workers needs to stop, as it is an illegal activity under USA law.” Steven Magee CEng MIET - Q

“It is important that the public knows the full story about what is occurring on the very high altitude summit of Mauna Kea in Hawaii.” Steven Magee CEng MIET - Q

“Given that I have traced the primary cause of my disabling sickness to the toxic environment of high altitude astronomical research facilities, I am now expecting those that willfully damaged my health to go to jail.” Steven Magee CEng MIET - Q

“If the laws are applied correctly, we may see some of the biggest names in astronomy go to jail.” Steven Magee CEng MIET - Q

“When I reflect on how astronomy management teams collectively damaged my health, I concluded that they were able to do so because the corporate government facilitated it.” Steven Magee CEng MIET - Q

“It is clear that the protective functions of workplace health and safety have transferred to the workers through the process of corporate government deregulation and reduced funding of relevant government departments.” Steven Magee CEng MIET - Q

“Occupational Safety & Health Administration (OSHA) is largely an interrogation agency for whistle-blowers that extracts their full range of knowledge without upholding their legal rights.” Steven Magee CEng MIET - Q

“Occupational Safety & Health Administration (OSHA) is rigged to allow your employer to willfully damage your health and disability is rigged to deny you your earned benefits when you have become too sick to work because your toxic employer damaged your health.” Steven Magee CEng MIET - Q

“During its more than 40 years of existence, OSHA has secured only 12 criminal convictions” https://en.wikipedia.org/wiki/Occupational_Safety_and_Health_Administration

“Occupational Safety & Health Administration's (OSHA) lack of law enforcement has made the USA a dangerous place to work.” Steven Magee CEng MIET - Q

“In the area of worker health and safety, the USA is like a third world country.” Steven Magee CEng MIET - Q

"I have no faith in the corporate USA government systems of protection of public health and safety." Steven Magee CEng MIET - Q

"Most people have no idea that OSHA is a ghost and has been so for years"

Devra Davis – Author of the Secret History of the War on Cancer