

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 who fully understands the [energy](#) in their own daily environment. Until that 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 \(IET\)](#)

Social Media

“GAME of Thrones star Jason Momoa has joined Nicole Scherzinger, Zoe Kravitz, Ian Somerhalder and other stars in a new social media campaign protesting against a construction project on Hawaii’s big island.” <http://www.news.com.au/entertainment/celebrity-life/celebrity-selfies/game-of-thrones-star-jason-joins-we-are-mauna-kea-campaign-to-protest-new-telescope/news-story/5455acb3bd9fd5600061f323f87f5847>

“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>

Facebook

- Environmental Radiation LLC: <https://www.facebook.com/EnvironmentEMR/>
- Protect Mauna Kea: <https://www.facebook.com/protectmaunakea/>
- We Are Mauna Kea: <https://www.facebook.com/groups/393211327547061/>

Twitter

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

Instagram

- Dustin Barca: <https://www.instagram.com/barcalive/>
- Dwayne "The Rock" Johnson: <https://www.instagram.com/dwaynej0hnson/>
- Environmental Radiation LLC: https://www.instagram.com/environmental_radiation_llc/
- Ian Somerhalder: <https://www.instagram.com/iansomerhalder/>
- Jason Momoa: <https://www.instagram.com/prideofgypsies/>
- Jill Wagner: <https://www.instagram.com/jillwagner/>
- Kelly Slater: <https://www.instagram.com/kellyslater/>
- 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/>

Petition

- “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.”
<http://www.staradvertiser.com/2015/04/20/breaking-news/mauna-kea-telescope-petition-delivered-with-53000-signatures/>
- “Stop TMT Construction and Arrests of Mauna Kea Protectors”
<https://www.change.org/p/governor-david-y-ige-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")
- #WeAreMaunakea

Interesting Quotes & Internet Links

Latest News

- "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" <http://hawaiitribune-herald.com/news/local-news/mental-exam-ordered-alleged-telescope-attacker>
- "40% less oxygen and high radiation levels can do strange things to sea level adapted humans." Steven Magee CEng MIET
- “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
- “High altitude makes you stupid.” <http://www.pbs.org/newshour/updates/reporters-notebook/>
- “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
- "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/>
- "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

- "...incidents claimed the lives of four workers during the construction of the telescope" https://en.wikipedia.org/wiki/Subaru_Telescope
- "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/>
- "astronomer...crushed to death between a door and a 150-ton revolving telescope dome" <http://www.nytimes.com/1987/05/02/us/marc-a-aaronson-astronomer-killed-by-revolving-dome.html>

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/>
- "Mauna Kea – Temple Under Siege." <http://oiwi.tv/oiwivt/mauna-kea-temple-under-siege/>
- "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-hawaiiis-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 Kanahale, 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-hawaiiis-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.[37][38] For this reason, a kapu (ancient Hawaiian law) restricted visitor rights to high-ranking ali‘i. 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. Poli‘ahu, deity of snow, also resides there.[34] In Hawaiian, Mauna Kea is a shortened form of Mauna a Wakea which denotes the mountain's connection to the sky father Wakea,[39] however, the English translation of Mauna Kea is "white mountain" in reference to its seasonally snow-capped summit.[40]” https://en.wikipedia.org/wiki/Mauna_Kea
- “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.” https://en.wikipedia.org/wiki/Culture_of_the_Native_Hawaiians
- “I have great respect for Hawaiians and their unique culture.” Steven Magee CEng MIET
- “I came to the belief that Mauna Kea was indeed sacred because all the visions that I had on the mountain were of Hawaiians.” Steven Magee CEng MIET

Altitude Hazards

- “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 Hawai‘i. 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." https://en.wikivoyage.org/wiki/Altitude_sickness
- "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." https://en.wikipedia.org/wiki/Altitude_sickness
- "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, and various brain issues including amnesia 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
- "someone who races up to an elevation of 15,000 feet will be worse for the wear" <http://adventure.howstuffworks.com/outdoor-activities/climbing/altitude-sickness5.htm>
- "A slow ascent with ample time for acclimatization do not safeguard against illness" <https://www.thetech.org/exhibits/online/everest/about/physiology.htm>
- "Pulmonary Hypertension...Mountain climbers all develop the condition" <http://www.mountsinai.org/patient-care/health-library/diseases-and-conditions/pulmonary-hypertension>
- "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/>
- "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."

<http://www.ncbi.nlm.nih.gov/pubmed/3379209>

- "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."
<http://emedicine.medscape.com/article/901668-overview>
- "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
- "Relationship of Hypoxia to Arrhythmia and Cardiac Conduction Hemorrhage"
<http://circ.ahajournals.org/content/circulationaha/27/4/742.full.pdf>
- "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." <https://www.ncbi.nlm.nih.gov/pubmed/23648165>
- "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>
- "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](http://www.amjmed.com/article/S0002-9343(05)00674-1/fulltext)
- "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
- "Causes of Low Blood Oxygen Levels" <https://www.livestrong.com/article/112012-causes-low-blood-oxygen-levels/>
- "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
- "It was clear to me that upper management and astronomers were adverse to going to very high altitude observatories." Steven Magee CEng MIET
- "The engineering mountain managers went to the summit of Mauna Kea two to three days per week, whereas the technicians went there four days per week. It was apparent to me that the technicians were sicker than the engineers." Steven Magee CEng MIET
- "The longer I worked in high altitude astronomy, the sicker I became." Steven Magee CEng MIET

- “Effects of High Altitude on Sleep and Respiratory System and Theirs 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 carbondioxide 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/>
- “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.” https://en.wikipedia.org/wiki/Decompression_sickness
- “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.”

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

- “Empty plastic water bottles at 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.” Steven Magee CEng MIET
- “Bags of chips (crisps) when taken to the very high altitude summit of Mauna Kea would commonly explode.” Steven Magee CEng MIET
- “It is well know 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.” Steven Magee CEng MIET
- “Having researched the biological toxicity of high altitudes, I would not take any sea level adapted human above 10,000 feet under any circumstances.” Steven Magee CEng MIET

High Altitude Disease Disability Codes

- “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>
- “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; adenotonsillar 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>
- “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”

<http://www.icd9data.com/2011/Volume1/800-999/990-995/993/993.2.htm>

- “ 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>

Other High Altitude Activities

- Pilots
 - “Ask an Airline Pilot: Why Do I Feel So Worn Out After a Flight?”
<https://jethead.wordpress.com/2012/09/19/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.”
<https://www.health24.com/Medical/Sports-injuries/About-sports-injuries/The-dangers-of-skydiving-20130225>
 - “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.”
<http://www.hawaiiistar.com/2002/12/skydiving-accident-kills-visitor-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
- “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
- “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>
- 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.” <https://www.nationalgeographic.com/adventure/features/why-are-so-many-base-jumpers-dying/>
- Skiers
 - “Is Skiing Harmful To Health?” <http://www.environmentalradiation.com/Is%20Skiing%20Harmful%20To%20Health.pdf>
- 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.”
<https://www.auntminnieeurope.com/index.aspx?sec=log&itemID=607424>
 - “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.”

<https://www.sciencealert.com/mountain-climbing-madness-high-altitude-psychosis>

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.”
https://en.wikipedia.org/wiki/List_of_highest_astronomical_observatories#History_of_high_altitude_astronomical_observatories
- “Very high altitude workers that have sea level adapted genetics are radiation workers.” Steven Magee CEng MIET
- "A few years after working on Mauna Kea, I discovered that I had radiation sickness." Steven Magee CEng MIET <http://amzn.com/1500896241>
- “The closer that you get to the Sun, the higher the levels of radiation become.” Steven Magee CEng MIET
- “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
- "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."
https://en.wikipedia.org/wiki/Ionizing_radiation
- “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
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.” <http://newsroom.heart.org/news/healthcare-workers-radiation-exposure-tied-to-range-of-health-problems>
- “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.”
<https://www.sciencedaily.com/releases/2009/10/091022202710.htm>
- “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.” <https://www.ncbi.nlm.nih.gov/pubmed/10360794>
- “At the age of 46 I was placed onto cholesterol lowering RX-Only prescription medication.”
Steven Magee CEng MIET
- “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
- “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.”
<http://www.popularmechanics.com/flight/a25086/radiation-clouds-in-upper-atmosphere/>
- “Earth's Atmospheric Layers”
https://www.nasa.gov/mission_pages/sunearth/science/atmosphere-layers2.html
- “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 from those of 54Mn and 124Sb.” <http://journals.lww.com/health-physics/pages/articleviewer.aspx?year=1968&issue=07000&article=00005&type=abstract>

- “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
- “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.”
https://en.wikipedia.org/wiki/Energy_Employees_Occupational_Illness_Compensation_Program
- “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.”
https://en.wikipedia.org/wiki/Nuclear_weapons_of_the_United_States#Occupational_illness
- “Adverse radiation exposures are cumulative and the longer you receive them, the more likely it is to make you sick.” Steven Magee CEng MIET
- “Sea level adapted humans are radiation workers when working at very high altitudes.” Steven Magee CEng MIET
- “The very high altitude summit of Mauna Kea is a bad place to be during a solar radiation storm.” Steven Magee CEng MIET

Ultraviolet (UV) Radiation Hazards

- "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

Oxygen Starvation Hazards

- "Decreasing Blood Oxygen At Altitude" <http://environmentalradiation.com/Steven%20Magee%20Decreasing%20Blood%20O2%20At%20Altitude.pdf>
- "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
- "What Happens After A Lack of Oxygen to the Brain?" <http://www.spinalcord.com/blog/what-happens-after-a-lack-of-oxygen-to-the-brain>
- "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>
- "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>
- "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/
- "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>
- "At altitude above 10,000 ft, a person may fail to adjust to the low level of oxygen" <http://www.amperordirect.com/pc/help-pulse-oximeter/z-interpreting-results.html>
- "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." <http://www.avweb.com/news/aeromed/181893-1.html>
- "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
- "Everyone on Mauna Kea should have a Pulse Oximeter" Steven Magee CEng MIET <http://amzn.com/B00B8L8ZXE>
- "Low Brain Oxygen Ups Alzheimer's Risk" <http://www.webmd.com/mental-health/news/20061120/alzheimers-risk-upped-by-low-brain-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
- "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 August 1993.” https://en.wikipedia.org/wiki/Biosphere_2
- “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.” <http://mentalfloss.com/article/81553/how-living-inside-biosphere-2-changed-these-scientists-lives>
- “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
- “High altitude workers should be screened annually for Sleep Apnea.” Steven Magee CEng MIET
- “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/>
- “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>
- "The Low Blood Oxygen Graph of a Very High Altitude Mauna Kea Worker" Steven Magee CEng MIET http://www.environmentalradiation.com/Steven_Magee_Low_SPO2_Graph.pdf
 - "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
 - "excessive or inappropriate supplemental oxygen can be deleterious" <http://www.uptodate.com/contents/oxygen-toxicity>
 - "Yup, pretty much how it works" W. M. Keck Observatory <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>
 - "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/>
 - "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
 - "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
 - "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
 - "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>

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
- “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.”
https://www.petmd.com/dog/conditions/cardiovascular/c_multi_hypoxemia?page=show
- “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 equatorial 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.”
<https://www.ncbi.nlm.nih.gov/pubmed/8162366>
- “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/>
- “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.”
<http://www.sciencemag.org/news/2016/10/two-weeks-mountains-can-change-your-blood-months>
- “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.”

<https://academic.oup.com/aje/article/173/7/768/102633>

- “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>

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. Vitamin B12 & iron absorption problems are currently being diagnosed and may involve the stomach, intestines & liver.” Steven Magee CEng MIET
- “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 reinstated 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”
https://en.wikipedia.org/wiki/Reperfusion_injury

- “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).”
<https://en.wikipedia.org/wiki/Ischemia->

reperfusion_injury_of_the_appendicular_musculoskeletal_system

- “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.” <https://en.wikipedia.org/wiki/Ischemia>
- “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 damageIn 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.” https://en.wikipedia.org/wiki/Reactive_oxygen_species

- “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>

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 $3.2\pm 5.4\%$ ($p<0.01$). 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 $4.5\pm 4.1\%$ and $22.4\pm 21.9\%$ respectively, during the Himalayan expedition. Concerning the nutritional state, $4.5\pm 4.0\%$ decrease of body weight was observed, but the serum cholesterol was increased of $12.6\pm 14.8\%$, 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.” <https://www.ncbi.nlm.nih.gov/pubmed/21992062>
- “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.” <https://www.physiology.org/doi/abs/10.1152/ajplegacy.1965.209.2.347>

Joint Hazards

- “Altitude Sickness & Joint Aches... Altitude decompression sickness causes achy joints and pain among other symptoms.” <https://www.livestrong.com/article/552091-altitude-sickness-joint-aches/>
- “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-weather-impacts-knee-pain/>

Vitamin and Mineral Hazards

- “There were no recommendations given to us about vitamin & mineral requirements when at high altitude by the high altitude astronomy management teams.” 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>

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
<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_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>
 - "Altitude sickness, unregulated drugs and medical gas enabled workers to become drug abusers/addicts" Steven Magee CEng MIET <http://www.keckobservatory.org/>
 - "Over-the-counter drug abuse or addiction was a problem that I observed at Mauna Kea" Steven Magee CEng MIET <http://www.crchealth.com/addiction/otc-drug-abuse/>
 - "During my five years on Mauna Kea, workers routinely displayed the symptoms of Cerebral Hypoxia" Steven Magee CEng MIET <http://www.nytimes.com/health/guides/disease/cerebral-hypoxia/overview.html>
 - “Oxygen deprivation and supplemental oxygen are both bio-hazards for Mauna Kea workers” 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
 - “I moved from the day shift to the extreme night shift because I knew that they had a much 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

Altitude Case Studies

- "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

- “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."”
<http://www.rollingstone.com/culture/news/las-vegas-shooter-stephen-paddock-what-we-know-so-far-w506562>
- “A person who avoids sunlight may eventually develop solar radiation deficiency sickness.” Steven Magee CEng MIET
- “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
- “Pilots have an established history of committing mass murder during their suicides.” Steven Magee CEng MIET
- “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
- “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://westhawaii.com/news/local-news/mental-exam-ordered-alleged-telescope-attacker>

- "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 amnesiac 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 Amnesiac 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

Dementia

- "The amnesiac 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 amnesiac 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/Amnesiac-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>

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>
- "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

- “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 THRB, which are known to play a role in HIF genetic functions.”https://en.wikipedia.org/wiki/Organisms_at_high_altitude
- “Human Genetic Adaptation to High Altitude.”
<http://online.liebertpub.com/doi/abs/10.1089/152702901750265341>
- “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.”
https://www.upi.com/Science_News/2017/10/25/Early-results-from-NASAs-Twins-Study-Space-encourages-gene-expression/1791508934803/
- “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.” <https://www.mnn.com/earth-matters/space/blogs/nasa-twin-study-space-travel-changes-human-DNA>
- “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.” <http://www.newsweek.com/scott-kelly-astronauts-nasa-dna-838535>
- “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.”
<https://health.ucsd.edu/news/releases/Pages/2013-08-15-genetic-adaptation-high-altitude->

[sickness.aspx](#)

- “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.” https://www2.palomar.edu/anthro/adapt/adapt_3.htm
- “Genetic adaptation processes may be triggered in sea level adapted humans that spend prolonged time at high altitudes.” Steven Magee CEng MIET
- “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 adaptation 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.” Steven Magee CEng MIET
- “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

Workers Changing Gender

- “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
- “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
- “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 thought 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
- “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/>

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>
- “Light, Radiation, and You: How to Stay Healthy by John Nash Ott” <http://a.co/fpMoOaj>
- “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>
- “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>

Computer Toxicity

- “Astronomy was field in which computers where extensively used and in some cases, multiple computers with several screens.” Steven Magee CEng MIET
- “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
- “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/>
- “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/>
- “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->

Triggering Of The Human Mating Cycle

- "Astronomers Are Finally Doing Something About Sexual Harassment"
<http://www.theatlantic.com/science/archive/2016/01/gender-discrimination-astronomy/422817/>
- "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
- "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. Sexsomnia 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
- "My research is indicating that sleep deprivation and unnatural electromagnetic radiation exposures can trigger the human mating cycle." Steven Magee CEng MIET

Social Isolation Hazards

- “High altitude observatories are commonly on remote mountain tops that isolate workers from society.” Steven Magee CEng MIET
- “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
- “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
- “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.” http://cotavic.org.au/wp-content/uploads/2014/02/Working-Paper_Social-Isolation.pdf
- “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.”
<http://www.bbc.com/future/story/20140514-how-extreme-isolation-warps-minds>
- “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/social-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>
- “After I started working extreme night shifts, I started 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

Island Hazards

- “It is common in high altitude astronomy to find astronomical observatories located on sparsely populated remote volcanic islands.” Steven Magee CEng MIET
- “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 'PM_{2.5}'. These particles are smaller than the width of a human hair. PM_{2.5} in vog is mainly composed of acid and neutral sulfate particles. Other sources of PM_{2.5} 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.ivhnh.org/vog/what-vog>
- "The Wrath of Vog...It comes on the Kona winds—the dreaded yellow-brown haze of vog that 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?" <http://www.honolulumagazine.com/Honolulu-Magazine/August-2009/The-Wrath-of-Vog/index.php?cparticle=1&siarticle=0#artanc>
- "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>
- "Hawaii: Year-Long Allergy Season Due to 'Vog'" <https://www.accuweather.com/en/weather-news/hawaii-yearlong-allergy-season/24904351>
- "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

Invisible Friend

- “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

Fatigue Hazards

- “Daily fatigue was a problem for many very high altitude workers.” Steven Magee CEng MIET
- “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://coderedssafety.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.” <https://www.healthandsafetyhandbook.com.au/dangers-of-worker-fatigue-7-warning-signs/>

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
- “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
- 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
- “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.”
<https://www.beyondblue.org.au/the-facts/depression/what-causes-depression>
- “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>

Drinking Water Hazards

- “It was common to drink from plastic bottles and cans in high altitude astronomy.” Steven Magee CEng MIET
- “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-plastic-water-bottles/>

- “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”
<https://www.usatoday.com/story/news/nation/2014/12/14/bottle-chemical-bpa-health-newser/20397547/>
- “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."” <https://www.usatoday.com/story/news/nation-now/2018/03/15/does-bottled-water-you-paid-3-contain-tiny-particles-plastic-study-says-yes/427210002/>
- “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.”
<https://www.ncbi.nlm.nih.gov/pubmed/16690193>
- “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
- “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
- “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." <https://www.livestrong.com/article/485761-negative-effects-of-gatorade/>

- "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." <https://www.livestrong.com/article/395825-the-risks-of-drinking-too-many-electrolyte-replacement-drinks/>
- "Negative Effects of Drinking Too Many Electrolytes...Hypernatremia...Hyperkalemia...Hypercalcemia...too much magnesium" <https://www.livestrong.com/article/507396-negative-effects-of-drinking-too-many-electrolytes/>
- "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." <https://draxe.com/electrolyte-imbalance/>
- "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)" <https://www.drugs.com/sfx/electrolyte-side-effects.html>
- "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." <http://heatherdane.com/the-little-known-reasons-behind-sleep-disorders-like-restless-legs-and-sleep-apnea/>
- "How can high Altitude Systemic Edema be prevented?...Avoiding salt may help." <https://quizlet.com/33077235/mountain-warfare-high-altitude-illness-prevention-flash-cards/>
- "We were advised to drink plenty of fluids during our very high altitude summit work days to offset altitude sickness." Steven Magee CEng MIET
- "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)." https://en.wikipedia.org/wiki/Water_intoxication

Kidney Hazards

- “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>
- “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>
- “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, erythropoetin, 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>
- “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.”
https://academic.oup.com/ndt/article/27/suppl_4/iv11/1881772
- “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>

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/>
- “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
- “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

Mercury Hazards

- “Mercury was in use in high altitude astronomy.” Steven Magee CEng MIET
- “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.”
[https://en.wikipedia.org/wiki/Mercury_\(element\)#Toxicity_and_safety](https://en.wikipedia.org/wiki/Mercury_(element)#Toxicity_and_safety)
- “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 acrodynia (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.”
https://en.wikipedia.org/wiki/Mercury_poisoning
- “There were numerous large glass bottles of mercury stored at high altitude astronomical facilities and it was used in the telescope mirror support systems.” Steven Magee CEng MIET

Oxygen Hazards

- "Levels of Oxygen Deficiency - Concentration of Oxygen Effects"
<http://www.bodydesigncenter.com/oxygen-service/oxygen-deficiency>
- "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>
- "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/>
- "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>
- "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>
- "At 3:31 in the first video you can clearly see four people in the video wearing what appear to be portable oxygen units and nasal cannula's on the 13,796 feet very high altitude summit of Mauna Kea." Steven Magee CEng MIET
<http://www.bigislandvideonews.com/2016/01/21/video-kamaaina-observatory-experience-visits-mauna-kea/>
- "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>
- "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>
- "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/>
- "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/>

- "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>
- "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>
- "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
- "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
- "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
- "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
- "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
- "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." http://www.uigi.com/MSDS_gaseous_O2.html
- "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." <https://www.ncbi.nlm.nih.gov/pubmed/8087571>
- "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.” <http://medind.nic.in/jac/t03/i3/jact03i3p234.pdf>

- “Though oxygen therapy is helpful in many disorders, its injudicious use may lead to toxic effects usually involving the CNS, the lungs and the eyes.” <http://medind.nic.in/jac/t03/i3/jact03i3p234.pdf>
- “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, absorptive atelectasis and carbon dioxide narcosis.” <http://www.emsworld.com/article/10523286/oxygen-toxicity>
- “What Are the Side Effects of Oxygen Therapy?” <http://www.livestrong.com/article/234287-what-are-the-side-effects-of-oxygen-therapy/>
- “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
- “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 high altitude 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
- “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 <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
 - “I never met anyone in high altitude astronomy that had a prescription for daily medical oxygen use.” Steven Magee CEng MIET
 - “Workers were using medical oxygen to treat numerous health conditions that included fatigue, confusion, headaches, feeling faint and digestive issues.” Steven Magee CEng MIET
 - “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 <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
- “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
- “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

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
- “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>
- “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>
- “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>

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
- “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.”
http://www.keckobservatory.org/recent/entry/a_mirrors_perfect_reflection
- “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.”
https://en.wikipedia.org/wiki/Carbon_dioxide#Below_1.25
- “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.”
<http://discovermagazine.com/2010/oct/20-life-under-the-bubble>
- “Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.” http://www.uigi.com/MSDS_liquid_CO2.html
- “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.”
<http://www.centralwelding.com/MSDS-P/Carbon%20Dioxide.pdf>

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
- “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
- “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
- “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
- “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
- “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
- “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.” <http://www.boconline.co.uk/en/sheq/gas-safety/gas-risks/cryogenic-gas-risks/cryogenic-gas-risks.html>

- “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.” https://en.wikipedia.org/wiki/Inert_gas_asphyxiation
- “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.” http://archive.rubicon-foundation.org/xmlui/bitstream/handle/123456789/6041/SPUMS_V27N1_13.pdf?sequence=1
- “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.” <http://www.airproducts.com/~media/files/pdf/company/safetygram-17.pdf>
- “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
- “Euphoric: Psychology. in a state of happy and confident well-being sometimes exaggerated in pathological states as mania.” <http://www.dictionary.com/browse/euphoric>
- “Giddy: 1. affected with vertigo; dizzy. 2. attended with or causing dizziness: a giddy climb. 3. frivolous and lighthearted; impulsive; flighty.” <http://www.dictionary.com/browse/giddy?s=t>
- “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.” <https://www.abclawcenters.com/frequently-asked-questions/what-are-long-term-effects-of-hie/>
- “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.”

<http://www.spinalcord.com/blog/what-happens-after-a-lack-of-oxygen-to-the-brain>

- “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.”
<https://www.dementia.org/oxygen-deprivation-dementia>
- “The Dangers of Industrial Gas Abuse” <http://www.essencia.be/en/Document/Download/15360>
- “5 Most Common OSHA Violations” <http://safetyculture.blr.com/safety-culture-5-most-common-osh-a-violations-infographic/>
- “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.”
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=12716&p_table=STANDARDS
- “Employee exposure means exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.”
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=12716&p_table=STANDARDS
- “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.”
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=12716&p_table=STANDARDS
- “Oxygen deficient atmosphere means an atmosphere with an oxygen content below 19.5% by volume.” https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=12716&p_table=STANDARDS
- “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.” <https://www.pureairemonitoring.com/all-categoriesgas-monitorsair-check-o2-oxygen-deficiency-monitor-for-co2-n2-storage-areas/>
- “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 <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 a industry recognized training course in the safe handling and use of them.” Steven Magee CEng MIET
- “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
- “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 on Mauna Kea” Steven Magee CEng MIET
- “We never used any form of respiratory protection when working with solvents at very high altitude on Mauna Kea.” Steven Magee CEng MIET
- “Inhalation of solvents in a 40% oxygen deficient atmosphere at very high altitudes is probably not a good idea.” Steven Magee CEng MIET

Industrial Gas Use In Chemical Weapons

- “Chemical warfare (CW) involves using the toxic properties of chemical substances as weapons.” https://en.wikipedia.org/wiki/Chemical_warfare
- “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
- “Nitrogen oxide” https://en.wikipedia.org/wiki/Nitrogen_oxide
- “Nitrogen mustard” https://en.wikipedia.org/wiki/Nitrogen_mustard
- “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](#)

- “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/>
- “How much nitrogen gas can the human body handle before nitrogen asphyxiation occurs? For an inert gas, nitrogen can be surprisingly dangerous if not handled properly. It's the kind of thing best left to professionals.” <https://www.quora.com/How-much-nitrogen-gas-can-the-human-body-handle-before-nitrogen-asphyxiation-occurs>

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
- “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.”
<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?”
<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.”
<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.”
<http://www.taylorandtaylorconsultants.com/index.php/services/compressed-cryogenic-gas-safety-training.html>

Professions That Breath Gas

- Actors
 - “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/Voices-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/>
- 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/>
- 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/>
- 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>
- 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/>

- 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.”
https://www.dri.edu/images/stories/editors/ehs/ehsdocs/Lab_Safety_DRI_Physical_Hazards_Feb_2009_r1.pdf
- 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/>
 - “CO₂ A Silent Killer...a restaurant employee was found unconscious at the top of a stairwell that leads to the basement storage area. A Firefighter and an Engineer went into the basement to see if the patient had tripped or slipped on something. After entering the basement both men became lightheaded and exited the basement. Upon exiting the basement, the Engineer fell and both members reported dizziness and a bitter taste in their mouths.” http://www.achd.net/food/pubs/pdf/2013_CO2_A_Silent_Killer.pdf
- Sewer Workers
 - “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/>

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.”
<https://academic.oup.com/bja/article/99/6/812/247337>
- “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
- “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>
- “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.”
<http://www.b12deficiency.info/b12-the-antidote/>
- “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/>
- “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
- “Abnormally irradiated air may eventually be proven to present long term toxicity to the sea level adapted human.” Steven Magee CEng MIET
- “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

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.”
<http://www.pharmacytimes.com/publications/issue/2013/december2013/vitamin-b12-deficiency-serious-consequences>
- “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 serotonergic 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>
- “Vitamin B12 deficiency can be sneaky, harmful...a severe vitamin B12 deficiency can lead to deep depression, paranoia and delusions, memory loss, incontinence, loss of taste and smell, and more.” <https://www.health.harvard.edu/blog/vitamin-b12-deficiency-can-be-sneaky-harmful-201301105780>
- “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.”
- “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” <https://www.easy-immune-health.com/vitamin-b-12-deficiency-symptoms.html>
- “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.” <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2532799/>

- “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.” <https://campise-chiropractor-fresno.com/could-it-be-b12/>
- “What Is Pernicious Anemia?... Without enough vitamin B12, your red blood cells don't divide normally and are too large. They may have trouble getting out of the bone marrow—a sponge-like tissue inside the bones where blood cells are made. Without enough red blood cells to carry oxygen to your body, you may feel tired and weak. Severe or long-lasting pernicious anemia can damage the heart, brain, and other organs in the body. Pernicious anemia also can cause other problems, such as nerve damage, neurological problems (such as memory loss), and digestive tract problems. People who have pernicious anemia also may be at higher risk for weakened bone strength and stomach cancer... The term “pernicious” means “deadly.” The condition is called pernicious anemia because it often was fatal in the past, before vitamin B12 treatments were available.” <https://www.nhlbi.nih.gov/health/health-topics/topics/prnania/>
- “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.” <https://www.livestrong.com/article/301431-sublingual-vitamin-b12-for-pernicious-anemia/>
- “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,² and 135-650 pmol/L in Australia.³ 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.” <https://www.mthfrsupport.com.au/vitamin-b12-reference-range-level-set-low/>
- “Routine evaluation of serum vitamin B12 after radiotherapy is recommended so that appropriate medication can be given, if possible before neurological symptoms appear.” <https://www.ncbi.nlm.nih.gov/pubmed/6708220>
- “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.” <https://www.jostrust.org.uk/node/11102>
- “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.” www.sciencedirect.com/science/article/pii/S1018364710000984

- “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.” <https://articles.mercola.com/sites/articles/archive/2009/09/15/common-hidden-cause-of-low-energy-brain-fog-and-blindness.aspx>
- “Seven Stages of Vitamin B12 Deficiency” <http://b12patch.com/blog/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.” <http://b12patch.com/blog/pernicious-anemia-and-b12-deficiency-historically-fatal-still-formidable/>
- “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. ” <https://online.epocrates.com/diseases/82251/Vitamin-B12-deficiency/Prognosis>
- “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!” <https://www.easy-immune-health.com/vitamin-b12-deficiency-treatment.html>
- “Vitamin B12 deficiency was reported to be the cause of seizures for adults and for infants.” https://en.wikipedia.org/wiki/Causes_of_seizures
- “I was diagnosed with seizures at age of forty five.” Steven Magee CEng MIET
- “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).” https://en.wikipedia.org/wiki/Absence_seizure
- “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
- “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
- “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
- “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
- “I had noticed the onset of sickness that was consistent with sleep disorders and B12 deficiency during working extreme night shifts at very high altitude atop Mauna Kea in Hawaii.” Steven

Magee CEng MIET

- “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

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 line 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/wiki/Pierre_Curie
- “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.” https://en.wikipedia.org/wiki/Ir%C3%A8ne_Joliot-Curie
- “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.”

<https://en.wikipedia.org/wiki/Leukemia>

- “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” <https://www.thefamouspeople.com/profiles/frdric-joliot-curie-7311.php>
- “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.” [https://www.biography.com/people/henri-becquerel-40055?_escaped_fragment_ =](https://www.biography.com/people/henri-becquerel-40055?_escaped_fragment_=)
- “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” https://en.wikipedia.org/wiki/Enrico_Fermi
- “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
- “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.” https://en.wikipedia.org/wiki/Coronary_thrombosis

- “A meta-analysis of eight randomized trials found a 62% increase in cardiac deaths among women who were treated with radiation therapy [10]. Even at lower radiation doses, there appears to be of excess risk of cardiovascular disease as shown in the Japanese atomic bomb survivors [11]...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.” <https://www.hindawi.com/journals/crp/2011/317659/>
- “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.” <http://listverse.com/2014/09/26/10-uncomfortable-truths-about-nikola-tesla/>
- “Guglielmo Marconi, 1st Marquis of Marconi (/ma:ˈr kooni/;[1] Italian: [ɡuʎˈʎɛlmo marˈkoːni]; 25 April 1874 – 20 July 1937) was an Italian[2][3][4][5] inventor and electrical engineer known for his pioneering work on long-distance radio transmission[6] 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.” https://en.wikipedia.org/wiki/Guglielmo_Marconi
- 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

Fall Hazards

- “I ventured up onto the domes of the worlds 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 getting a feeling of 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
<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>
- “Training Requirements in OSHA Standards” <https://www.osha.gov/Publications/osha2254.pdf>

Extreme Night Shift Hazards

- "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
- "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>
- "Shift Work, Light-at-Night and Melatonin" <http://www.breastcancerfund.org/clear-science/radiation-chemicals-and-breast-cancer/light-at-night-and-melatonin.html>
- “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 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/night-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/w3csw8g7>

- “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.canmybossothat.com/category.php?id=169>
- “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>
- “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
- “Do you know the signs of shift work disorder?” <http://scrubsmag.com/shift-work-disorder/view-all/>
- “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>
- “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>
- “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
- “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>

- “Sleep Disorders – ICD-10 Codes and 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
- “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
- “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
- “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 oxygenation issues.” Steven Magee CEng MIET
- “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
- “A sleep disorder, or somniphath, 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 tranquillisers); 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
- “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 drunkenness). 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
- “Sleep disorders are commonly misdiagnosed as mental health disorders.” Steven Magee CEng MIET
- “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/>
- “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>
- “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/>
- “How Sleep Deprivation effects your sex drive revealed!” <http://asox9.com/blog/how-sleep-deprivation-effects-your-sex-drive-revealed/>
- “12 Shocking Effects Of Sleep Deprivation That Will Make You Want to Go to Bed Immediately” <https://www.nestmaven.com/sleep/sleep-deprivation-effects/>
- “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
- “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

- “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
- “The shorter your sleep, the shorter your life: the new sleep science...Leading neuroscientist Matthew Walker on why sleep deprivation is increasing our risk of cancer, heart attack and Alzheimer’s – and what you can do about it”
<https://www.theguardian.com/lifeandstyle/2017/sep/24/why-lack-of-sleep-health-worst-enemy-matthew-walker-why-we-sleep>
- “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
- “How Messing With Our Body Clocks Can Raise Alarms With Health”
http://www.npr.org/sections/health-shots/2017/10/02/555054483/how-messing-with-our-body-clocks-can-raise-alarms-with-health?utm_source=facebook.com&utm_medium=social&utm_campaign=npr&utm_term=nprnews&utm_content=202702
- “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
- “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 diēm, 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.” https://en.wikipedia.org/wiki/Circadian_rhythm
- “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.”
<https://en.wikipedia.org/wiki/Chronobiology>
- “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."

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

- "Night shift workers typically suffer from solar radiation deficiency sickness." Steven Magee CEng MIET
- "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." <https://drgominak.com/sleep/vitamin-d-hormone/>
- "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." <https://drgominak.com/2017/12/16/vitamins-can-hurt-you/>
- "Sleep — Why You Need It and 50 Ways to Improve It" <https://articles.mercola.com/sites/articles/archive/2018/03/29/why-do-you-need-sleep.aspx>

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
- "It was normal to drink two pots of coffee during an extreme night shift" Steven Magee CEng MIET
- "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>

- “20+ Harmful Effects of Caffeine” <https://www.caffeineinformer.com/harmful-effects-of-caffeine>
- “Caffeine: how does it affect our health?” <https://www.medicalnewstoday.com/articles/271707.php>
- “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
- “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
- “What that energy drink can do to your body” <http://www.cnn.com/2017/04/26/health/energy-drinks-health-concerns-explainer/index.html>
- “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>
- “Drug May Help Keep Night-Shift Workers Alert...Study: Provigil Eased but Didn't Erase Shift Workers' Sleep Woes” <https://www.webmd.com/sleep-disorders/news/20050803/drug-may-help-keep-night-shift-workers-alert#1>

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
- “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/>
- “New Study Shows Sleeping Pills Linked to Increased Risk of Death and Cancer” <https://articles.mercola.com/sites/articles/archive/2012/03/17/new-study-shows-sleeping-pills->

[linked-to-increased-risk-of-death-and-cancer.aspx](#)

- “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 couldnt remember it.” <https://www.dailystrength.org/group/sexual-abuse/discussion/sleeping-pills-and-unwanted-sex>
- “Tiger Woods 'took sleeping pills to spice up sex with mistress” <http://www.dailymail.co.uk/sport/golf/article-1233385/Tiger-Woods-took-sleeping-pills-spice-sex-mistress.html>
- “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>

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
- “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
- “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
- “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/>
- “Light Sources and Laser Safety - SPIE” <https://spie.org/Documents/Publications/00%20STEP%20Module%2002.pdf>
- “ANSI Z136 Standards: The Foundation of a Successful Laser Safety Program”
<https://www.lia.org/store/ANSI%20Z136%20Standards>
- “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.” https://en.wikipedia.org/wiki/Laser_safety
- “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.”
<https://www.lia.org/index.php>
- “Laser Bio-effects” <http://www2.lbl.gov/ehs/safety/lasers/bioeffects.shtml>
- “Laser guide star” https://en.wikipedia.org/wiki/Laser_guide_star
- “Industrial very high powered sodium LASER systems in action”
<https://youtu.be/o1xEQ21iyY>
- “Summary of Sodium Laser Guide Stars now On-the-Sky”
http://lao.ucolick.org/static/SodiumLaserGuidestars_Frameset.html
- “The most serious health problems that I exhibited during my night shifts at the very high altitude summit of Mauna Kea occurred after I started routinely working with the high powered sodium LASER guide star system.” Steven Magee CEng MIET
- “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.” <http://oregonstate.edu/ehs/laser/training/laser-biological-hazards-eyes>

- “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.”
<https://www.ncbi.nlm.nih.gov/pubmed/11744401>
- “The outer retina [photoreceptors and retinal pigment epithelium (RPE)], is immediately adjacent to the choroidal blood supply and thus highly oxygenated. Therefore, these are potentially favourable conditions for photodynamic damage to occur. The strong dependence of susceptibility of the retina to photodamage on oxygen concentration suggests that light-induced damage to the retina is indeed photodynamic in nature”
<http://photobiology.info/Rozanowska.html>
- “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 and bright high powered 20 watt scattered sodium LASER light a decade earlier in very high altitude astronomy.” Steven Magee CEng MIET
- “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>

Mauna Kea Hazards

- High Altitude Health Hazards of Mauna Kea, Hawaii
<http://www.environmentalradiation.com/Altitude%20chapter%20of%20health%20forensics.pdf>
- Mauna Kea, Hawaii, USA – A very high altitude worker's experiences
<http://www.environmentalradiation.com/Hawaii%20Chapter.pdf>
- Annoynymous 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>
- Annoynymous 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>
- “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

- "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
- "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
- "I WANT YOUR RESIGNATION!" W. M. Keck Observatory #MeToo
- "The toxic female managers clearly stated that 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
- "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
- "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
- "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
- "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
- "Not content with harassing me numerous times in a private office, an aggressive female manager started extending my extreme night shifts which would would make me really sick with shift work disorder, very high altitude sickness and workplace drug use." Steven Magee CEng MIET #MeToo
- "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
- "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

- “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
- “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
- “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
- "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
<http://www.environmentalradiation.com/Glassdoor%20w%20m%20keck%20observatory%20review%20rejection%20captioned.jpg>
- "What do I need to know about... WORKPLACE HARASSMENT" #MeToo
<http://www.dol.gov/oasam/programs/crc/2011-workplace-harassment.htm>
- “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.” <https://www.cbsnews.com/news/forced-to-resign-what-are-your-options/>
- “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
- “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”

<https://www.wenzelfenton.com/blog/2017/04/17/constructive-discharge-forced-quit-job/>

- “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".[1] 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.”
<https://en.wikipedia.org/wiki/Discrimination>
- “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 voluntarily resign, make their working conditions intolerable by repeatedly changing their working conditions on a regular basis & 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
- “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
- “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

- “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
- “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
- “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
- "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 Sleep Apnea and fatigue. 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
- "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
- “Very high altitude observatories are a known worker health hazard.” Steven Magee CEng MIET
- “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

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 Vieques 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.”
https://en.wikipedia.org/wiki/United_States_Navy_in_Vieques,_Puerto_Rico#Sonic_booms
- “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.” <https://www.hsph.harvard.edu/news/press-releases/aircraft-noise-linked-with-heart-problems/>
- “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.” <http://quiettucsonskies.org/health/health-impacts/>
- “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.”
https://en.wikipedia.org/wiki/Aircraft_noise

Radio Frequency Hazards

- “High altitude astronomical sites are commonly also used as Radio Frequency (RF) radiation antenna parks.” Steven Magee CEng MIET
http://www.environmentalradiation.com/RF_Steward_Observatory_captioned.jpg
- “RF Readings At Kitt Peak National Observatory (KPNO)” <https://youtu.be/HBTljT8dANs>
- “Lyon, France, May 31, 2011 -- The WHO/International Agency for Research on Cancer (IARC) has classified radiofrequency electromagnetic fields as possibly carcinogenic to humans (Group 2B), based on an increased risk for glioma, a malignant type of brain cancer, associated with wireless phone use.” http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf

- “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/>
- “Lloyd Burrell of electricsense.com Interviews Steven Magee” <http://youtu.be/lmyHveZzJDY>
- “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/#.Wd2CH6Iirg.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" <https://betweenrockandhardplace.wordpress.com/2017/06/26/guest-blog-health-exemption-for-firefighters-sends-a-message-to-the-world-by-susan-foster/>
- “Health implications of long-term exposure to electrosmog” http://kompetenzinitiative.net/KIT/wp-content/uploads/2016/07/KI_Brochure-6_K_Hecht_web.pdf
- “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

- “There was a lot of observatory fabricated electronic circuitry used in astronomy that had never been tested to Federal Communications Commission (FCC) standards for electromagnetic interference (EMI).” Steven Magee CEng MIET
- “Steven Magee Discovers That Kelp & Vitamin B12 Offset Radiation Induced Damage In Plants” Steven Magee CEng MIET <https://youtu.be/nb4mSk06eGw>

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
- “State of Arizona warns about the toxicity of sitting near to electrical rooms.” Steven Magee CEng MIET <https://youtu.be/oHTXt-LMWIE?t=1h5m45s>
- “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/>
- “Random aches and pains? Fatigue? Insomnia? Headaches? Facial pains? Sore eyes? Irregular heartbeats? Sick kids? Relationship problems? Blotchy skin? Hot skin? Anxiety? The second edition of Toxic Electricity takes a look at the electrical system and asks the question: Is this one of the most toxic endeavors that humanity has ever engaged in?” <http://amzn.com/1475295693>
- ““Dirty” Electricity is a National Problem Affecting Everyone’s Health in the United States” <https://healthimpactnews.com/2015/dirty-electricity-is-a-national-problem-affecting-everyones-health-in-the-united-states/>
- “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 tortuous 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
- “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.” <http://www.bbc.com/future/story/20170919-how-flying-seriously-messes-with-your-mind>
- “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.” <http://electricfertilizer.com/2014/07/natural-earth-currents-and-plant-health/>
- “Clearing Up Headaches With X-Ray Radiation”
<http://www.environmentalradiation.com/Clearing%20Up%20Headaches%20With%20XRay%20Radiation.pdf>
- “Cars are a form of the Faraday cage.” Steven Magee CEng MIET

Travel Hazards

- “The most dangerous roads that I have driven on are those leading to high altitude astronomical observatories” Steven Magee CEng MIET
- “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
- “Driving judgment is compromised in the sea level adapted human when at high altitudes.” Steven Magee CEng MIET
- “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
- “Falling asleep at the wheel was always a danger when working extreme night shifts.” Steven Magee CEng MIET
- “There were times that I would drive home after an extreme set of night shifts and have no recollection of the journey.” Steven Magee CEng MIET
- “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

- “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.” https://en.wikipedia.org/wiki/Sleep-deprived_driving
- “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.” <http://www.nsc.org/learn/NSC-Initiatives/Pages/Fatigue.aspx>
- “Extreme weather in conjunction with Cerebral Hypoxia makes for a very dangerous driving experience when at high altitudes.” Steven Magee CEng MIET
- “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.” <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1069044/>
- “New info in Kitt Peak wreckage, human remains” <http://www.tucsonnewsnow.com/story/31441734/new-info-in-kitt-peak-wreckage-human-remains>
- “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.” <http://unofficialnetworks.com/2013/04/19/the-worst-cable-car-disasters-in-history/>

- “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”
https://en.wikipedia.org/wiki/Saint-%C3%89tienne-en-D%C3%A9voluy_cable_car_disaster
- “San Jose: Lick Observatory mourns death of employee killed in Mount Hamilton crash “
<http://www.mercurynews.com/2012/12/12/san-jose-lick-observatory-mourns-death-of-employee-killed-in-mount-hamilton-crash/>
- “Great drive for those with a death wish” https://www.tripadvisor.com/ShowUserReviews-g60583-d3140479-r192779874-Maunakea_Visitor_Information_Station-Hilo_Island_of_Hawaii_Hawaii.html
- “Woman dies after car lost control, tumbled down Mauna Kea”
<http://www.hawaiiensnow.com/story/34746006/fatal-crash-closes-mauna-kea-access-rd-on-hawaii-island>
- “Take A Drive On The Most Dangerous Road In Hawaii... If You Dare”
<http://www.onlyinyourstate.com/hawaii/saddle-road-hi/>
- “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
- “10 Things Your Commute Does to Your Body” <http://time.com/9912/10-things-your-commute-does-to-your-body/>
- “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
- “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>

Extreme Weather Hazards

- “The most extreme weather that I have experienced was on top of high altitude mountain summits at astronomical observatories” Steven Magee CEng MIET
- “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
- “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

- “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>

Lightning Hazards

- “The most amazing lightning that 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 amazing!” Steven Magee CEng MIET
- “Lightning emits a high powered electromagnetic pulse (EMP) that induces energy into everything in the area.” Steven Magee CEng MIET
- “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>
- “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/>
- “Long term exposure to abnormally high levels of lightning may trigger genetic adaptation processes in the human.” Steven Magee CEng MIET
- “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

- “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>
- “The Effects of Thunder & Lightning on Humans & Nature” <https://sciencing.com/effects-thunder-lightning-humans-nature-8545584.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>
- “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

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).”
https://en.wikipedia.org/wiki/Sick_building_syndrome
- “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”
https://www.epa.gov/sites/production/files/2014-08/documents/sick_building_factsheet.pdf

- “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-information/related-conditions/sick-building-syndrome/>
- “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).” https://en.wikipedia.org/wiki/Indoor_air_quality
- “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...Ventilation Rate Procedure is rate based on standard and prescribes the rate at which ventilation air must be delivered to a space and various means to condition that air.[6] 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.[6] 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.”

[https://en.wikipedia.org/wiki/Ventilation_\(architecture\)](https://en.wikipedia.org/wiki/Ventilation_(architecture))

- “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.
<https://www.ashrae.org/home>
- “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.”
<https://www.ashrae.org/resources--publications/bookstore/standards-62-1--62-2>
- “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.” <https://www.independent.co.uk/life-style/health-and-families/health-news/computers-cause-sick-building-syndrome-698624.html>
- “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.” http://www.stetzerizer-us.com/Dirty-Electricity--An-Invisible-Pollutant-in-Schools_df_56.html
- “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.”
<http://www.electricalpollution.com/documents/YourPatientIsNotCrazy.pdf>

- “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

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.”
https://en.wikipedia.org/wiki/Hubble_Space_Telescope#Flawed_mirror
- “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 honeycreepers 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]"

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

- “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>
- “Gordon Earle Moore is an American businessman, co-founder and chairman emeritus of Intel Corporation, and the author of Moore's law. As of 2017, his net worth is \$8.4 billion.” https://en.wikipedia.org/wiki/Gordon_Moore
- “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_\(astronomer\)](https://en.wikipedia.org/wiki/Jerry_Nelson_(astronomer))
- “USA Federal Government” <https://www.usa.gov/>
- “State of Hawaii” <https://portal.ehawaii.gov/>
- “County of Hawai‘i” <http://www.hawaiicounty.gov/>
- “Occupational Safety and Health Administration (OSHA)” <https://www.osha.gov/>

Social Problems in High Altitude Astronomy

- “I found that high altitude astronomy was riddled with nepotism.” Steven Magee CEng MIET
- “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
- “It was who you knew and not how good you were that determined success in certain high altitude observatories.” Steven Magee CEng MIET
- “When one of the workers suggested that 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

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>
- “Very High Altitude Mauna Kea Worker Steven Magee: Insomnia, Ideopathic Hypersomnia, Amnesic Disorder, Obstructive Sleep Apnea, Small Airways Disease of the lungs, Hole in the heart, Heart Arrhythmia's, Erratic Low Blood Oxygen, High Cholesterol, 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, Amnesic Disorder, Irritability, Aggressive Behaviors, Confusion, Various Mental Health Issues, Radiation Sickness including Faraday Cage Sickness and Cancer.” Steven Magee CEng MIET
- “The top three symptoms that I observed in high altitude workers were: 1. Forgetfulness &

Confusion; 2. Irritability; 3. Fatigue & Apathy.” Steven Magee CEng MIET

- “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
- “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>

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

Disability Hazards

- “The vast majority of initial disability applications are denied.” Steven Magee CEng MIET
- “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
- “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

- “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
- “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
- “Judges pressured to deny disability appeals, one judge tells the AJC...Ginsberg said once one of his clients gets a hearing scheduled, the outcome can largely depend on who gets the case. Some judges approve a vast percentage of their cases, while others deny an equally large number.” <http://www.myajc.com/news/national-govt--politics/judges-pressured-deny-disability-appeals-one-judge-tells-the-ajc/wDh8dfN5j9kxSXY5LrMApN/>
- “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
- “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
- “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
- “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
- “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
- “Getting really sick in the USA results in bankruptcy for many people.” Steven Magee CEng MIET
- “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.” <https://www.myajc.com/news/national-govt--politics/this-atlanta-woman-lost-her-home-waiting-for-disability/Nd0uGeSLLQD1bSYz6bHBKM/>
- “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.” <https://www.cbsnews.com/news/disabled-and-waiting/>
- “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.” <https://en.wikipedia.org/wiki/Disability>

- “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.” <https://www.cbsnews.com/news/social-security-disability-backlog-tops-1-million-thousands-die-on-waitlist/>
- “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.” http://www.oregonlive.com/special/index.ssf/2008/08/getting_disability_payments_ca.html
- “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.” <http://www.frontiernet.net/%7Elindafl/SOCSECHDP.html>
- “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/%7Elindafl/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/>
- “The disability system discriminates against those that are educated.” Steven Magee CEng MIET
- “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
- “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

- “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.” <https://www.easy-immune-health.com/vitamin-b-12-deficiency-symptoms.html>
- “The problem with getting old and sick is that you learn that corporate government systems that you thought would protect you actually fail you.” Steven Magee CEng MIET
- “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
- “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
- “It is disappointing to witness the corporate government disability system letting massive numbers of sickened people down during their time of need.” Steven Magee CEng MIET
- “While the corporate government wants you to believe that many people that apply for disability are fraudulent, the reality is that the far bigger corporate government fraud is the massive numbers of eligible sickened people that are being denied their earned disability payments.” Steven Magee CEng MIET
- “Corporate government disability left me sickened, unable to work, and without any disability income for the rest of my life.” Steven Magee CEng MIET
- “Being denied corporate government disability shatters your faith in corporate government.” Steven Magee CEng MIET
- “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
- “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
- “If you apply for government disability, I wish you the best of luck...as you are going to need it!” Steven Magee CEng MIET
- “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

- “3 Social Security Horror Stories” <https://www.forbes.com/sites/kotlikoff/2016/05/22/3-social-security-horror-stories/#11f01e9b754e>
- “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!” <http://www.frontiernet.net/~lindaf1/SOCIALSECURITYDISABILITYNIGHTMARE.html>
- “Social Security Disability: Why Do So Many Americans Get Denied? Two-thirds of those who apply for disability benefits get rejected.” <https://www.fool.com/retirement/general/2014/09/06/social-security-disability-why-do-so-many-american.aspx>
- “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
- ““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.” <https://www.everydayhealth.com/news/myths-facts-about-social-security-disability-insurance/>
- “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
- “The government disability program has developed a wide range of feeble excuses to deny you your earned benefits.” Steven Magee CEng MIET
- “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
- “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.” <https://blog.easybreathe.com/5-problems-that-can-be-fixed-by-upgrading-your-cpap/>
- “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.” <http://www.thecpapshop.com/blog/addressing-the-frustration-that-result-in-cpap-therapy-non-compliance/>
- “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.” <https://www.verywell.com/are-severe-sleep-apnea-and-cpap-pressure-correlated-3015267>

- “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
- “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
- “The USA claims to be a first world country but it has the disability system of a third world country.” Steven Magee CEng MIET
- “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.”
https://en.wikipedia.org/wiki/Social_Security_Disability_Insurance
- “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

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.
- Commuting sickness.
- Drinking fluids from canned and bottled supplies.

- Electrolyte imbalances.
- Isolation.
- Night shift work.
- Extremely long shifts.
- 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 Adaptation Disease (HAAD).

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.
- 2003-2006: Working several extreme night shifts every two weeks at very high altitude on Mauna Kea: Headaches, digestive disorders, chronic headaches, cracked & dry lips, chronic fatigue, sleepiness, sleep disorders, amnesic disorders, confusion & irritability. Using medical oxygen & company supplied drugs to treat Mauna Kea Sickness.
- 2007-2008: Working at high altitude on Kitt Peak: Regular visits to the doctor for pains from head to toe, hot and painful skin, severe chest pains during exercise, fatigue, daytime sleepiness, falling asleep at work, insomnia, irritability, forgetfulness & confusion. Prescribed Nuvigil & Seroquel. Discharging industrial gas into the indoor environment,

- 2008-2009: Working in solar photovoltaic industry: Regular visits to the doctor for fatigue, daytime sleepiness, falling asleep at work. Prescribed Nuvigil & Seroquel. Regular exposure to high powered electromagnetic fields and solar radiation reflections.
- 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.
- 2010-2011: Working in solar photovoltaic industry: Regular visits to the doctor for fatigue, daytime sleepiness & heart arrhythmia's. Doctor detected extremely low vitamin D and low normal range of vitamin B12. Prescribed vitamin D and advised to eat more meat & fish for B12. No medication for heart arrhythmia's.
- 2011-2014: No medical insurance. Developed Electromagnetic Hyper- Sensitivity (EHS) and cured it with lifestyle changes, supplements, and over the counter medications.
- 2014 – present: Mental functioning significantly degraded at age 45 and referred to mental health & neurology, they diagnosed depression, amnesic 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. Currently raising vitamin B12, iron, magnesium and vitamin D levels using supplements.

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
- “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
- “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
- “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
- “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 pain and suffering or lost lifetime wages of the decedents."
<https://www.beasleyfirm.com/blog/2012/october/how-much-is-a-wrongful-death-lawsuit-worth/>
 - "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."
<https://www.missourilawyers.com/blog/how-much-is-a-wrongful-death-case-worth/>
 - "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

Steven Magee's Astronomical Observatories

- "1999 to 2001 - 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"
https://en.wikipedia.org/wiki/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”
https://en.wikipedia.org/wiki/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

- http://www.environmentalradiation.com/Steven_Magee_Resume_Public.pdf

Steven Magee's Published Articles

- “Active control systems for large segmented optical mirrors”
<http://ieeexplore.ieee.org/document/1029808/?reload=true&arnumber=1029808>

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 Field Sickness (EFS) - High Voltage Power Lines, High Voltage Transformers, Inverters, Electrical Rooms, Electrical Panels, Electrical Wiring, Computers & Printers & Monitors, Conventional & Electric & Hybrid Cars, Solar Photovoltaics (PV), Wind Power, Electric Power Generation
- 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

- Wireless Sickness (WS) – Wireless Networks (WiFi), Wireless Radio Frequency (RF) Devices, Radio Frequency Identification Systems (RFID), Smart Homes & Cars, Wireless RF Utility Meters (Smart Meters), Cell Phones, Cell Phone Towers, Antenna Towers, RADAR Systems, Government Building Transmitters, Police & Fire & Hospital Transmitters, Airport Transmitters, Aircraft Transmitters, Television & Radio Transmitters.
- Dirty Electricity (DE) – Harmonics, Switched Mode Power Supplies, Electronic Lamp Dimmers, Electronic Lighting Products (Florescent, CFL & LED), Inverters (Solar & Wind Power), Variable Frequency Drives (VFD), Stray Voltage, Wiring Errors, Magnetic & Electric & Radio Wave Fields.
- 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 Resistance Techniques (RRT) - Hibernation, Blood Micro-Clot Flushing, Supplementing, Diet, Natural Solar Radiation Exposure, Earthing, Atmospheric DC Human Charging, Pulsed Electromagnetic Field Therapy (PEMF), Natural Electromagnetic Exposures.
- Radiation Biological Growth Defects in Plants (RBGDP) – Growth Enhancement, Deformity, Retardation, Death.
- 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 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.
- Fraud - Utility Companies, Energy & Electrical & Electronics & Wireless Industries, State Regulators, OSHA, FCC, FDA, Law Enforcement, Police Reports, Police Internal Affairs, Law Courts, Corporate Media, Politicians, High Altitude Astronomers, Medical Industry, Insurance Industry.
- 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
- 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
- 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.
 - Digestive disorders.
 - Lung disorders.
 - Kidney disorders.
 - Cancer screening: https://en.wikipedia.org/wiki/Cancer_screening
 - Electrolyte imbalances: https://en.wikipedia.org/wiki/Electrolyte_imbalance
 - 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 follow 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.
- Cancer screening.
- Place on regular high dose vitamin B12 injections for 6 months to see if they respond to it.
- Place on daily iron supplements to see if they respond to it.
- Referrals for:
 - Sleep.
 - Sleep study.
 - Neurology.
 - Screen for Amnesiac disorders.
 - Screen for early onset Dementia.
 - High resolution brain MRI scan.
 - Mental Health.
 - Screen for Depression.
 - Screen for oxygen starvation disorders.
 - Screen for brain damage.
 - Screen for prolonged over the counter drug abuse.
 - Pulmonology.
 - Screen for lung disease.
 - Screen for oxygen starvation disorders.
 - Screen for industrial gas exposures.
 - Screen for medical oxygen exposures.
 - High resolution lung MRI scan.
 - 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.
 - Low Level Radiation Sickness.
 - Screen for general body aches & pains.
 - Screen for skin disorders.
 - Screen for eye disorders.
 - Screen for headaches.

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)

- “The United States Pharmacopoeial Convention” <http://www.usp.org/>
- “Contact Information” <http://www.usp.org/contact-us>

Federal Aviation Administration(FAA)

- “Federal Aviation Administration” <https://www.faa.gov/>
- “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/
- “Policy, International Affairs and Environment - 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>
- “Equal Employment Opportunity” <https://www.dol.gov/general/topic/discrimination>
- “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/>

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>
- “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
- “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
- “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>
- “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
- “OSHA Frequently Asked Questions” 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.“ <https://www.osha.gov/laws-regs/standardinterpretations/2007-04-02-0>

- “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.”
<https://www.osha.gov/laws-regs/federalregister/1998-01-08>

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=ZxhJXhhQHq&sig=zKtzSwg_yNRbSvVngt5gcSsFlhk&hl=en&sa=X&ved=0ahUKEwiS9Mafxo_aAhUD5WMKHW_wBd8Q6AEIdDAI#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>

Health & Safety Websites

- “EHS Today” <http://www.ehstoday.com/>
- “Safety+Health magazine” <http://www.safetyandhealthmagazine.com/>
- “Occupational Health & Safety” <https://ohsonline.com/home.aspx>

Astronomy Health & Safety

- "Based on the medical evidence that clearly states that 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
- “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
- “The biggest mistake that I made in high altitude astronomy was not realizing that the onset of sickness that I saw at the first astronomical observatory were the initial signs of High Altitude Observatory Sickness (HAOS).” Steven Magee CEng MIET
- “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
- “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
- "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
- “High altitude astronomy is a strange world of oxygen starvation, sleep deprivation and radiation sickness.” Steven Magee CEng MIET
- “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

- “Sleep disorders are a known occupational hazard to astronomers and their support staff” Steven Magee CEng MIET
- “I was aware of many workers that were showing behavioral problems during my time in high altitude astronomy.” Steven Magee CEng MIET
- “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
- “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
- “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
- “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
- “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
- “It is time to stop the abusive workplace practices of very high altitude astronomy.” Steven Magee CEng MIET
- “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
- “High altitude astronomy is a sad story of a myriad of environmental toxins that should have been avoided by the unsuspecting workers.” Steven Magee CEng MIET
- “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
- "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
- “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
- “It has been my experience that the astronomical industry will not rehire past staff members whose health they know that they damaged with their biologically toxic high altitude workplaces.” Steven Magee CEng MIET
- “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.
- “After almost 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

- “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
- “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
- “The medical profession seem incompetent at diagnosing Low Level Radiation Sickness (LLRS).” Steven Magee CEng MIET
- “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, and the B12 deficiency.” Steven Magee CEng MIET
- “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
- “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
- “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
- “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
- “Manua Kea's summit astronomical facilities were run by incompetents for the benefit of incompetents.” Steven Magee CEng MIET
- “High altitude astronomy is a very unprofessional profession.” Steven Magee CEng MIET
- "Never trust a high altitude astronomer." Steven Magee CEng MIET
- "the hashtag #WeAreMaunaKea...and the hashtag #ProtectMaunaKea have seen big jumps in use this week." <http://www.bbc.com/news/blogs-trending-32239000>
- "Stop TMT Construction and Arrests of Mauna Kea Protectors" <https://www.change.org/p/governor-david-y-ige-stop-tmt-construction-and-arrests-of-mauna-kea-protectors>
- “Should the Thirty Meter Telescope Be Built?” <http://pbs-hawaii.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
- “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
- “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
- "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 <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
- "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 had supervised to the ill health that I displayed at age 48." Steven Magee CEng MIET
- "As a manager in high altitude astronomy, I found poor performing employees to be a feature of remote observatories." Steven Magee CEng MIET
- "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
- "There is a lot of willful incompetence in high altitude astronomy that is in the process of coming to light." Steven Magee CEng MIET
- "I will use science to shut down the toxic Thirty Meter Telescope (TMT) project atop Mauna Kea in Hawaii." Steven Magee CEng MIET
- "Time's up for very high altitude astronomy." Steven Magee CEng MIET
- "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
- "I'm just a sickened person that researches the toxicity of the many dubious things that I was exposed to." Steven Magee CEng MIET
- "It really should not fall onto a sickened Mauna Kea manager to research the biological toxicity of the very high altitude summit research facilities." Steven Magee CEng MIET
- "I guess when it come to corporate government science interests, the inconvenience of worker sickness will be covered up." Steven Magee CEng MIET
- "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
- "Mauna Kea Sickness (MKS) left me appearing alive on the outside and feeling dead on the inside." Steven Magee CEng MIET
- "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 <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

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 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
- “Researching the toxicity of high altitude astronomy led me to the conclude that it is primarily driven by astronomical greed.” Steven Magee CEng MIET
- “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 obtained tainted astronomical data.” Steven Magee CEng MIET
- “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
- “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
- “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
- “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
- “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
- “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
- “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
- "I have no faith in the corporate USA government systems of protection of public health and safety." Steven Magee CEng MIET

"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](#)