# AFF CASE – BLAKE

## Framework

#### Simple perception tells us that pleasure is good and pain is bad – to deny the value of such judgments undermines the basis for any system of reasoning.

Thomas Nagel, The View From Nowhere HUP 1986: 156-168

I shall defend the unsurprising claim that **sensory pleasure is good and pain bad, no matter whose they are.** The point of the exercise is to see how the pressures of objectification operate in a simple case. Physical pleasure and pain do not usually depend on activities or desires which themselves raise questions of justification and value. They are just [is a] sensory experiences in relation to which we are fairly passive, but toward which we feel involuntary desire or aversion. Almost **everyone takes the avoidance of** his own **pain and** the **promotion of**  his own **pleasure as subjective reasons for action** in a fairly simple way; they are not back up by any further reasons. On the other hand if someone pursues pain or avoids pleasure, either it as a means to some end or it is backed up by dark reasons like guilt or sexual masochism. What sort of general value, if any, ought to be assigned to pleasure and pain when we consider these facts from an objective standpoint? What kind of judgment can we reasonably make about these things when we view them in abstraction from who we are? We can begin by asking why **there is no plausibility in the zero position, that pleasure and pain have no value of any kind that can be objectively recognized.** That would mean that I have no reason to take aspirin for a severe headache, however I may in fact be motivated; and that looking at it from outside, you couldn't even say that someone had a reason not to put his hand on a hot stove, just because of the pain. Try looking at it from the outside and see whether you can manage to withhold that judgment. If the idea of objective practical reason makes any sense at all, so that there is some judgment to withhold, it does not seem possible. If the general arguments against the reality of objective reasons are no good, then **it is at least possible that I have a reason**, and not just an inclination, **to refrain from putting my hand on a hot stove.** But given the possibility, it seems meaningless to deny that this is so. Oddly enough, however, we can think of a story that would go with such a denial. It might be suggested that the aversion to pain is a useful phobia—having nothing to do with the intrinsic undesirability of pain itself—which helps us avoid or escape the injuries that are signaled by pain. (The same type of purely instrumental value might be ascribed to sensory pleasure: the pleasures of food, drink, and sex might be regarded as having no value in themselves, though our natural attraction to them assists survival and reproduction.) There would then be nothing wrong with pain in itself, and someone who was never motivated deliberately to do anything just because he knew it would reduce or avoid pain would have nothing the matter with him. He would still have involuntary avoidance reactions, otherwise it would be hard to say that he felt pain at all. And he would be motivated to reduce pain for other reasons—because it was an effective way to avoid the danger being signaled, or because interfered with some physical or mental activity that was important to him. He just wouldn't regard the pain as itself something he had any reason to avoid, even though he hated the feeling just as much as the rest of us. (And of course he wouldn't be able to justify the avoidance of pain in the way that we customarily justify avoiding what we hate without reason—that is, on the ground that even an irrational hatred makes its object very unpleasant!) There is nothing self-contradictory in this proposal, but it seems nevertheless insane. **Without some positive reason to think there is nothing in itself good or bad about having an experience you intensely like or dislike, we can't seriously regard the common impression to the contrary as a collective illusion.** Such things are at least good or bad for us, if anything is. What seems to be going on here is that we cannot from an objective standpoint withhold a certain kind of endorsement of the most direct and immediate subjective value judgments we make concerning the contents of our own consciousness. We regard ourselves as too close to those things to be mistaken in our immediate, nonideological evaluative impressions. No objective view we can attain could possibly overrule our subjective authority in such cases. There can be no reason to reject the appearances here.

#### Thus, the standard is Util

#### Prefer additionally…

#### Actor specificity

#### Governments must aggregate since every policy benefits some and harms others, which also means side constraints freeze action.

#### States lack wills or intentions since policies are collective actions. Actor-specificity comes first since different agents have different ethical standings. Takes out util calc indicts since they’re empirically denied and link turns them because the alt would be *no* action.

1. **Moral uncertainty means preventing extinction should be our highest priority.**  
   Bostrom 12 [Nick Bostrom. Faculty of Philosophy & Oxford Martin School University of Oxford. “Existential Risk Prevention as Global Priority.” Global Policy (2012)]  
   These reflections on **moral uncertainty suggest** an alternative, complementary way of looking at existential risk; they also suggest a new way of thinking about the ideal of sustainability. Let me elaborate.¶ **Our present understanding of axiology might** well **be confused. We may not** nowknow — at least not in concrete detail — what outcomes would count as a big win for humanity; we might not even yet **be able to imagine the best ends** of our journey. **If we are** indeedprofoundly **uncertain** about our ultimate aims,then we should recognize that **there is a great** option **value in preserving** — and ideally improving — **our ability to recognize value and** to **steer the future accordingly. Ensuring** that **there will be a future** version of **humanity** with great powers and a propensity to use them wisely **is** plausibly **the best way** available to us **to increase the probability that the future will contain** a lot of **value.** To do this, we must prevent any existential catastrophe.

## The Advantage is Space Debris

#### Space debris is on the brink

David 4/14

Leonard David, space exploration reporter for Scientific American, <https://www.scientificamerican.com/article/space-junk-removal-is-not-going-smoothly/>, “Space Junk Removal is Not Going Smoothly”, published 4-14-21, accessed 12-17-21 // mk

A Space Age “tragedy of the commons” is unfolding right under our nose—or, really, right over our head—and no consensus yet exists on how to stop it. For more than a half-century, humans have been hurling objects into low-Earth orbit in ever growing numbers. And with few meaningful limitations on further launches into that increasingly congested realm, the prevailing attitude has been persistently permissive: in orbit, it seems, there is always room for one more. After so many decades of the buildup of high-speed clutter in the form of spent rocket stages, stray bolts and paint chips, solid-rocket-motor slag, dead or dying satellites and the scattered fragments from antisatellite tests—all of which could individually damage or destroy other assets—low-Earth orbit is finally on the verge of becoming too crowded for comfort. And the problem is now poised to get much worse because of the rise of satellite “mega constellations” requiring thousands of spacecraft, such as SpaceX’s Starlink, a broadband Internet network. Starlink is but one of many similar projects: Another mega constellation from a company called OneWeb is already being deployed. And Amazon’s Project Kuiper is seeking to create a mega constellation of up to 3,200 satellites in the near future. As the congestion has grown, so too have close calls between orbiting assets. The International Space Station, for instance, regularly tweaks its orbit to avoid potentially hazardous debris. Worse yet, there has been an uptick in the threat of full-on collisions that generate menacing refuse that exacerbates the already bad situation. Consider the February 2009 run-in between a dead Russian Cosmos satellite and a commercial Iridium spacecraft, which produced an enormous amount of debris. Finding ways to remove at least some of all that space junk should be a top global priority, says Donald Kessler, a retired NASA senior scientist for orbital debris research. In the late 1970s he foretold the possibility of a scenario that has been dubbed the Kessler syndrome: as the density of space rubbish increases, a cascading, self-sustaining runaway cycle of debris-generating collisions can arise that might ultimately make low-Earth orbit too hazardous to support most space activities. “There is now agreement within the community that the debris environment has reached a ‘tipping point’ where debris would continue to increase even if all launches were stopped,” Kessler says. “It takes an Iridium-Cosmos-type collision to get everyone’s attention. That’s what it boils down to.... And we’re overdue for something like that to happen.” As for the Kessler syndrome, “it has already started,” the debris expert says. “There are collisions taking place all the time—less dramatic and not at the large size scale,” Kessler adds.

#### Debris removal is unreliable – the only solution is prevention

David 4/14

“From my perspective, the best solution to dealing with space debris is not to generate it in the first place,” says T. S. Kelso, a scientist at CelesTrak, an analytic group that keeps an eye on Earth-orbiting objects. “Like any environmental issue, it is easier and far less expensive to prevent pollution than to clean it up later. Stop leaving things in orbit after they have completed their mission.” There simply is no “one-size-fits-all solution” to the problem of space junk, Kelso says. Removing large rocket bodies is a significantly different task than removing the equivalent mass of a lot more smaller objects, which are in a wide range of orbits, he observes. Meanwhile innovations by companies such as SpaceX are dramatically lowering launch costs, opening the floodgates for far more satellites to reach low-Earth orbit, where some will inevitably fail and become drifting, debris-generating hazards (unless they are removed by ELSA-d-like space tugs). “Many of these operators are starting to understand the difficulty and complexity of continuing to dodge the growing number of debris.” Space junk ranges from nanoparticles to whole spacecraft such as the European Space Agency’s Envisat, which is the size of a double-decker bus and at the top of everyone's removal hit list, says Alice Gorman, a space archaeologist and space junk expert at Flinders University in Australia. There are also objects such as despin weights, which are solid lumps of metal, and thermal blankets, which are paper-thin. “They’ll cause different types of damage and may need different strategies to remove. There is no way that a one-size-fits-all approach is going to do it,” Gorman says. The most serious risks, she says, come from debris particles between one and 10 centimeters in size. “There’s far more of them than whole defunct spacecraft, and there is a far greater probability of collision,” Gorman says. “While debris this size might not cause a catastrophic breakup, collision with it can certainly damage working satellites and create new debris particles.” Turning her attention to satellite mega constellations, Gorman worries about their effects in a low-Earth orbital environment that is already congested. “We also know that orbital dynamics can be unpredictable,” she says. “I want to see some of these mega constellation operators releasing their long-term modeling for collisions as more and more satellites are launched.” There is no doubt that active orbital debris removal is technically challenging, Gorman says. “However, the big issue is that any successful technology that can remove an existing piece of debris can also be used as an antisatellite weapon,” she says. “This is a whole other can of worms that requires diplomacy and negotiation and, most importantly, trust at the international level.” Indeed, the ability to cozy up to spacecraft in orbit and perform servicing or sabotage has spurred considerable interest from military planners in recent years, says Mariel Borowitz, an associate professor at the Georgia Institute of Technology’s Sam Nunn School of International Affairs. “These rapidly advancing technologies have the potential to be used for peaceful space activities or for warfare in space,” she says. “Given the dual-use nature of their capabilities, it’s impossible to know for sure in advance how they’ll be used on any given day.”

#### 2 Scenarios

#### 1] Constellations

#### Private companies crowd outer space and drastically increase the risks of space junk

McCoustra 2020

Mark McCoustra is the ScotCHEM Chair in Chemical Physics at Herlot-Watt University. “Space junk: Astronomers worry as private companies push ahead with satellite launches”, <https://theconversation.com/space-junk-astronomers-worry-as-private-companies-push-ahead-with-satellite-launches-137572>, published 5-13-20, accessed 12-17-21 // mk

And it’s getting busier. In the last few weeks, SpaceX [has launched 60 new satellites](https://www.space.com/space-starlink-satellites-launch-rocket-landing-success-april-2020.html) as part of its Starlink programme. This brings the total to currently around 400 Starlink satellites in low Earth orbit as part of a programme that aims to bring cheap, satellite-based internet access to everyone. Eventually, this programme could place nearly 12,000 satellites in orbit around the Earth. With Amazon, Canada’s [Telesat](https://www.telesat.com/services/leo/phase-1) and others [planning satellite constellations](https://www.cnbc.com/2019/12/14/spacex-oneweb-and-amazon-to-launch-thousands-more-satellites-in-2020s.html) of similar scale, low Earth orbit is becoming ever more crowded. The debris ranges in size from a few microns to many metres. [Stuart Grey](https://www.stugrey.com/), an aerospace engineer at the University of Strathclyde, has produced a stunning visualisation that highlights the more than 20,000 objects over 10cm in size now orbiting the Earth (see video above). But there are many millions of particles 1mm in size and smaller. Closing our window on the universe? Amateur astronomers are [already expressing concern](https://edition.cnn.com/2020/04/21/tech/starlink-satellites-stargazers-complaints-scli-intl-gbr/index.html) over the increasing number of bright, moving objects in the night sky. But the worry is perhaps much greater for the professionals. Crowding in low Earth orbit has inevitable consequences for ground-based astronomers. Bright surfaces on satellites can reflect rays from the sun – giving rise to a burst of sunlight directed towards the surface of the Earth. Such intense bursts of light are much stronger than the weak light sources typically being observed by astronomers and will impede observations of distant objects in space. Billions have already been spent on existing optical telescopes, and many more billions will be poured into new platforms in the next decade, such as the [European Extremely Large Telescope](https://www.eso.org/sci/facilities/eelt/) being built on the Atacama plateau in Chile. There is intense competition for observing time on such resources, so any potential threat from satellite reflections must be taken seriously as they may make some of the observations driving our understanding of the evolution of the universe impossible. SpaceX has assured the public that Starlink will not contribute to this problem and says it [has been taking steps](https://time.com/5225670/spacex-space-junk-cleaner-launch/) to mitigate the impacts of its satellites on observational astronomy – even to the extent of testing whether a black coating on its satellites can reduce visibility, and adjusting some of the satellites’ orbits if necessary. With some 3% of its planned constellation launched, SpaceX is at least responding to the concerns raised by astronomers. Hopefully other agencies planning satellite constellation launches will also be upfront with their plans to reduce this serious problem to astronomical observation. But crowding in low Earth orbit also has consequences for satellites and other space vehicles, including those designed to carry humans. To achieve orbit, satellites seek a balance between their speed and the effect of Earth’s gravity on them. The speed with which a satellite must travel to achieve this balance depends on its altitude above Earth. The nearer to Earth, then the faster the required orbital speed. At an altitude of 124 miles (200km), the required orbital velocity is a little more than 17,000 miles per hour (about 7.4 km/s). Any object shed by a satellite or other vehicle in orbit will maintain the same orbital speed. Collisions between such objects can therefore occur at combined speeds of potentially up to 34,000 mph at 124 miles (if it is head-on). The effects of such impacts can be serious for astronauts and space stations – as the dramatic opening scenes of the 2013 movie Gravity depict. There is impact shielding on satellites and space vehicles which is designed to stop objects smaller than 1cm crashing into them. At best, the shielding will do so – though the electromagnetic impulse created may interfere with electronic systems. At worst, larger pieces of space junk could penetrate the vehicles. This could result in internal damage and disintegration that threaten the safety of the mission. Space agencies such as NASA and ESA have therefore established [orbital debris research programmes](https://www.orbitaldebris.jsc.nasa.gov/) to observe such debris and develop strategies to control its effects. There is little doubt that, with the increasing use and commercialisation of space, we boost the risk of catastrophic events associated with orbital debris. Agencies, both state and commercial, must recognise this and support efforts to reduce the likelihood of such events by taking steps to remove existing debris and reduce the potential for further debris by removing redundant satellites and other space vehicles. For example the [RemoveDEBRIS satellite](https://www.surrey.ac.uk/news/harpoon-successfully-captures-space-debris) uses an on-board harpoon to capture junk. Only when we resolve the problem of space junk will our window on, and pathway to, space be truly fully open.

#### Under the Outer Space Treaty, constellations should be considered a form of appropriation

Johnson 20

Article II of the Outer Space Treaty, discussed above, is clear on the point that the appropriation of outer space, including the appropriation of either void space or of celestial bodies, is an impermissible and prohibited action under international law. No means or methods of possession of outer space will legitimize the appropriation or ownership of outer space, or subsections thereof. Excludes Others The constellations above, because they seem to so overwhelmingly possess particular orbits through the use of multiple satellites to occupy orbital planes, and in a manner that precludes other actors from using those exact planes, constitute an appropriation of those orbits. While the access to outer space is nonrivalrous – in the sense that anyone with the technological capacity to launch space objects can therefore explore space – it is also true that orbits closer to Earth are unique, and when any actor utilizes that orbit to such an extent to these proposed constellations will, it means that other actors simply cannot go there. To allow SpaceX, for example, to so overwhelmingly occupy a number of altitudes with so many of their spacecraft, essentially means that SpaceX will henceforth be the sole owner and user of that orbit (at least until their satellites are removed). No other actors can realistically expect to operate there until that time. No other operator would dare run the risk of possible collision with so many other spacecraft in that orbit. Consequently, the sole occupant will be SpaceX, and if “possession is 9/10th of the law,” then SpaceX appears to be the owner of that orbit. Done Without Coordination Additionally, SpaceX and other operators of megaconstellations are doing so without any real international conversation or agreement, which is especially egregious and transgressive of the norms of outer space. Compared to the regime for GSO, as administered by the ITU and national frequency administrators, Low Earth Orbit is essentially ungoverned, and SpaceX and others are attempting to seize this lack of authority to claim entire portions of LEO for itself; and before any international agreement, consensus, or even discussion is had. They are operating on a purely “first come, first served” basis that smacks of unilateralism, if not colonialism. Governments Are Ultimately Implicated As we know, under international space law, what a nongovernmental entity does, a State is responsible for. Article VI of the Outer Space Treaty requires that at least one State authorize and supervise its nongovernmental entities and assure their continuing compliance with international law. As such, the prohibition on nonappropriation imposed upon States under Article II of the Outer Space Treaty applies equally to nongovernmental private entities such as SpaceX. Nevertheless, through the launching and bringing into use of the Starlink constellation, SpaceX will be the sole occupant, and thereby, possessor, both fact and in law, of 550 km, 1100 km, 1130 km, 1275 km, and 1325 km above our planet (or whatever orbits they finally come to occupy). The same is true for the other operators of these large constellations which will be solely occupying entire orbits. Long-Term Occupation Constitutes Appropriation These altitudes are additionally significant, as nonfunctional spacecraft in orbits lower than around 500 km will re-enter the Earth’s atmosphere in months or a few years, but the altitudes selected for the Starlink constellation, while technologically desirable for their purposes, also mean that any spacecraft which are not de-orbited from these regions may be there for decades, or possibly even hundreds of years. By comparison, the granting of rights for orbital slots at GSO is in 15-year increments, a length of time much less than what the altitudes of the megaconstellations threaten. Such long spans of time at these altitudes by these megaconstellations further bolster the contention that this occupation rises to the level of appropriation of these orbits. Prevents Others from Using Space Article I of the Outer Space Treaty establishes that the exploration and use of outer space is “the province of all mankind.” It further requires that this exploration and use shall be by all States “without discrimination of any kind, on a basis of equality and in accordance with international law...” However, when one private corporation so overwhelmingly possesses entire portions of outer space, their use is discriminatory to other potential users and interferes with their freedom to access, explore, and use outer space. So long as these actors are so dominantly possessing and occupying those orbits, their actions exclude others from using them. What other operator would dare use orbits where there are already hundreds of satellites operating as part of a constellation? It would be an extremely unwise and risky decision to try to share these orbits with a mega constellation, so they will likely choose other altitudes and orbits. This massive occupation of particular orbits effectively defeats others from enjoying the use of outer space. While a State can issue permits for one of its corporations allowing them to launch and operate satellites to this extent, that does not automatically mean that their activities in outer space, an area beyond national sovereignty, are therefore in perfect accordance with the strictures of international law. Indeed, national permissions offer no such guarantee. No Due Regard for Others That these megaconstellations violate the prohibition on appropriation in Article II is additionally supported by Article IX of the Outer Space Treaty. Article IX requires that in the exploration and use of outer space, States “shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space... with due regard to the corresponding interests of other States...” There is hardly any way to view this deployment of megaconstellations as showing any type of due regard to the corresponding interests of others. This lack of regard further supports the notion of their unilateral transgressive violations of the purposes of space law norms. Harmful Contamination The impacts of the spacecraft on the pressing issue of space debris need not be gone into detail here. Suffice it to say, megaconstellations threaten mega-debris. The failure rate of these comparatively cheap satellites should give pause, because if 5% of a constellation of 100 satellites fails, this is 5 guaranteed new pieces of debris intentionally introduced to the fragile space domain. Article IX of the Outer Space Treaty warns of harmful contamination of the space environment and requires States to take appropriate measures to prevent this harmful contamination. A responsible government could not, in all seriousness, permit the intentional release of such amounts of space debris, especially in the already fraught orbits that many megaconstellations are headed towards. While the threat of space debris is not directly relevant to the accusation of appropriation of outer space, it goes towards the argument that these actors are conducting activities in a manner lacking in regard to others, and in fact, amounts to excluding others from using the space domain. By excluding others, this has the effect of taking orbits for themselves, which IS occupation. If This Isn’t Appropriation, Then What Is? Arguing in the alternative, if these megaconstellations — in their dominant occupation of entire orbits in orbital planes with numerous satellites — could be considered (merely for the sake of argument) to not be appropriation, we must therefore ask: what would be appropriation? What use of void space, including orbits of the Earth, would constitute actual appropriation? What further, additional fact of these uses of space, if added to the scenario, would cause that constellation to cross over the line into clearly prohibited appropriation? Perhaps the exact same scenario, but supplemented with an actual, formal claim of sovereignty, issued by a government, is the only element which could be added to megaconstellations which would then cross the threshold into appropriation. However, a formal claim of sovereignty would be merely an act occurring on Earth and would not change any actual facts in the space domain. Consequently, the lack of a formal claim of sovereignty should not be the deciding criteria in arriving at the conclusion that megaconstellations constitute appropriation of orbits.

#### 2] Mining

#### Asteroid mining spikes the risk of satellite-dust collisions

Scoles 15 [(Sarah Scoles, freelance science writer, contributor at Wired and Popular Science, author of the books Making Contact and They Are Already Here) “Dust from asteroid mining spells danger for satellites,” New Scientist, May 27, 2015, <https://www.newscientist.com/article/mg22630235-100-dust-from-asteroid-mining-spells-danger-for-satellites/>] TDI

* Study this is citing – Javier Roa, Space Dynamic Group, Applied Physics Department, Technical University of Madrid. Casey J Handmer, Theoretical Astrophysics, California Institute of Technology. Both PhD Candidates. “Quantifying hazards: asteroid disruption in lunar distant retrograde orbits,” arXiv, Cornell University, May 14, 2015, <https://arxiv.org/pdf/1505.03800.pdf>

NASA chose the second option for its [Asteroid Redirect Mission](http://www.nasa.gov/content/what-is-nasa-s-asteroid-redirect-mission/), which aims to [pluck a boulder from an asteroid’s surface](https://www.newscientist.com/article/dn27243-rock-grab-from-asteroid-will-aid-human-mission-to-mars) and relocate it to a stable orbit around the moon. But an asteroid’s gravity is so weak that it’s not hard for surface particles to escape into space. Now a new model warns that debris shed by such transplanted rocks could intrude where many defence and communication satellites live – in geosynchronous orbit. According to [Casey Handmer](http://www.caseyhandmer.com/) of the California Institute of Technology in Pasadena and Javier Roa of the Technical University of Madrid in Spain, 5 per cent of the escaped debris will end up in regions traversed by satellites. Over 10 years, it would cross geosynchronous orbit 63 times on average. A satellite in the wrong spot at the wrong time will suffer a damaging high-speed collision with that dust. The study also looks at the “catastrophic disruption” of an asteroid 5 metres across or bigger. Its total break-up into a pile of rubble would increase the risk to satellites by more than 30 per cent ([arxiv.org/abs/1505.03800](http://arxiv.org/abs/1505.03800)).

#### Space dust wrecks satellites and debris exponentially spirals

Intagliata 17 [(Christopher Intagliata, MA Journalism from NYU, Editor for NPRs All Things Considered, Reporter/Host for Scientific American’s 60 Second Science) “The Sneaky Danger of Space Dust,” Scientific American, May 11, 2017, <https://www.scientificamerican.com/podcast/episode/the-sneaky-danger-of-space-dust/>] TDI

When tiny particles of space debris slam into satellites, the collision could cause the emission of hardware-frying radiation, Christopher Intagliata reports.

Aside from all the satellites, and the space station orbiting the Earth, there's a lot of trash circling the planet, too. Twenty-one thousand [baseball-sized chunks](https://www.scientificamerican.com/article/orbital-debris-space-fence/) of debris, [according to NASA](https://www.orbitaldebris.jsc.nasa.gov/faq.html). But that number's dwarfed by the number of small particles. There's hundreds of millions of those.

"And those smaller particles tend to be going fast. Think of picking up a grain of sand at the beach, and that would be on the large side. But they're going 60 kilometers per second."

Sigrid Close, an applied physicist and astronautical engineer at Stanford University. Close says that whereas mechanical damage—like punctures—is the worry with the bigger chunks, the dust-sized stuff might leave more insidious, invisible marks on satellites—by causing electrical damage.

"We also think this phenomenon can be attributed to some of the failures and anomalies we see on orbit, that right now are basically tagged as 'unknown cause.'"

Close and her colleague Alex Fletcher modeled this phenomenon mathematically, based on plasma physics behavior. And here's what they think happens. First, the dust slams into the spacecraft. Incredibly fast. It vaporizes and ionizes a bit of the ship—and itself. Which generates a cloud of ions and electrons, traveling at different speeds. And then: "It's like a spring action, the electrons are pulled back to the ions, ions are being pushed ahead a little bit. And then the electrons overshoot the ions, so they oscillate, and then they go back out again.”

That movement of electrons creates a pulse of electromagnetic radiation, which Close says could be the culprit for some of that electrical damage to satellites. The study is in the journal Physics of Plasmas. [Alex C. Fletcher and Sigrid Close, [Particle-in-cell simulations of an RF emission mechanism associated with hypervelocity impact plasmas](http://aip.scitation.org/doi/full/10.1063/1.4980833)]

#### **Climate change creates irreversible risks towards staying on Earth**

Jorgen Randers and Ulrich Goluke November 12 2020 (Both have written dozens of these kinds of studies backed by science and various data models. <https://www.nature.com/articles/s41598-020-75481-z> //nk):

So what exactly does the study say? **The researchers used their model to see what would happen by 2500 if emissions stopped today and** **if they slowly declined to zero by 2100,** as AFP explained**. In the first** scenario, **temperatures would still rise to around 2.3 degrees Celsius above pre-industrial levels** within the next 50 years, **taper off, then rise again starting in 2150**. **By 2500, the world would** **be** around **three degrees Celsius warmer** **and sea levels would rise by around three meters** (approximately 9.8 feet). **In the second,** **temperature and sea level rise** would **end up in the same place**, **but the temperature increase would be much faster.** **The reason for the persistent increase comes from** three feedback loops, the model found. The **melting of**[**sea ice**](https://www.ecowatch.com/tag/sea-ice), **which means that the sun's heat is absorbed into the darker**[**ocean**](https://www.ecowatch.com/tag/ocean)**instead of reflected back by the bright ice.** The **thawing of permafrost,** which **releases more greenhouse gases into the atmosphere**. **Increased moisture in the atmosphere**, which **in turn raises temperatures**. The only way to have prevented runaway climate change would have been to have stopped burning [fossil fuels](https://www.ecowatch.com/tag/fossil-fuels) between 1960 and 1970, the model found, as [USA TODAY reported](https://eu.usatoday.com/story/news/nation/2020/11/12/reducing-greenhouse-gas-emissions-stop-climate-change-study/3761882001/)**. In order to stop temperatures and sea levels from rising now, we would have to remove at least 33 gigatons of carbon dioxide from the atmosphere every year starting this one.**

#### Space exploration is key to maintaining

Peter Koteki Quotes from Stephen Hawkings books in 2018 (Koteki is a reporter and Hawking is one of the most important scientists of the 21st century <https://www.businessinsider.com/stephen-hawking-humans-leave-earth-or-be-annihilated-2018-10> //NK)

**Hawking said it was hard** for him **to maintain** his **optimism in light of** all the problems in the world, **particularly political instability and global warming**. **The population is becoming too large for this planet**, and **physical resources are quickly running out**, he pointed out. A number of issues — including **deforestation, the extinction of animal species, rising temperatures, and lack of water** — can be solved, though **we are failing to take appropriate action**, Hawking wrote. He said scientists have a duty to inform the public about the dangers we face, even as **politicians** who deny the existence of man-made climate change **ignore these warnings.** If it hasn't already, **global warming may become self-sustaining** soon, Hawking wrote. For example, **the melting of ice caps** in the Arctic and Antarctic could lower the amount of solar energy that reflects back into space, which would then brings the global temperature up even more. The **Earth could end up looking a lot like Venus**, Hawking said, with **sulfuric acid rains and a boiling temperature** of 482 degrees Fahrenheit. In addition, **a catastrophic asteroid collision is inevitable**, Hawking wrote. (The last big impact, believed to have wiped out dinosaurs, occurred 66 million years.) As a more immediate threat, Hawking said he is concerned about **a possible nuclear war**, saying **there are enough nuclear weapons to destroy humans multiple times over**. Even if we escape to another planet, **it may not be possible to save millions of other species**. Their extinction, Hawking said, "will be on our conscience as a race."

#### That’s key to mitigating existential risks

Reuter 12-9

Timothy Reuter (Head of Aerospace and Drones, World Economic Forum), 12-9-2021, "Why the human race must become a multiplanetary species," World Economic Forum, <https://www.weforum.org/agenda/2021/12/humans-multiplanetary-species/>, //hzheng

Supporters of space exploration sometimes suggest that sending robotic probes to the remote corners of the solar system and beyond can teach us what we need to know about the universe at less cost and risk than sending people. Yet, for the safety of our descendants and to reach humanity’s full potential, we must become a multiplanetary species. Humans have a one in six chance of going extinct this century according to Oxford Philosopher Toby Ord. In his book, The Precipice: Existential Risk and the Future of Humanity, Dr Ord lays out a variety of long-tail risks that are both existential and very difficult to mitigate. These include nature-based risks like asteroids, large-scale volcanic eruptions and stellar explosions. Although we can track many of these phenomena, we do not have the technology (nor are we likely to develop it anytime soon) to prevent large eruptions or redirect large asteroids. Initial efforts to nudge space objects are just beginning. This is to say nothing of the human-created risks of nuclear war or bioweapons intentionally or unintentionally released on the public, a scenario made easier to imagine by the current pandemic. As long as humanity is grouped together on a single planet there will always be a possibility that all of us can be killed at once. It is equivalent to having everyone in a single building: there is always a risk greater than zero of a collapse or fire that kills everyone. By establishing, at first, small outposts and eventually larger scale settlements on other planets, the risk of our species being destroyed is significantly curtailed. On a more positive note, human habitation in a greater variety of settings will radically expedite science and commerce. While we currently have small-scale experimentation with manufacturing items in micro and zero gravity on the International Space Station, the potential for us to set up large-scale industry in different physics requires us to have a presence on other celestial locations. Large-scale settlements of people are hubs of innovation and human flourishing. Just think of how many more discoveries and marvels could be created by 80 billion people in the future instead of today’s 8 billion. Our current planet has a limited carrying capacity but our solar system can accommodate many more people than any single planet can. Just as cultural and geographic variety contributes to the richness of our current society, further expanding the diversity of human settings would continue to expand the creativity of our species. Space travel itself has already been an incredible inspiration to numerous scientists, engineers and artists with many people citing seeing the moon landing as one of the most formative events of their lives. The technologies we develop on our way to becoming a multiplanetary species will also benefit us here on earth. Today, satellites are used to monitor carbon and other greenhouse gas emissions to give us a better picture of the causes of global warming and promote accountability. In her first speech devoted to space, US Vice-President Kalama Harris said: “I truly believe space activity is climate action.” In a recent report, the World Economic Forum's Global Future Council on Space laid out the many ways satellite data is being used to address climate change and suggests feeding data from space-based assets into an “Earth Operations Centre” to provide a real-time picture of activities and phenomena that contribute to warming. Less well known are the many other technologies developed on our way to space but used in our daily lives. The CMOS sensor was first invented at NASA’s Jet Propulsion Laboratory in the 1990s. No one could have predicted that this technology would eventually be part of all our phones, enabling high-quality digital images and affecting everything from how we document human rights abuses to how we present ourselves to potential mates on dating apps.