# Mars

## 1AC – Plan

**Plan: The appropriation of Mars by private entities is unjust.**

#### Normal means is using the non-appropriation principle in the OST to declare Mars *res communis* and prohibit private appropriation

van Eijk 20

Cristian van Eijk, (International Lawyer LLM and BA cum laude) “Sorry, Elon: Mars is not a legal vacuum – and it’s not yours, either”, Völkerrechtsblog, 05.11.2020, doi: [10.17176/20210107-183703-0](https://doi.org/10.17176/20210107-183703-0). // HW AW

The principle of non-appropriation SpaceX risks breaching OST article II, the “cardinal rule” of space law ([Tronchetti, 2007](https://iislweb.org/docs/Diederiks2007.pdf" \t "_blank)). This principle is a jus cogens norm [(Hobe et al. 2009, pp. 255-6)](https://elibrary.bwv-verlag.de/book/99.105025/9783830522195) establishing Mars as res communis, rather than terra nullius. I must acknowledge, with tongue firmly in cheek, that SpaceX is partly correct – states have no sovereignty on Mars. But that does not leave Mars a “free planet” up for grabs – SpaceX has no sovereignty either. On plain reading, article II OST lacks clarity on two key points: i) whose claims are prohibited, and ii) what exactly constitutes a ‘claim of sovereignty’. The first has been answered; per the then-customary interpretative rules and travaux préparatoires, there is quite broad academic consensus ([Hobe, et al. 2017](https://elibrary.bwv-verlag.de/book/99.105025/9783830522195); [Tronchetti, 2007](https://iislweb.org/docs/Diederiks2007.pdf); [Pershing, 2019](https://digitalcommons.law.yale.edu/yjil/vol44/iss1/5/); [Cheney, 2009](https://perma.cc/W3QU-GMTY)) that **sovereign claims include those by private entities**. This is consistent with OST article VI; private entities act in space with state authorisation, and thus state authority. It also accords with the law of state responsibility, wherein conduct of entities exercising state authority is attributable to the state, even if ultra vires ([ARSIWA](https://legal.un.org/ilc/texts/instruments/english/draft_articles/9_6_2001.pdf) articles 5, 7). The second issue is more complex. Much has been written on whether claims to space [resources](https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-of-air-space-law/the-hague-space-resources-governance-working-group) or space property ([Nemitz v United States](https://opil.ouplaw.com/view/10.1093/law:ildc/1986us04.case.1/law-ildc-1986us04" \t "_blank)) are sovereign. In this case, the territorial claim is less clear; is establishing a jurisdiction a sovereign claim “by other means”? SpaceX purports not to create law horizontally via contract, but to establish the only law on Mars – a vertical structure endemic to sovereign legal orders. International caselaw on territorial acquisition agrees; sovereign acts include “legislative, administrative and quasi-judicial acts” (Case concerning sovereignty over Pulau Ligitan and Pulau Sipadan (Indonesia v. Malaysia), [para 148](https://www.icj-cij.org/public/files/case-related/102/102-20021217-JUD-01-00-EN.pdf); Decision regarding delimitation of the border between Eritrea and Ethiopia, [para. 3.29](https://legal.un.org/riaa/cases/vol_XXV/83-195.pdf)) with the exercise of jurisdiction and local administration having “particular, probative value” ([Minquiers and Ecrehos (France v. UK), p. 22](https://www.icj-cij.org/public/files/case-related/17/017-19531117-JUD-01-00-EN.pdf" \t "_blank)). Also relevant are attempts to exclude other states’ jurisdiction ([Island of Palmas (USA v. Netherlands), pp. 838-9](https://pcacases.com/web/sendAttach/714)). An attempt by SpaceX to prescribe its own jurisdiction on Mars would constitute a sovereign claim in breach of OST article II, and entail US responsibility for an internationally wrongful act. Of course, as Thom Cheney [points out](https://www.instagram.com/tv/CG71f4KjwSg/?utm_source=ig_web_button_share_sheet), this is all just words until it isn’t – but there is cause for concern. The Federal Communications Commission (FCC) has been consistently accommodating to commercial space actors, and to SpaceX [in particular](https://fcc.report/IBFS/SAT-MOD-20200417-00037/2274315.pdf), preferring to leave regulation up to markets rather than regulatory bodies. As Commissioner O’Rielly [said](https://docs.fcc.gov/public/attachments/FCC-18-164A1.doc) upon granting SpaceX market access: “our job at the Commission is to approve the qualified applications [by SpaceX et al.] and then let the market work its will.” It is not unforeseeable that the FCC would [prioritise](https://www.vice.com/en/article/z3bxx3/ajit-pai-still-thinks-killing-net-neutrality-was-a-brilliant-idea) corporate objectives over principle, and under an administration increasingly [dismissive](https://www.whitehouse.gov/briefings-statements/remarks-president-trump-74th-session-united-nations-general-assembly/) of the international rule of law, might fail to regulate SpaceX in case of breach. Both SpaceX’s actions or FCC inaction risk breaching OST article II, and could leave the US facing reparations claims from injured state(s). Mars nullius: A thought experiment But **this problem extends beyond the legal**. As previously mentioned, the OST, especially article II, designates Mars as res communis. This precludes territorial acquisition by occupation, which can only legitimately occur on terra nullius. But indulge me for a moment in a half-serious thought experiment. **No provision of outer space law explicitly designates Mars res communis**. The exploration and use of Mars is the “province of mankind” per OST article I (emphasis added), but that language was specifically diluted in negotiations from the originally-proposed “common heritage of mankind”. The Moon is the “common heritage of mankind” ([Moon Agreement](https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/moon-agreement.html), article 5), but only for [18 states](https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXIV-2&chapter=24&clang=_en). The United States has recently and repeatedly attempted to erode the status of space as res communis, including by [treaty](https://www.nasa.gov/specials/artemis-accords/img/Artemis-Accords-signed-13Oct2020.pdf) and by [Executive Order](https://www.whitehouse.gov/presidential-actions/executive-order-encouraging-international-support-recovery-use-space-resources/), and it is not alone. If current trends continue, Mars nullius may come sooner than we think. **That line between res communis and terra nullius is the principal legal obstacle to acquiring extra-terrestrial land by the legal process of occupation.** In territorial acquisition cases, international law distinguishes between the act of attempting to exercise jurisdiction or sovereignty (called an ‘effectivité‘), and the legal right to do so (sovereign title). The former is a question of fact; the latter is a question of law. Absent other sovereign claims, an effectivité compliant with international law is “as good as title” (Island of Palmas (USA v. Netherlands), [p. 839](https://legal.un.org/riaa/cases/vol_II/829-871.pdf); Frontier Dispute (Burkina Faso v. Mali), [para 63](https://www.icj-cij.org/public/files/case-related/69/069-19861222-JUD-01-00-EN.pdf)). Such an effectivité would contravene international law now, but that law is in flux. What if the current rule proves less-than-robust? As shown above, the elements of successful effectivité, state attribution and a sovereign act with sovereign intention, are satisfied. Slipping this provision on the future Martian legal order into satellite broadband Terms of Service serves little purpose – except as basis for a claim prior to some future critical date. Crucially, SpaceX is not an international actor. It is an American company subject to US law and continuing US supervision. In both [Island of Palmas](https://legal.un.org/riaa/cases/vol_II/829-871.pdf) and the [Pedra Branca Dispute](https://www.icj-cij.org/public/files/case-related/130/130-20080523-JUD-01-00-EN.pdf), corporations acting under national authorisation and regulation established sovereign titles for their respective states. A future attempt by SpaceX to act on its Terms could be received by other states, either legally or politically, as an American colonisation of Mars. Concerns and conclusions Three primary concerns emerge from this picture. First, non-appropriation is cardinal for a reason – if breached, international peace and security in space hangs in the balance. Second, even signalling the implementation of a provision so contrary to US obligations without censure risks the international rule of law**.** Finally, and most pragmatically, American vulnerability to future claims by other states should concern American citizens; it is their money, their national reputation on the line. Commercial actors in space present great innovative and developmental potential for all mankind ([Aganaba-Jeanty, 2015](https://www.sciencedirect.com/science/article/abs/pii/S0094576515002842" \t "_blank)), but their so-called ‘self-regulatory’ or administrative role should be taken with a healthy scepticism. We already know how that story ends. As Bleddyn Bowen [put](https://spacewatch.global/2020/10/spacewatchgl-column-the-hell-of-humans-in-heaven-debating-the-risks-of-space-technology-and-habitation/) it, “[t]he continuation of the term ‘colonies’ in describing the potential human future in space should raise political and moral alarm bells immediately given the last 500 years of international relations. Will billionaires run their ‘colonies’ the way they run their factory floors, and treat their citizens like they treat their lowest paid employees?” As humanity expands into space, we will need new legal rules and understandings of sovereignty to govern the process ([Leib, 2015](https://www.tandfonline.com/doi/full/10.1080/14777622.2015.1015112" \t "_blank)). **The current legal order is a critical framework that, without supplement, will someday prove incomplete. The legal governance of Mars is an excellent example.** However, **those new laws must fit into that framework; they cannot hang suspended in a vacuum**. We have seen previously the dangers of rashly governing the global commons based on aspiration and resource hunger ([Ranganathan, 2016](https://academic.oup.com/ejil/article/27/3/693/2197248) and [2019](https://academic.oup.com/ejil/article/30/2/573/5536726)). Martian soil cannot become the [manganese nodules](https://oxford.universitypressscholarship.com/view/10.1093/oso/9780198798200.001.0001/oso-9780198798200-chapter-23) of this century. If anything, it is imperative on us to recognise and correct the inequities the current rules have created ([Craven, 2019](https://academic.oup.com/ejil/article/30/2/547/5536739)) before proposing new ones. Space law is an established rulebook likely to undergo some high-octane developments in coming decades. While Elon is welcome to the table, he cant keep sucking the air from the room. It leaves us space lawyers just shouting into the void.

## 1AC – Colonization

**The pursuit of Mars colonization legitimizes the destructive activity of the ultra-rich**

**Kern 21**

(Sim, <https://www.independent.co.uk/voices/bezos-musk-branson-space-billionaires-b1886741.html>, 7-19)

Last weekend, Richard Branson described his bounce up to low-earth orbit as making space “more accessible to all.” **It’s laughably ironic for a billionaire to co-opt the language of inclusivity to describe the privatization of space flight.** However, mainstream media shared the speech far and wide, largely uncritically, with few journalists pointing out that this carnival ride for the uber-rich was funded with over $200 million dollars in taxpayer subsidies. None that I saw credited Chanda Prescod-Weinstein, the Black feminist astrophysicist whose line Branson reflected, and whose idea of making space accessible to all starts with social justice on earth. With this speech, Branson added to the chorus of billionaires using **science fiction fantasies to sell us on their vanity space programs**. Jeff Bezos will likely treat us to more high-minded speechifying in advance of his launch on Tuesday. He has described Blue Origin’s mission as necessary to avoid putting a limit on energy usage per capita on Earth. Basically, in order to avoid learning to live sustainably here, we must go up to space so we can keep exploiting the hell out of whatever we find up there. As SpaceX’s Elon Musk has said, “We don’t want to be one of those single planet species, we want to be a multi-planet species”. Never mind that we’ve found zero evidence of any kind of life on other planets, let alone intelligent life, let alone intelligent life spread across multiple planets; Musk’s rhetoric echoes a commonly-held belief that space colonization is an inevitability, that it’s our destiny. **We should be wary when rich people say that colonization is our destiny**. That rhetoric sounds awfully similar to Manifest Destiny, which provided greedy men a moral pretense to commit **a lot of atrocities.** I recently wrote a viral Twitter-thread-turned-essay about the enormous challenges of sustaining life in space, and why we’re not going to see lunar colonies anytime soon. But **just because these billionaires won’t succeed in establishing exoplanetary colonies in their lifetimes doesn’t mean their pursuit of them isn’t harmful.** Bezos, Branson, and Musk have sold the public on their space programs, and as a result, **we’re giving them a lot of our wealth** – billions of dollars of taxpayer money and billions in personal investments. What’s more, the global economic system is rigged so that a guy like Bezos can become a hundred-billionaire while profiting off the labor of over a million employees, some working for poverty wages, who piss in bottles to meet quotas and sometimes die at work. Meanwhile, the activities of the corporations that create these billionaires are **ravaging the only habitable** planet we’ve got. But because our neo-feudal lords have sold us on a **science-fiction fantasy**, many look up to them as heroes rather than decrying their **obscene and ill-gotten wealth.** Look, I love science fiction. I’m a sci-fi writer and a lifelong Trekkie. But I’m starting to realize that a public which consumes so much science fiction and so little science fact is dangerous. Just because you watched Matt Damon live on Mars for a year in a movie with convincing graphics doesn’t mean that Elon Musk is on the verge of building a colony there. But when he says he’s going to Mars in six years, there are legions of Musk stans on Twitter who believe him – and his stock soars. One reason we find the fantasy of outer space colonization so irresistible is the **prospect of starting afresh**. Our global society is enormously complicated, with baked-in bigotries and illogical ways of doing things that seem impossible to untangle here on earth. But on another planet, so we assume, we could start over and get it right this time. Realistically, though, there’s **no leaving our messiness behind**, no matter how many light-years away we travel. I can’t think of a better illustration for this than the fact that the moon is already a toilet. When people think of what astronauts left behind on the moon, they might picture Buzz Aldrin planting an American flag. But I picture all the literal shit we left up there. NASA, unlike any respectable hiker, didn’t value “packing out waste”. The pooping protocol for Apollo astronauts involved wearing adhesive bags stuck to their asses, which notoriously tore out pubic hairs when removed. They sealed the bag – hoping nothing escaped to float around the lunar module – and crushed an antibacterial capsule inside, mushing it around with their poop to prevent a future biohazard. Then they chucked the bag out the airlock. Over the course of the Apollo missions, we planted five flags on the moon and ninety-six bags of human excrement. We also left a plaque on the Lunar Lander reading, “We came in peace for all mankind” – never mind that at the time, the US was carpet-bombing Vietnam and hitting the kids who lived there with napalm. Anywhere we travel, we’ll be bringing all our shit – literal and figurative – with us. And as any Apollo astronaut can tell you, shit is much easier to deal with on Earth than in space. **If you care deeply, as I do, about the long-term goals of space science, it’s imperative to put a stop to the world-eating overconsumption that creates billionaires, rather than indulging their pet projects**. For now, the best thing we could do to ensure humanity’s long-term survival in space is to **figure out living sustainably here on earth.** If you’re a sci-fi lover like me, think of it this way: we are already living on a magnificent spaceship uniquely suited to our needs. It is enormous, big enough to bring all our friends and family along. It has excellent gravity and radiation shielding in the form of a breathable atmosphere. It comes with a nearly-unlimited renewable energy source – the Sun – which should last us another billion years before it gets too hot and burns us up.

**Discount optimism about space colonization - there’s a profit incentive to make colonization appear feasible despite technological deficiencies.**

**Prell 18**

(James Prell is a recent graduate of the University of Pennsylvania. He reads and writes about science, technology, and society. [https://www.sciencehistory.org/distillations/the-folly-of-the-martian-back-up-plan 8-17](https://www.sciencehistory.org/distillations/the-folly-of-the-martian-back-up-plan%208-17))

In an interview with the American astrophysicist Neil deGrasse Tyson in 2010, Stephen Colbert called astronauts “the supermodels of science.” The bit was satirical, but Colbert had a point: for many, spaceflight is sexy. The serious question is: do we actually need to send people into space—supermodels or not? In recent years, buzz has surrounded the partnership between NASA and SpaceX, a company whose founder, Elon Musk, has famously stated that he will launch the first manned mission to Mars in 2024. On February 6, SpaceX ran its first test launch of the Falcon Heavy, a rocket system with three reusable boosters that Musk says is the precursor to the BFR, or Big Falcon Rocket, that he intends to build in order to carry the first colonists to Mars. For Musk, an independent colony on Mars would function as a way to "back up the biosphere." If anything were to happen on Earth that could cause an extinction event, such as nuclear war or a meteor strike, Musk sees Mars as a way to ensure that humanity survives. This existential reasoning for traveling to the red planet does **come with a problem**. We have barely developed the technology to consistently launch these rockets. Musk is confident in the tech behind his reusable boosters, but experts like Dan Dumbacher—a former NASA employee—remain skeptical. “We tried to make [the space shuttle] reusable for 55 flights,” he told SpaceNews in 2014. “Look how long and how much money it took for us to do that, and we still weren’t completely successful for all the parts. I want to be realistic: **We are not as smart as we think we are and we don’t understand the environment as well as we think we do.”** The cost of each launch during the space shuttle program, with refurbishment costs taken into account, ran between $450 million and $1.5 billion. SpaceX’s account of their costs have been well below those figures, averaging between $61.2 million and $42.8 million per launch. However, the private company does not have 30 years’ worth of data on refurbishment costs at this point, so it is too early to celebrate its success. And that’s just getting off the ground. It would cost between $121 and $48 billion per person per year to sustain a Martian colony according to data from Popular Science Magazine in 2013, but the real cost is impossible to know without actually going. Why should we spend time and resources trying to survive **on Mars when we could be working to understand how to survive on earth** in the event of the kind of catastrophe that set Musk’s eye on Mars in the first place? If some group were to attempt the journey today, they would need access to technologies that would make them as self-sufficient as possible. After all, Earth would be nearly 33.9 million miles away during its closest pass to the red planet. Water recovery systems that reclaim vapor, wastewater, and urine — like the ones currently installed on the International Space Station — would have to be used on the journey, and sent ahead to Mars along with habitats ready for assembly upon the astronauts’ arrival. According to NASA such a system would have to have an efficiency much higher than the current 74% in order to be viable for deep space missions. The same goes for oxygen regeneration and carbon dioxide removal, which, as of today stands at around 40% efficiency and “must increase significantly” before anyone attempts the journey to Mars. As for food, astronauts would have to rely on a one-time supply of food sent ahead, or attempt to grow it themselves along the way. Since self-sustainability is key, a mission hoping to survive on the dead surface of Mars would likely rely on greenhouses, such as the inflatable ones in development under Dr. Ray Wheeler at NASA. These greenhouses use hydroponic farming techniques to grow crops and “sustain astronauts on a vegetable diet,” with the added benefit of helping carbon dioxide, oxygen, and wastewater management. While all of these systems might be ready for use by a small crew within a few years, a colony of a size large enough to safeguard humanity from extinction would **push them to the breaking point**. It would take, optimistically, **decades before Mars was truly self-sufficient**, and that time and money could be spent working to **prevent the kind of disasters that threaten our existence on Earth**, such as natural disasters related to climate change. On its best day, Mars still barely has an atmosphere. Its core is inactive, which means that it lacks any kind of magnetic field to block out the most intense solar radiation. It is a dead planet that would take efforts only dreamed about in science fiction to colonize. **Even Earth after total nuclear war would be easier to live on.** There is scientific value in the exploration of other planets, but discoveries can be achieved without the steep added cost of having to keep an astronaut **alive during** the trip. Compared to the projected cost of a Martian base, NASA’s Curiosity rover cost a fraction of that, coming in at $2.5 billion. Curiosity has far exceeded its life expectancy of two years and continues to operate today, with the added benefit of not needing to eat, breath, or worry about dying from radiation exposure.

#### Terraforming fails

Chow 18

(Denise, <https://www.nbcnews.com/mach/science/sorry-elon-musk-new-study-says-terraforming-mars-simply-impossible-ncna899021>, 8-9)

Before humans can colonize Mars, we’ll need to figure out a way to make it a bit more hospitable. But a surprising new study suggests that “terraforming” Mars into an Earthlike planet — an idea at the heart of many science fiction novels and films — simply isn’t possible with today's technology. The study, published July 30 in the journal Nature Astronomy, seems to throw cold water on those fictional terraforming schemes — along with some real-world ideas that sound like make-believe: In 2015, SpaceX CEO Elon Musk said we could warm Mars and give it a thicker atmosphere capable of supporting agriculture by detonating nuclear warheads over the planet’s icy poles. There’s no doubt that Mars' thin atmosphere and its soil and icy polar regions contain carbon dioxide. But the new research indicates that there’s not enough of it for us to be able to trigger a sort of runaway greenhouse effect that would turn the red planet into a green one. “The bottom line is that there just isn’t very much there, and it’s hard to put very much back into the atmosphere,” said Bruce Jakosky, a professor of geological sciences at the University of Colorado, Boulder and the study's lead author. “Our conclusion is we can’t do it with today’s technology.” Jakosky and his collaborator, Christopher Edwards, an assistant professor of planetary science at Northern Arizona University in Flagstaff, came up with an estimate for the total amount of carbon dioxide on Mars by looking at data collected by space probes over the past two decades. They concluded that the polar ice caps contain the most accessible stores of carbon dioxide, but that melting the caps — for example, by somehow covering them with sunlight-absorbing dust — wouldn't produce enough gaseous carbon dioxide to terraform the planet. NASA's Mars Reconnaissance Orbiter captured this image of snow and ice covering dunes in Mars' northern hemisphere.NASA / AFP - Getty Images file And tapping the carbon dioxide in Martian soil would likely require heating and strip-mining the entire planet — things the researchers concluded aren't feasible. Astronomer Caleb Scharf, director of the Columbia Astrobiology Center at Columbia University in New York City, said in an email to NBC News MACH that while it might be premature to conclude that we know the full extent of carbon dioxide on Mars, the study was “nicely done.” “We may have to simply accept that Mars will remain an alien environment, and what we could do with currently feasible terraforming is simply to bring it to a state that makes habitation easier, but not easy,” Scharf said in the email. “And of course all of this is likely moot, since the chances of us launching a full-scale terraforming effort on Mars anytime soon seem pretty remote.”

**Private colonization makes solving terrestrial threats like warming impossible**

**Bharmal 18**

(Zahaan works for Google and is a recipient of Nasa’s Exceptional Public Achievement Medal for YouTube Space Lab. [https://www.theguardian.com/science/blog/2018/aug/28/the-case-against-mars-colonisation 8-28](https://www.theguardian.com/science/blog/2018/aug/28/the-case-against-mars-colonisation%208-28))

The most polarising issue in the Mars debate is arguably the tension between those dreaming of a second home and those prioritising the one we have now. Before his death, Stephen Hawking made the bleak prediction that humanity only had 100 years left on Earth. Faced with a growing list of threats – climate change, overpopulation, nuclear war – Hawking believed that we had reached "the point of no return" and had no choice as a species but to become multi-planetary – starting with the colonisation of Mars. Elon Musk has also said on numerous occasions that we need a “backup planet” should something apocalyptic – like an asteroid collision – destroy Earth. **However, not everyone agrees**. In the Pew survey mentioned earlier, a majority of US adults believed that Nasa’s number one priority should be fixing problems on Earth. The billions – if not trillions – of dollars needed to colonise Mars could, for example, **be better spent investing in renewable forms of energy to address climate change or strengthening our planetary defenses against asteroid collisions.** And of course, **if we have not figured out how to deal with problems of our own making here on Earth, there is no guarantee that the same fate would not befall Mars colonists.** Furthermore, if something truly horrible were to happen on Earth, it’s not clear Mars would actually be an **effective salvation.** Giant underground bunkers on Earth, for example, **could protect more people, more easily than a colony on Mars**. And in the event of apocalyptic scenario, it is possible that the conditions on Earth – **however horrific** – **may still be more hospitable than the Martian wasteland**. Let's not forget that Mars has next to no atmosphere, only one third gravity and is exposed to surface radiation approximately 100 times greater than on Earth.

#### Warming causes extinction.

Dr. Peter Kareiva 18 – Ph.D. in Ecology and Applied Mathematics from Cornell University, Director of the Institute of the Environment and Sustainability at UCLA, Pritzker Distinguished Professor in Environment & Sustainability at UCLA, et al., September 2018, “Existential Risk Due To Ecosystem Collapse: Nature Strikes Back”, Futures, Volume 102, p. 39-50

In summary, six of the nine proposed planetary boundaries (phosphorous, nitrogen, biodiversity, land use, atmospheric aerosol loading, and chemical pollution) are unlikely to be associated with existential risks. They all correspond to a degraded environment, but in our assessment do not represent existential risks. However, the three remaining boundaries (climate change, global freshwater cycle, and ocean acidification) do pose existential risks. This is because of intrinsic positive feedback loops, substantial lag times between system change and experiencing the consequences of that change, and the fact these different boundaries interact with one another in ways that yield surprises. In addition, climate, freshwater, and ocean acidification are all directly connected to the provision of food and water, and shortages of food and water can create conflict and social unrest. Climate change has a long history of disrupting civilizations and sometimes precipitating the collapse of cultures or mass emigrations (McMichael, 2017). For example, the 12th century drought in the North American Southwest is held responsible for the collapse of the Anasazi pueblo culture. More recently, the infamous potato famine of 1846–1849 and the large migration of Irish to the U.S. can be traced to a combination of factors, one of which was climate. Specifically, 1846 was an unusually warm and moist year in Ireland, providing the climatic conditions favorable to the fungus that caused the potato blight. As is so often the case, poor government had a role as well—as the British government forbade the import of grains from outside Britain (imports that could have helped to redress the ravaged potato yields). Climate change intersects with freshwater resources because it is expected to exacerbate drought and water scarcity, as well as flooding. Climate change can even impair water quality because it is associated with heavy rains that overwhelm sewage treatment facilities, or because it results in higher concentrations of pollutants in groundwater as a result of enhanced evaporation and reduced groundwater recharge. Ample clean water is not a luxury—it is essential for human survival. Consequently, cities, regions and nations that lack clean freshwater are vulnerable to social disruption and disease. Finally, ocean acidification is linked to climate change because it is driven by CO2 emissions just as global warming is. With close to 20% of the world’s protein coming from oceans (FAO, 2016), the potential for severe impacts due to acidification is obvious. Less obvious, but perhaps more insidious, is the interaction between climate change and the loss of oyster and coral reefs due to acidification. Acidification is known to interfere with oyster reef building and coral reefs. Climate change also increases storm frequency and severity. Coral reefs and oyster reefs provide protection from storm surge because they reduce wave energy (Spalding et al., 2014). If these reefs are lost due to acidification at the same time as storms become more severe and sea level rises, coastal communities will be exposed to unprecedented storm surge—and may be ravaged by recurrent storms. A key feature of the risk associated with climate change is that mean annual temperature and mean annual rainfall are not the variables of interest. Rather it is extreme episodic events that place nations and entire regions of the world at risk. These extreme events are by definition “rare” (once every hundred years), and changes in their likelihood are challenging to detect because of their rarity, but are exactly the manifestations of climate change that we must get better at anticipating (Diffenbaugh et al., 2017). Society will have a hard time responding to shorter intervals between rare extreme events because in the lifespan of an individual human, a person might experience as few as two or three extreme events. How likely is it that you would notice a change in the interval between events that are separated by decades, especially given that the interval is not regular but varies stochastically? A concrete example of this dilemma can be found in the past and expected future changes in storm-related flooding of New York City. The highly disruptive flooding of New York City associated with Hurricane Sandy represented a flood height that occurred once every 500 years in the 18th century, and that occurs now once every 25 years, but is expected to occur once every 5 years by 2050 (Garner et al., 2017). This change in frequency of extreme floods has profound implications for the measures New York City should take to protect its infrastructure and its population, yet because of the stochastic nature of such events, this shift in flood frequency is an elevated risk that will go unnoticed by most people. 4. The combination of positive feedback loops and societal inertia is fertile ground for global environmental catastrophes. Humans are remarkably ingenious, and have adapted to crises throughout their history. Our doom has been repeatedly predicted, only to be averted by innovation (Ridley, 2011). However, the many stories of human ingenuity successfully addressing existential risks such as global famine or extreme air pollution represent environmental challenges that are largely linear, have immediate consequences, and operate without positive feedbacks. For example, the fact that food is in short supply does not increase the rate at which humans consume food—thereby increasing the shortage. Similarly, massive air pollution episodes such as the London fog of 1952 that killed 12,000 people did not make future air pollution events more likely. In fact it was just the opposite—the London fog sent such a clear message that Britain quickly enacted pollution control measures (Stradling, 2016). Food shortages, air pollution, water pollution, etc. send immediate signals to society of harm, which then trigger a negative feedback of society seeking to reduce the harm. In contrast, today’s great environmental crisis of climate change may cause some harm but there are generally long time delays between rising CO2 concentrations and damage to humans. The consequence of these delays are an absence of urgency; thus although 70% of Americans believe global warming is happening, only 40% think it will harm them (http://climatecommunication.yale.edu/visualizations-data/ycom-us-2016/). Secondly, unlike past environmental challenges, the Earth’s climate system is rife with positive feedback loops. In particular, as CO2 increases and the climate warms, that very warming can cause more CO2 release which further increases global warming, and then more CO2, and so on. Table 2 summarizes the best documented positive feedback loops for the Earth’s climate system. These feedbacks can be neatly categorized into carbon cycle, biogeochemical, biogeophysical, cloud, ice-albedo, and water vapor feedbacks. As important as it is to understand these feedbacks individually, it is even more essential to study the interactive nature of these feedbacks. Modeling studies show that when interactions among feedback loops are included, uncertainty increases dramatically and there is a heightened potential for perturbations to be magnified (e.g., Cox, Betts, Jones, Spall, & Totterdell, 2000; Hajima, Tachiiri, Ito, & Kawamiya, 2014; Knutti & Rugenstein, 2015; Rosenfeld, Sherwood, Wood, & Donner, 2014). This produces a wide range of future scenarios. Positive feedbacks in the carbon cycle involves the enhancement of future carbon contributions to the atmosphere due to some initial increase in atmospheric CO2. This happens because as CO2 accumulates, it reduces the efficiency in which oceans and terrestrial ecosystems sequester carbon, which in return feeds back to exacerbate climate change (Friedlingstein et al., 2001). Warming can also increase the rate at which organic matter decays and carbon is released into the atmosphere, thereby causing more warming (Melillo et al., 2017). Increases in food shortages and lack of water is also of major concern when biogeophysical feedback mechanisms perpetuate drought conditions. The underlying mechanism here is that losses in vegetation increases the surface albedo, which suppresses rainfall, and thus enhances future vegetation loss and more suppression of rainfall—thereby initiating or prolonging a drought (Chamey, Stone, & Quirk, 1975). To top it off, overgrazing depletes the soil, leading to augmented vegetation loss (Anderies, Janssen, & Walker, 2002). Climate change often also increases the risk of forest fires, as a result of higher temperatures and persistent drought conditions. The expectation is that forest fires will become more frequent and severe with climate warming and drought (Scholze, Knorr, Arnell, & Prentice, 2006), a trend for which we have already seen evidence (Allen et al., 2010). Tragically, the increased severity and risk of Southern California wildfires recently predicted by climate scientists (Jin et al., 2015), was realized in December 2017, with the largest fire in the history of California (the “Thomas fire” that burned 282,000 acres, https://www.vox.com/2017/12/27/16822180/thomas-fire-california-largest-wildfire). This catastrophic fire embodies the sorts of positive feedbacks and interacting factors that could catch humanity off-guard and produce a true apocalyptic event. Record-breaking rains produced an extraordinary flush of new vegetation, that then dried out as record heat waves and dry conditions took hold, coupled with stronger than normal winds, and ignition. Of course the record-fire released CO2 into the atmosphere, thereby contributing to future warming. Out of all types of feedbacks, water vapor and the ice-albedo feedbacks are the most clearly understood mechanisms. Losses in reflective snow and ice cover drive up surface temperatures, leading to even more melting of snow and ice cover—this is known as the ice-albedo feedback (Curry, Schramm, & Ebert, 1995). As snow and ice continue to melt at a more rapid pace, millions of people may be displaced by flooding risks as a consequence of sea level rise near coastal communities (Biermann & Boas, 2010; Myers, 2002; Nicholls et al., 2011). The water vapor feedback operates when warmer atmospheric conditions strengthen the saturation vapor pressure, which creates a warming effect given water vapor’s strong greenhouse gas properties (Manabe & Wetherald, 1967). Global warming tends to increase cloud formation because warmer temperatures lead to more evaporation of water into the atmosphere, and warmer temperature also allows the atmosphere to hold more water. The key question is whether this increase in clouds associated with global warming will result in a positive feedback loop (more warming) or a negative feedback loop (less warming). For decades, scientists have sought to answer this question and understand the net role clouds play in future climate projections (Schneider et al., 2017). Clouds are complex because they both have a cooling (reflecting incoming solar radiation) and warming (absorbing incoming solar radiation) effect (Lashof, DeAngelo, Saleska, & Harte, 1997). The type of cloud, altitude, and optical properties combine to determine how these countervailing effects balance out. Although still under debate, it appears that in most circumstances the cloud feedback is likely positive (Boucher et al., 2013). For example, models and observations show that increasing greenhouse gas concentrations reduces the low-level cloud fraction in the Northeast Pacific at decadal time scales. This then has a positive feedback effect and enhances climate warming since less solar radiation is reflected by the atmosphere (Clement, Burgman, & Norris, 2009). The key lesson from the long list of potentially positive feedbacks and their interactions is that runaway climate change, and runaway perturbations have to be taken as a serious possibility. Table 2 is just a snapshot of the type of feedbacks that have been identified (see Supplementary material for a more thorough explanation of positive feedback loops). However, this list is not exhaustive and the possibility of undiscovered positive feedbacks portends even greater existential risks. The many environmental crises humankind has previously averted (famine, ozone depletion, London fog, water pollution, etc.) were averted because of political will based on solid scientific understanding. We cannot count on complete scientific understanding when it comes to positive feedback loops and climate change.

**Mars colonization attempts destroy OST legitimacy**

**Salmeri 20**

Antonino Salmeri, (attorney and doctoral researcher in space law at the University of Luxembourg, where he is pursuing a Ph.D. on space mining enforcement), 12-5-2020, "No, Mars is not a free planet, no matter what SpaceX says," SpaceNews, https://spacenews.com/op-ed-no-mars-is-not-a-free-planet-no-matter-what-spacex-says/, // HW AW

\*\*bracketed for roman numerals

SpaceX makes no secret of its driving goal to make humans a multiplanetary species. Given SpaceX founder Elon Musk’s fixation on Mars and fondness for Tesla ‘Easter eggs’ and other gags, it’s hardly surprising to see Mars mentioned in the terms of service (ToS) agreement for beta users of its Starlink satellite broadband service. However, as a space lawyer, I certainly didn’t expect Starlink’s beta ToS to include the following provision: “For services provided on Mars, or in transit to Mars via Starship or other colonization spacecraft, the parties recognize Mars as a free planet and that no Earth-based government has authority or sovereignty over Martian activities. Accordingly, Disputes will be settled through self-governing principles, established in good faith at the time of the Martian settlement.” To be sure, SpaceX might have inserted Clause 9 as another one of Musk’s jokes that aren’t really jokes, like the time he invoked South Park’s infamous underwear gnomes in explaining how he intended to fund his ambitious Mars colonization plans. After all, there are no Starlink satellites orbiting Mars, and no prospective customers there yet, either. But international law is no laughing matter. Taken literally, Starlink users must agree with SpaceX that Mars is a “free planet” and that disputes concerning Starlink services provided on Mars or while en route to the red planet via a SpaceX Starship — will be settled through self-regulation. But is this clause valid? What are the political implications of a transportation company proclaiming the legal status of a celestial body? Does such an attempt make strategic sense? LEGAL ASPECTS From a legal viewpoint, Clause 9 of Starlink’s terms of service should be regarded as void. Simply put, declaring Mars as a “free planet” and refusing any Earth-based authority over Martian activities conflicts with the international obligations of the United States under the Outer Space Treaty, which naturally take precedence over contractual terms of services. First, under Articles I and III of the treaty, international law applies in outer space, including the moon and other celestial bodies, and influences all activities conducted thereby. Accordingly, Mars cannot be considered a “free planet” left to “self-governing principles” of dubious nature and origin, because it is rather fully subjected to the rule of law. A passenger-laden Starship enters Mars’ atmosphere in this artist’s concept. Credit: SpaceX illustration Further, Starlink’s **refusal of Earth-based governmental authority on Mars is in clear violation of Article [8]** VIII **of the treaty.** According to this provision, states “retain jurisdiction and control”over any registered space objects and “any personnel thereof, while in outer space or on a celestial body.” This principle is known as “quasi-territorial” jurisdiction and serves the purpose of ensuring the applicability of relevant national laws, **preventing space from being abandoned to the rule of the strongest**. As an American company, SpaceX is obliged under U.S. law to respect these rules in order to get licenses from the U.S. government to conduct commercial launches and provide satellite services. This is mandated by Article VI of the treaty, according to which nongovernmental activities in space require the “authorization and continuing supervision of the appropriate State,” which is internationally responsible for assuring that these activities “are carried out in conformity with the provisions set forth in the present Treaty.” As such, any attempt to declare “Mars as a free planet” and reject the authority of “Earth-based government” over Martian activities is in violation of international space law and would consequently bear no legal effect on third parties. POLITICAL IMPLICATIONS **SpaceX’s declaration on the legal status of Mars is not without political implications**. Interestingly enough, a thorough look at the first part of Starlink’s terms of service Clause 9 shows that SpaceX doesn’t seem to have problems with “Earth-based authority” regulating lunar activities: “For Services provided to, on or in orbit around the planet Earth or the Moon, these Terms and any disputes […] will be governed by and construed in accordance with the laws of the State of California in the United States.” Nevertheless, under international space law there are no grounds to distinguish between the moon and Mars; the same rules apply to “the Moon and other celestial bodies.” Assuming SpaceX knows this, it appears that **the company is sending a political message to subvert the status quo and establish a separate regime for Mars**. Now, if SpaceX was merely an internet service provider, the issue would be purely theoretical with no reason for any further concern. However, SpaceX fully intends to send the first humans to Mars. As such, the company’s refusal to respect international law once its en route could put SpaceX’s passengers in real peril. These early passengers would fully depend on SpaceX for their survival en route to Mars and while on the surface, not to mention their prospects for returning to Earth. One the one hand, you have a company that controls the means to survival; on the other hand, you have a group of fragile individuals potentially stranded in an incredibly hostile environment a long, long way from home. How could SpaceX seriously refer to principles established in “good faith” given such a massive imbalance of power? Politically speaking, declaring Mars a “free planet” would condemn its first inhabitants to the indisputable will of a private corporation — a dangerous situation threatening the fundamental rights of any human traveling with SpaceX. STRATEGIC CONSIDERATIONS Truth to be told, **any attempt to escape international law on Mars may actually turn out to be strategically counterproductive**. First, as any international lawyer knows, the only support for declaring Mars a “free planet” can only come from the applicability of international law, not its denial. Under Article I (2) of the UN Charter, any independent community of humans enjoys the right to self-determination. If and when SpaceX’s vision of a million people living on Mars becomes a reality, there is no doubt that this community would be entitled to political independence and self-regulation. However, this outcome can neither be imposed in advance nor accomplished against international law. Rather, it can only develop from the natural evolution of the circumstances, under the safeguards of the rule of law. In the early stages, any Martian settlement will have to rely on Earth’s supplies, technologies, personnel and overall logistical support. Conversely, this dependence will also **imply the legitimate exercise of Earth-based authority in order to protect** the **settlement from degenerating into violence and Wild West types of behaviors**. Later, when the settlement has developed an autonomous structure and a balanced division of powers, then independence and self-regulation would naturally follow — but not a minute before the conditions for protecting fundamental rights are established. Finally, another reason why SpaceX’s declaration may become counterproductive can be identified by looking at the company’s core business: launching spacecraft for a government-heavy customer base. Openly refusing governmental authority while still depending on governmental contracts is not exactly a smart move; it undermines the credibility of SpaceX as a reliable partner and advantages its competitors. If a government had to choose between an expensive service from a company pledging allegiance to the rule of law and a cheap one from an enterprise trying to impose “self-governing principles established in good faith,” there is little doubt which one will be awarded a contract. Actually, with such terms of service, SpaceX would not even be authorized to launch its Starships toward Mars in the first place. There can be no doubts that **applying international law on other celestial bodies is the best way to preserve the exploration and use of outer space as the province of all humankind**. Space activities, no matter where in the solar system, shall always be conducted under the safeguards of the rule of law. No company should be allowed to question this essential principle in the attempt to turn outer space into a modern Wild West. SpaceX’s defiance of international law should be taken very seriously and stopped now, before the company is able to push it to the point of establishing its private domain on Mars. **The future of space as a peaceful, fair and inclusive domain may very well depend on this.**

**OST collapse kills multilateralism**

**Cheney 20** (Thomas has a PhD in space law from Northumbria University, where his research focused on space resources and the associated issues of the relationship between property rights and sovereignty, Space Resource the Need for Multilateralism in Outer Space, Space Resource the Need for Multilateralism in Outer Space, <https://www.open.ac.uk/research-groups/astrobiology/blog/space-resource-need-multilateralism-outer-space>) // HW ML

24 April 2020 is the International Day of Multilateralism and Diplomacy for Peace. This post will argue that a multilateralism is vital for the effective maintenance of order in outer space. It will use space resources as a case study to make this argument. **The Outer Space Treaty**, the foundational legal instrument for the space law regime, **is an outstanding example of a multilateral instrument.** While often perceived as a Cold War bargain between the Untied States and the Soviet Union, the Outer Space Treaty was negotiated by the (then) 28 member states of the UN Committee on the Peaceful Uses of Outer Space.[1] The negotiating record is full of interjections by delegates from a relatively diverse range of countries, and important contributions were made by delegations from countries like Brazil and Japan. Furthermore, the treaty is open to all States and in Article I declares that the use and exploration of outer space is a freedom enjoyed by all States. COPUOS remains an important forum for the continuing discussion of space governance and has grown to approximately 95 members with the Outer Space Treaty now has over 109 parties.[2] Outer space, particularly Earth orbit naturally lends itself to a multilateral governance structure, however, just as with terrestrial governance, **multilateralism in outer space is under threat**. Space resources represent one strain of that ‘threat’. Several States responded to the promulgation, by the United States in 2015, of national legislation on space resources with claims of ‘unilateralism’. Subsequent discussions at UNCOPUOS and further developments since have highlighted the risk of diverging approaches to space resources and **the potential danger of ‘fragmentation’ of ´space law regime. This could have disastrous consequences and is a perfect example of why we need to retrench a multilateral approach to space governance.** The space resource industry and its advocates constantly proclaim the need for property rights and/or legal certainty in order to acquire the necessary funding in order to conduct space resource activities. This makes sense, at the most basic level in order to secure investment you need to be able to convince investors that if you go to the trouble (and expense) of locating viable ‘ore’ deposits and then extracting them you will be able to make a profit from the exercise. However, property rights, as they are generally understood, rely on the backing of a State to protect and enforce those rights. Traditionally, this would be done by annexation of the territory concerned (as with the ‘Guano islands’ in the late 19th century)[3] or other territorial measures. However, this is prohibited by Article II of the Outer Space Treaty. Beyond such a remedy raw force would be necessary to protect ‘property rights’, however this is a recipe for anarchy and only provides security insofar as you are able to actually protect your ‘property’ (although technically annexation only provides security to the extent that the State is actually able to protect that territory, as English colonies in North America and elsewhere demonstrated Spanish declarations of sovereignty over territory didn’t amount to much in the areas beyond their actual control.) However, **a multilateral approach would enable a mutually beneficial solution**. Further, there are multiple reasons this is so. While, it is possible to grant ‘property rights’ over resources once they have been extracted from a celestial body without violating Article II of the Outer Space Treaty, the space resources industry needs more than that. They need to be sure they don’t have to worry about ‘claim jumping’ and a host of other issues, some of which were explored during the drafting of The Hague International Space Resources Governance Working Group’s Building Blocks for the Development of an International Framework on Space Resource Activities.[4] While **individual countries** can provide assurances of these things against claims or actions between their own citizens they are **unable to provide assurances, beyond the vague protections** offered by Article IX of the Outer Space Treaty and its injunction against ‘harmful interference’, against actions taken by citizens of other countries (at least without violating Article II of the Outer Space Treaty. However, **some sort of multilateral framework**, such as that proposed by The Hague Working Group, **would be able to provide such protections**. Similar multilateral frameworks already exist. The International Telecommunications Union provides such a framework for regulation of radio frequency which avoids harmful interference with satellite and radio communication by coordinating spectrum use. So it is possible, it just needs to be developed. Further, now is perhaps the best time to negotiate such a framework, or at least the basic principles of one. We still benefit from a relative ‘veil of ignorance’, sure we can be reasonably certain who the ‘major players’ will be in any ‘race’ for space resources but no one, as yet, has any entrenched interests. And while it is easy to be cynical, the evidence from UNCOPUOS and indeed President Trump’s recent executive order is encouraging. There is broad agreement and a desire to maintain the multilateral nature of space governance. Multilateralism isn’t about a utopian vision for international relations, it is about balancing interests and compromising, in short it is the essence of diplomacy. 75 years ago, in the final days of calamity that was the Second World War the nations of this planet committed to embracing multilateralism embodied by the United Nations in order to ensure the peace and build a better future. And they reaffirmed that in the Outer Space Treaty, the foundation for the governance of humanity’s journey into the cosmos. We shouldn’t abandon it now.

#### Multilateralism solves a laundry list of impacts

Esther Brimmer 14 [Assistant Secretary for the Bureau of International Organization Affairs at the United States Department of State from April 2009 to June 2013, “Smart Power” and Multilateral Diplomacy, June, <http://transatlantic.sais-jhu.edu/publications/books/Smarter%20Power/Chapter%204%20brimmer.pdf>] Recut Justin

Over the subsequent decade, the variable definitions of Smart Power have evolved to reflect a rapidly changing foreign affairs landscape – a landscape shaped increasingly by transnational issues and what can only be described as truly global challenges. Nations of the world must now calibrate their foreign policy investments to try to leverage new opportunities while protecting their interests from emerging vulnerabilities. Smart Power is no longer an alternative path; it is a four-lane imperative. ¶ The world in 2014 is fundamentally different from previous periods, growing vastly more interconnected, interdependent, networked, and complex. National economies are in many cases inextricably intertwined, with cross-border imports and exports increasing nearly tenfold over the past forty years, and more than doubling over just the past decade. At the same time, we are all connected – and connected immediately – to news and events that in past generations would have been restricted to their local vicinities.¶ Consider, for example, the 2011 tsunami that devastated parts of Japan. Not only did we know in real time of the earthquake that triggered the tsunami, we had live coverage of some of the tsunami’s most devastating impacts and then round-the-clock coverage of the Fukushima nuclear power plant crisis. Communications technology brings such events to us without delay and in high definition. This communications revolution, headlined by the explosion of social media, carries with it the almost unlimited potential to inform and educate. It also provides people and communities with new ability to influence and advance their causes – both benevolent and otherwise, as the dramatic events of recent years in North Africa and the Middle East have made clear. ¶ At the same time, global power is more diffuse today than in centuries. Although predictions of the nation-state’s demise have gone unrealized, non-state actors – including NGOs, corporations, and international organizations - are more influential today than perhaps at any point in human history. The same might be said for transnational criminal networks and other harmful actors. Concurrently, we are witnessing the rise of new centers of influence – the so-called “emerging” nations – that are seeking and gaining positions of global leadership. These emerging powers bring unique histories and new perspectives to the discussion of current challenges and the future of global governance. Several of these countries are democracies and share many of the core values of the United States; others have sharply different political systems and perspectives. All are gauging how to be more active in the global arena. ¶ It is this new, more diffused global system that must now find means of addressing today’s pressing global challenges – challenges that in many cases demand Smart Power ingenuity. From terrorism to nuclear proliferation, climate change to pandemic disease, transnational crime to cyber attacks, violations of fundamental human rights to natural disasters, today’s most urgent security challenges pay no heed to state borders. ¶ So, just as global power is more diffuse, so too are the opposing threats and challenges, and it is in this new reality that the United States must define and employ its Smart Power resources. That reality demands a definition that must now far exceed the origin parameters of hard and soft. Many of these challenges would be unresponsive to traditional Hard tools (coercion, economic sanctions, military force), while the application of Soft tools (norm advancement, cultural influence, public diplomacy) in customary channels is likely to provide unsatisfactory impact. ¶ Ultimately, the other component necessary in today’s Smart Power alchemy is robust, focused, and sustained international cooperation. In effect, in an increasing number of instances, Smart Power must now feature shared power, and in that context foreign policy choices must follow two related but distinct axes. ¶ First, those policy choices must strengthen a state’s overall stature and influence (rather than diminish it), leaving the state undertaking the action in a position of equal or greater global standing. This is easier said than done. The proliferation in challenges facing all states has created a need for multiple, simultaneous diplomatic transactions among a broadening cast of actors. Given the nature of today’s threats facing states both large and small, those transactions have never been more frequent and at times overlapping – a reality that requires new agility and synchronization within foreign policy hierarchies. States that are less capable of responding to this new reality may experience diminished political capital and international standing by acting on contemporary threats in isolation or without a full appreciation of the reigning international sentiment. Many observers have highlighted U.S. decision-making in advance of the 2003 Iraq invasion as indicative of just this phenomenon. ¶ Alternatively, states applying a new Smart Power approach to their foreign policy recognize the overlapping need to maintain global standing and stature while seeking resolution of individual policy challenges. We see considerable effort on the part of emerging powers to find just that balance, and I would argue that the United States has also made great strides in that regard since 2009. ¶ Second, Smart Power policy choices must contribute to the strength and resilience of the international system. As noted above, the globalization of contemporary challenges and security threats has augmented the need for effective cooperation among states and other international actors, and placed even greater demands on the global network of international institutions, conferences, frameworks, and groupings in which these challenges are more and more frequently addressed. Given this heightened need for structures to facilitate international collaboration, states are more rarely undertaking foreign policy courses of action that entirely lack a multilateral component, or that feature no interaction with or demands upon the international architecture. As recent American history shows, even states with unilateral tendencies have found themselves returning to the multilateral fold to address aspects of a threat or challenge that simply cannot be addressed effectively alone.

#### Mars colonization is inseparable from military violence

Williston 20

(Byron Williston is Professor of Philosophy at Wilfrid Laurier University and a member of the Interdisciplinary Centre on Climate Change at the University of Waterloo, <https://bostonreview.net/articles/byron-williston-taking-space-back-space-cadets/>, 5-26)

Deudney arrives at this insight by placing the drive to colonize the heavens in the larger context of the twentieth-century development of weapons of mass destruction as well as the efforts we have made—via bilateral and multilateral treaties and other legal regimes—to contain the threat they pose. The book’s thesis is that unfettered space expansion is likely to increase the threat of large-scale violence and generally exacerbate human insecurity. If we adopt this approach, Mars colonization should be shelved, for now at least, while we expand and enhance the terms of the Outer Space Treaty, an international agreement crafted in 1966 that places limits on various forms of space adventurism and militarization (for starters, nobody can own the moon). Because it is unapologetically boring, hard-core expansionists will loathe the CSP. With its focus on rules and restraints, it can sound like the over-anxious parent wagging a scolding finger at the impetuous teenager who just wants to have some harmless fun. The problem is that there’s nothing harmless about space expansion. Deudney’s book exposes the persistent refusal of its advocates to think meaningfully about the consequences of their proposals. So just as we parents seek various ways of restraining the teenager who sees no problem with doing hard drugs, binge drinking, or driving at breakneck speed, we should find ways of curbing the urge to “leave the Earth.” Dull advice if your dream was to, say, terraform Mars. But perhaps boring is not so bad in this area. “Space choices,” Deudney remarks drily, “are too important to be left to space cadets.” The same has been said about several other meeting places of science and society in the twentieth century—the development of nuclear weapons, above all. For Deudney, it is crucial to emphasize that the intercontinental ballistic missiles we already have are in fact “the quintessential space weapon.” They mark a major weapons innovation because they arc through space on their way across the globe. The frictionless medium allows them to travel at roughly 10,000 miles per hour and thus reach their intercontinental targets in under half an hour. (For a sense of scale, recall the Earth’s equator is just shy of 25,000 miles long.) In the beginning we went to space with the express mission of winning the Cold War and becoming more efficient at killing each other, a historical reality that tugs against the breathless visions of the technologists. In fact, this past looms over the whole subsequent project of space expansion. The quest to inhabit other worlds, Deudney suggests, has piggybacked on this darker purpose without ever fully coming to terms with it. If this is right, we must look beyond the breezy pleadings of space expansion’s most ardent advocates and examine the actual arguments for this grand vision. There have been three broad patterns of attempted justification. The first appeals to evolution, the second to long-term human security, and the last to the expansion of human freedom

#### **No checks on escalation.**

MacDonald 18. Bruce W. MacDonald, professor at the Johns Hopkins University School of Advanced International Studies (SAIS), ("Outer Space; Earthly Escalation? Chinese Perspectives on Space Operations and Escalation," August 2018, *NSI* white paper, <https://nsiteam.com/social/wp-content/uploads/2018/08/SMA-White-Paper_Chinese-Persepectives-on-Space_-Aug-2018.pdf>, accessed 7-14-2019) bm

Challenges across all five phases: Another escalation threat is the inexperience that nations share in the space and cyber domains, unlike in conventional domains of conflict and in the nuclear domain to a lesser extent. This inexperience gives rise to a “sorcerer’s apprentice” problem, placing leaders at risk of making potentially unwise judgment calls without a full grasp of their implications. The space and cyber domains are sufficiently new and dynamic that such decisions are highly likely. Adding to this uncertainty is the ever-growing interdependence of infrastructures within and among advanced countries, making the impact of major attacks against a country’s space and/or cyber infrastructures inherently unknowable. In considering all these factors, it is important to keep in mind that events in space do not happen in isolation. Any space conflict would likely be part of a multidimensional field of play, with space being important because of the effects it has on the earth. Significant instability in space is unlikely to lead to war if there is stability in other domains and in the larger geopolitical relationship between participants, while conflict could easily spread to a stable space domain if war in other domains appeared preferable to the alternative. While any use of nuclear weapons would pose a serious threat of escalation to full-scale nuclear war, any use of space or cyber offense would not pose a comparable escalation threat. That said, a series of reciprocal escalations could easily become unstable. No clear-cut escalation barrier exists in the space and cyber domains, and given the short-term tactical benefits of escalating ahead of an adversary, each additional escalation could create incentives for further escalation that an adversary would not always anticipate. Escalation in space, then, is a slippery slope with few off-ramps.

#### Nuke war causes extinction

Webber 19 – Dr Philip Webber has written widely on nuclear issues and is Chair of Scientists for Global Responsibility (SGR) – a membership organisation promoting responsible science and technology. We will all end up killing each other and one nuclear blast could do it. 5/18/19. [METRO.UK “We will all end up killing each other and one nuclear blast could do it,” <https://metro.co.uk/2019/05/18/we-will-all-end-up-killing-each-other-and-one-nuclear-blast-could-do-it-9370115/>] Recut Justin

The nuclear armed nations have inadvertently created a global Doomsday machine, built with 15,000 nuclear weapons.

Most (93%) have been built by Russia and in the US, 3,100 of them are ready to fire within hours.

Pre-programmed targets include main cities as well as a range of military and civilian targets across the world primarily in the UK, Europe, US, Russia and China but also in Japan, Australia and South America.

One nuclear blast, one mistake, one cyber attack could trigger it.

But first a reminder about the incredible destructive power of a nuclear weapon. Modern nuclear warheads are typically 20 times larger than either of the two bombs that obliterated Hiroshima and Nagasaki at the end of the Second World War. What just one nuclear warhead can do is unimaginable. We’ve drawn some of the key features to scale against cityscapes in the UK for a Russian SS-18 RS 20V (NATO designation ‘Satan’) 500kT warhead. US submarines deploy a similar weapon – the Trident II Mk5, 475kT warhead. A deafening, terrifying noise will be created, like an intense thunder that lasts for 10 seconds or longer.

After a blinding flash of light bright destroying the retina of anyone looking, and a violent electromagnetic pulse (EMP) knocking out electrical equipment several miles away, a bomb of this size quickly forms an incandescent fireball 850 metres across.

This is about the same height as the world’s tallest building, the Burj Khalifa. Drawn against the London Canary Wharf financial district or the Manchester skyline, the huge fireball dwarfs one Canary Sq. (240m), the South Tower Deansgate (201m) and the Beetham Tower Hilton, (170m). The fireball engulfs both city centres completely, melting glass and steel and forms an intensely radioactive 60m deep crater zone of molten earth and debris. A devastating supersonic blast wave flattens everything within a radius of two to three km, the entire Manchester centre, an area larger than the City of London, with lighter damage out to eight km. Most people in these areas would be killed or very seriously injured.

The fireball quickly rises forming an enormous characteristic mushroom shaped cloud raining highly radioactive particles (fallout). It rises to 60,000 ft (18,000m) – twice the altitude of Everest – and is 15 miles, 24km across.

This is one warhead. There are 10 such warheads on each of Russia’s 46 missiles (460 in total) and 48 on each of eight US Trident submarines (384 in total). In reality, in a nuclear conflict all of these warheads and a further 956 ready-to-fire are likely to be launched.

Whilst this scale of destruction is horrific and hundreds of millions of people would be killed in a few hours from a combination of blast, radiation and huge fires, there are also terrible longer-term effects.

Scientists predict that huge city-wide firestorms combined with very the high-altitude debris clouds would severely reduce sunlight levels and disrupt the world’s climate for a decade causing drought, a prolonged winter, global famine and catastrophic impacts for all life on earth and in the seas due to intense levels of UV with the destruction of the ozone layer.

But even at the level of a few hundred nuclear warheads, the consequences of a nuclear war would be extremely severe across the world far beyond the areas hit directly. A nuclear conflict between India and Pakistan with ‘only’ 100 small warheads would kill hundreds of millions and cause climate damage leading to a global famine. The sheer destructive nature of nuclear explosions combined with long lasting radiation, means that nuclear weapons are of no military use. ‘Enemy’ territory would be unusable for years because of intense radiation – especially when nuclear power stations and reprocessing plants are hit.

Even if your own country is not hit, radiation and climate damage will spread across the globe. No one escapes the consequences.

But the nuclear nations argue that they build and keep nuclear weapons to make sure that they are never used. After all no one would be stupid enough to actually launch a nuclear weapon facing such terrible retaliation? It sounds obvious. If you threaten any attacker with terrible nuclear devastation of course they won’t attack you. That might be true most of the time. It is very unlikely that any country would launch a nuclear attack deliberately. But there are two very major problems. First, a terrorist organisation with a nuclear weapon cannot be deterred in this way. Secondly, there are several ways in which a nuclear war can start by mistake. A report by the prestigious Chatham House in 2014 documents 30 instances between 1962 and 2002 when nuclear weapons came within minutes of being launched due to miscalculation, miscommunication, or technical errors. What prevented their use on many of these occasions was the intervention of individuals who, against military orders, either refused to authorise a nuclear strike or relay information that would have led to launch. Examples include a weather rocket launch mistaken for an attack on Russia, a US satellite misinterpreting sunlight reflecting off clouds as multiple missiles firings, a 42c chip fault creating a false warning of 220 missiles launched at the United States. Such risks are heightened during political crises.

The risk of mistake is very high because, in a hangover from the Cold War, the USA and Russia each keep 900 warheads ready to fire in a few minutes, in a ‘launch on warning’ status, should a warning of nuclear attack come in.

These nuclear weapons form a dangerous nuclear stand-off – rather like two people holding guns to each other’s heads.

With only a few minutes to evaluate a warning of nuclear attack before warheads would strike, one mistake can trigger disaster. A similar nuclear stand-off exists between India and Pakistan.

**Space militarization causes collapse of R&D, commercial ops, economy, and deterrence and destroys satellites creating debris**

**Gilliard 19**, Alexandra. (Alexandra Gilliard is a Senior Editor and interviewer of international relations experts for the International Affairs Forum. She holds an M.S. in Global Studies and International Relations from Northeastern University, and a B.A. in International Relations from Boston University, with expertise in conflict resolution, arms control, human rights issues, and the MENA region.) “What Are the Consequences of Militarizing Outer Space?” Global Security Review, 10 June 2019, https://globalsecurityreview.com/consequences-militarization-space/. //JQ

Consequences of Armament and Aggression in Space The consequences of weapons testing and aggression in space could span generations, and current technological advances only increase the urgency for policymakers to pursue a limitations treaty. As it stands, there are three major ramifications of a potential arms race in space: The destruction of satellites As both financial and technological barriers to the space services industry have decreased, the number of governmental and private investors with assets in space has inevitably increased. There is now an abundance of satellites in space owned by multiple states and corporations. These satellites are used to not only coordinate military actions, but to perform more mundane tasks, like obtaining weather reports, or managing on-ground communications, and navigation. Should states begin weapons testing in space, debris could cloud the orbit and make positioning new satellites impossible, disrupting our current way of life. More pressing, however, is that if a country’s satellites are successfully destroyed by an enemy state, military capabilities can be severely hindered or destroyed, leaving the country vulnerable to attack and unable to coordinate its military forces on the ground. Diminished future use of near space Whether caused by weapons testing or actual aggression, the subsequent proliferation of debris around the planet would damage our future ability to access space. Not only would debris act as shrapnel to preexisting assets in space, but it would also become much more difficult to launch satellites or rockets, hindering scientific research, space exploration, and commercial operations. From the past fifty-odd years of activity in space alone, the debris left behind in Earth’s orbital field has already become hazardous to spacecraft — a main reason why the U.S. and the Soviet Union did not continue with ASAT testing during the Cold War. If greater pollution were to occur, space itself could be become unusable, resulting in the collapse of the global economic system, air travel, and various communications. Power imbalances and proliferation on the ground Only so many states currently have access to space—which means any militarization be by the few, while other states would be left to fend for themselves. This would establish a clear power imbalance that could breed distrust among nations, resulting in a more insecure world and a veritable power keg primed for war. Additionally, deterrence measures taken by states with access to space would escalate, attempting to build up weapons caches not dissimilar to the nuclear weapons stockpiling activities of the Cold War. In any arms race, it is inevitable that more advanced weaponry is created. Yet, this does not only pose a risk to assets in space. Should a terrestrial war break out, this weaponry may eventually be deployed on the ground, and space-faring states would be able to capitalize on the power imbalance by using these new developments against states that have not yet broken into the space industry or developed equally-advanced weaponry.

#### Satellites solve a laundry list of impacts – specifically the grid.

Pellegrino & Stang 16. Massimo Pellegrino, Master’s Degree in Space Studies from ISU, with Gerald Stang, Senior Associate Analyst at the EUISS, holds BSc and MSc degrees in chemical engineering from the University of Saskatchewan and an MA in international affairs from the School of International and Public Affairs at Columbia University (“Space Security for Europe”, *EU Institute for Security Studies*, published July 2016, <https://www.iss.europa.eu/content/space-security-europe>, accessed 7-10-2019) bm

Modern societies are highly dependent on the continuous operation of critical infrastructure to ensure the provision of basic goods and services. They consist of assets, systems or parts thereof which are so vital, that their disruption would significantly impact the economy, national security, public health, safety, or social well-being. Examples of critical infrastructure include energy, water, food supply, communication, transportation, and waste processing systems. Space assets are so deeply embedded in developed economies that a day without fully functioning space capabilities would severely restrict or even endanger our lives. Space systems are critical for running energy grids and telecommunication networks, border and maritime surveillance, crisis management and humanitarian operations, environmental and climate monitoring, verification of international treaties and arms control agreements, and the fight against organised crime and terrorism. Space assets also provide the technological backbone for other critical infrastructures. The synchronisation of power grids and telecommunication networks, for example, is heavily dependent on GNSS timing signals and any disruption would create a domino effect on other critical infrastructures (see Figure 5). Satellites also play a central role in supporting defence systems and military operations. They are force multipliers that provide intelligence, surveillance, and reconnaissance (ISR) capabilities, as well as communication, navigation, positioning and timing signals. Armed forces do not only use their own space systems, but are also significant consumers of space services provided by private operators. In fact, about 90% of US military communications traffic passes through civilian satellites, many of which privately owned, rather than through dedicated systems designed to withstand attempted interruptions.1 The reliance of both civilian and military users on space systems therefore places them firmly in the area of critical infrastructure. Some critical space systems, such as the American GPS, are under foreign control, and the governments controlling those systems retain the authority to disrupt services, even for allies, in case of a national emergency. While the United States announced that it has no intention of ever intentionally degrading public GPS signals (also known as ‘Selective Availability’) and that the next generation of GPS satellites will not include this feature, other governments might still do so.2 These dependences engender new and growing vulnerabilities. Reliance on space is likely to increase further as space capabilities and services improve in diversity, quality and affordability. Close to 1,500 satellites with a launch mass of over 50 kg are expected to be launched over the next decade; an increase of 50% compared to 2005-2014. This estimate excludes both the expected proliferation of smaller satellites (such as CubeSats), but also the planned OneWeb and Steam mega-constellations for global internet broadband service. Advances in small satellite capabilities and in launch technology (e.g. SpaceX’s Falcon rocket family) have already lowered the cost of access to space. About 45% more CubeSats were launched in 2014 than in 2013 (130 vs. 91), accounting for 63% of all satellites launched3 . However, just as the reliance on space increases, so too do threats and vulnerabilities. Therefore, in order to realise the full potential of investments in space, critical space systems need to be adequately protected and the space environment properly managed.

#### Grid security is an existential risk factor.

Denkenberger 21 – David Denkenberger, Anders Sandberg, Ross John Tieman, and Joshua M. Pearce, \*Assistant professor of mechanical engineering at University of Alaska Fairbanks, “Long-term cost-effectiveness of interventions for loss of electricity/industry compared to artificial general intelligence safety,” 2021, *European Journal of Futures Research*, Vol. 9, Issue 1, https://doi.org/10.1186/s40309-021-00178-z, EA Recut Justin

Civilization relies on a network of highly interdependent critical infrastructure (CI) to provide basic necessities (water, food, shelter, basic goods), as well as complex items (computers, cars, space shuttles) and services (the internet, cloud computing, global supply chains), henceforth referred to as industry. Electricity and the electrical infrastructure that distributes it plays an important role within industry, providing a convenient means to distribute energy able to be converted into various forms of useful work. Electricity is one component of industry albeit a critical one. Industry provides the means to sustain advanced civilization structures and the citizens that inhabit them. These structures play a critical role in realizing various futures by allowing humanity to discover and utilize new resources, adapt to various environments, and resist natural stressors.

Though industry is capable of resisting small stressors, a sufficiently large event can precipitate cascading failure of CI systems, resulting in a collapse of industry. If one does not temporally discount the value of future people, the long-term future (thousands, millions, or even billions of years) could contain an astronomically large amount of value [18]. Events capable of curtailing the potential of civilization (existential risks, such as human extinction or an unrecoverable collapse) would prevent such futures from being achieved, implying reducing the likelihood of such events is of the utmost importance [100]. Reducing the prevalence of existential risks factors; events, systemic structures, or biases which increase the likelihood of extinction but do not cause extinction by themselves is also highly valuable. Complete collapse or degraded function of industry would drastically reduce humanity’s capacity to coordinate and deploy technology to prevent existential risks, representing an existential risk factor. Consequently, interventions preventing loss of industry, reducing the magnitude of impacts, or increasing speed of recovery could be extremely valuable.

Existential risk research is, by nature, future focused, requiring the investigation of events that have not yet occurred. Futures studies methodologies are often applied to uncover salient trends or events, and explore potential causal structures [54, 123]. Probabilistic modeling techniques can then be used to determine the likelihood of such events occurring, including adequate treatment of uncertainty [101]. The cost-effectiveness modeling approach outlined in this paper is an example of this, attempting to assess the marginal utility of losing industry interventions on improving the long-term future. This approach could guide future efforts to assess the relative cost-effectiveness of interventions for different risks, existential or otherwise. More practically, this research can inform prioritization efforts of industrialized countries by providing estimates of the cost of global industrial collapse, and the utility of resilience interventions. This is relevant to the European Union which has a highly industrialized economy, providing $2.3 Trillion USD of the $13.7 Trillion USD global total of value add manufacturing [122]. The EU has shifted toward a more proactive foresight approach about natural and man-made disasters, noting the importance of rare high-impact events, systemic risks, and converging trends requiring better data and forecasting to drive a more ambitious crisis management system [47]. Still, it is clear that most academic and institutional emphasis has been on “ordinary” rather than extreme disasters, and risks from industry to the public and environment rather than widespread failures of industrial services causing harm. The integrated nature of the electric grid, which is based on centralized generation makes the entire system vulnerable to disruption.1 There are a number of anthropogenic and natural catastrophes that could result in regional-scale electrical grid failure, which would be expected to halt the majority of industries and machines in that area. A high-altitude electromagnetic pulse (HEMP) caused by a nuclear weapon could disable electricity over part of a continent [16, 48, 66, 93]. This could destroy the majority of electrical grid infrastructure, and as fossil fuel extraction and industry is reliant on electricity [49], industry would be disabled. Similarly, solar storms have destroyed electrical transformers connected to long transmission lines in the past [117]. The Carrington event in 1859 damaged telegraph lines, which was the only electrical infrastructure in existence at the time. It also caused Aurora Borealis that was visible in Cuba and Jamaica [70]. This could potentially disable electrical systems at high latitudes, which could represent 10% of electricity/industry globally. Though solar storms may last less than the 12 h that would be required to expose the entire earth with direct line of sight, the earth’s magnetic field lines redirect the storm to affect the opposite side of the earth [117]. Lastly, both physical [6, 8, 69, 89, 111] and cyber attacks [3, 63, 90, 96, 118, 128, 130] could also compromise electric grids. Physical attacks include traditional acts of terrorism such as bombing or sabotage [130] in addition to EMP attacks. Significant actors could scale up physical attacks, for example by using drones. A scenario could include terrorist groups hindering individual power plants [126], while a large adversary could undertake a similar operation physically to all plants and electrical grids in a region. Unfortunately, the traditional power grid infrastructure is simply incapable of withstanding intentional physical attacks [91]. Damage to the electric grid resulting in physical attack could be long lasting, as most traditional power plants operate with large transformers that are difficult to move and source. Custom rebuilt transformers require time for replacement ranging from months and even up to years [91]. For example, a relatively mild 2013 sniper attack on California’s Pacific Gas and Electric (PG&E) substation, which injured no one directly, was able to disable 17 transformers supplying power to Silicon Valley. Repairs and improvements cost PG&E roughly $100 million and lasted about a month [10, 102]. A coordinated attack with relatively simple technology (e.g., guns) could cause a regional electricity disruption. However, a high-tech attack could be even further widespread. The Pentagon reports spending roughly $100 million to repair cyber-related damages to the electric grid in 2009 [57]. There is also evidence that a computer virus caused an electrical outage in the Ukraine [56]. Unlike simplistic physical attacks, cyber attackers are capable of penetrating critical electric infrastructure from remote regions of the world, needing only communication pathways (e.g., the Internet or infected memory sticks) to install malware into the control systems of the electric power grid. For example, Stuxnet was a computer worm that destroyed Iranian centrifuges [73] to disable their nuclear industry. Many efforts are underway to harden the grid from such attacks [51, 63]. The U.S. Department of Homeland Security responded to ~ 200 cyber incidents in 2012 and 41% involved the electrical grid [103]. Nations routinely have made attempts to map current critical infrastructure for future navigation and control of the U.S. electrical system [57]. The electric grid in general is growing increasingly dependent upon the Internet and other network connections for data communication and monitoring systems [17, 112, 118, 127, 135]. Although this conveniently allows electrical suppliers management of systems, it increases the susceptibility of the grid to cyber-attack, through denial of webpage services to consumers, disruption to supervisory control and data acquisition (SCADA) operating systems, or sustained widespread power outages [3, 72, 118, 120]. Thus global or regional loss of the Internet could have similar implications. A less obvious potential cause is a pandemic that disrupts global trade. Countries may ban trade for fear of the disease entering their country, but many countries are dependent on imports for the functioning of their industry. If the region over which electricity is disrupted had significant agricultural production, the catastrophe could be accompanied by a ~ 10% food production shortfall as well. It is uncertain whether countries outside the affected region would help the affected countries, do nothing, or conquer the affected countries. Larger versions of these catastrophes could disrupt electricity/industry globally. For instance, it is possible that multiple HEMPs could be detonated around the world, due to a world nuclear war [105] or due to terrorists gaining control of nuclear weapons. There is evidence that, in the last 2000 years, two solar storms occurred that were much stronger than the Carrington event [85]. Therefore, it is possible that an extreme solar storm could disable electricity and therefore industry globally. It is conceivable that a coordinated cyber or physical attack (or a combination) on many electric grids could also disrupt industry globally. Many of the techniques to harden the electric grid could help with this vulnerability as well as moving to more distributed generation and microgrids [23, 29, 75, 76, 103, 114]. An extreme pandemic could cause enough people to not show up to work such that industrial functioning could not be maintained. Though this could be mitigated by directing military personnel to fill vacant positions, if the pandemic were severe enough, it could be rational to retreat from high human contact industrial civilization in order to limit disease mortality. The global loss of electricity could even be self-inflicted as a way of stopping rogue artificial general intelligence (AGI) [124]. As the current high agricultural productivity depends on industry (e.g., for fertilizers), it has been assumed that there would be mass starvation in these scenarios [107].

Repairing these systems and re-establishing electrical infrastructure would be a goal of the long term and work should ideally start on it immediately after a catastrophe. However, human needs would need to be met immediately (and continually) and since there is only a few months of stored food, it would likely run out before industry is restored with the current state of preparedness. In some of the less challenging scenarios, it may be possible to continue running some machines on the fossil fuels that had previously been brought to the surface or from the use microgrids or shielded electrical systems. In addition, it may be feasible to run some machines on gasified wood [31]. However, in the worst-case scenario, all unshielded electronics would be destroyed.

**Mars col activity ensures contamination**

**Rolfe 19**

(Samantha, Lecturer in Astrobiology and Principal Technical Officer at Bayfordbury Observatory, University of Hertfordshire <https://theconversation.com/elon-musks-starship-may-be-more-moral-catastrophe-than-bold-step-in-space-exploration-124450> 10-2)

There are many reasons to believe SpaceX will succeed. The company has been extremely impressive in its contribution to space, filling a gap when government agencies such as NASA could not justify the spending. It’s not the rocket technology that I doubt, my concern is mainly **astrobiological.** If life exists elsewhere in our universe, the solar system is a good place to start looking – enabling us to touch, collect and analyse samples in a reasonably short time. Along with some of Jupiter’s and Saturn’s moons, Mars is one of the top contenders for hosting some sort of microbial life, or for having done so in the past. However, there is a risk that microbe-ridden humans walking on the red planet could contaminate it with bugs from Earth. And contamination may threaten alien organisms, if they exist. It may also make it impossible to figure out whether any microbes found on Mars later on are martian or terrestrial in origin. A mission to return samples from Mars to Earth is expected to be completed by the early 2030s, with all the collection work completed by sterilised robots. While such missions pose a certain risk of contamination too, there are rigorous protocols to help minimise the chance. These were initiated by the Outer Space Treaty in 1967 and must be followed by anyone in the space industry, governmental or non-governmental entities alike. Can we be confident that, while pushing the boundaries of human exploration in such a short time frame, **corners won’t be cut or standards won’t be allowed to slip**? It will be considerably harder to follow these protocols once humans are actually on the planet. If SpaceX was serious about planetary protection, I would expect to see a policy on its website, or easily found by searching “SpaceX planetary protection”. But that isn’t the case. So while it is possible that it has a rigorous planetary protection plan in place behind the scenes, its public-facing content seems to suggest that pushing the boundaries of human exploration is **more important than the consequences of that exploration**.

**Preserving Martial life outweighs**

**Bharmal 18**

(Zahaan works for Google and is a recipient of Nasa’s Exceptional Public Achievement Medal for YouTube Space Lab. [https://www.theguardian.com/science/blog/2018/aug/28/the-case-against-mars-colonisation 8-28](https://www.theguardian.com/science/blog/2018/aug/28/the-case-against-mars-colonisation%208-28))

It is hard to forget the images six months ago of Elon Musk's midnight cherry Tesla floating through space. Launched atop the Falcon Heavy, SpaceX hoped to shoot the Tesla into orbit with Mars. A stunt, for sure – but also a marvellous demonstration of technical competence. But not everyone was happy. Unlike every previous craft sent to Mars, this car – and the mannequin called Starman sitting behind the wheel – **had not been sterilised.** And for this reason, some scientists described it as the “largest load of earthly bacteria to ever enter space”. As it happens, the Tesla overshot its orbit. At the time of writing, it is 88 million miles from Mars, drifting through the darkness of space with Bowie on an infinite loop. But the episode illustrates the first argument against human travel to Mars: contamination. If humans do eventually land on Mars, they would not arrive alone. They would carry with them their earthly microbes. Trillions of them. There is a real risk that some of these microbes could find their way onto the surface of Mars and, in doing so, confuse – perhaps irreversibly so – the search for Martian life. This is because we wouldn't be able to distinguish indigenous life from the microbes we'd brought with us. Our presence on Mars could jeopardise one of our main reasons for being there – the **search for life.** Furthermore, there is no one way of knowing how our microbes may react with the vulnerable Martian ecosystem. In Cosmos, the late Carl Sagan wrote, “If there is life on Mars, I believe we should do nothing with Mars. Mars then belongs to the Martians, **even if the Martians are only microbes** … the preservation of that life must, I think, **supersede any other possible use of Mars**.”

**Organisms in space bypass the immune systems of humans causing pandemics**

**Smith et al. 20** [Adam Smith, Science and Technology reporter for The Independent. Harry Cockburn, newsdesk editor for The Independent. "Space germs could pose threat to mammals’ immune systems, scientists warn." Independent, 7-23-2020, accessed 2-17-2022, https://www.independent.co.uk/life-style/gadgets-and-tech/news/alien-germs-human-cells-immune-system-science-a9633811.html] HWIC]

Just as the Martians in HG Wells’ novel The War of the Worlds are finally slain by “disease bacteria” on Earth, scientists now suggest humans and other mammals could struggle to fight germs from other planets. Given the right conditions and mixture of elements, it is conceivable that microorganisms such as bacteria and viruses could exist beyond Earth, and there are plans to search for signs of them on Mars and some of Saturn and Jupiter’s moons. Alien life forms could theoretically be composed of different amino acids to those familiar to us on Earth. Amino acids are the fundamental organic compounds which form the basis for all life as we know it, and are made up of nitrogen, carbon, hydrogen and oxygen. Scientists from the universities of Aberdeen and Exeter tested how mammal immune cells responded to peptides containing two amino acids that are rare on Earth but are commonly found on meteorites. The amino acids “isovaline” and “α-aminoisobutyric acid” were introduced to mice, which have immune systems similar to humans. They found that those mice’s immune systems responded to the “alien” peptides in a way that was “less efficient” than to germs from this planet. The research team examined mammalian T cells, which normally work to kill pathogenic bodies, and can recruit other cells to fight off invading diseases. But when the scientists introduced the amino acids found on the meteorites, the T cell response was less efficient, with activation levels of 15 per cent and 61 per cent – compared to 82 per cent and 91 per cent when exposed to peptides made entirely of amino acids that are common on Earth. “Life on Earth relies on essential 22 amino acids,” said lead author Dr Katja Schaefer, of the University of Exeter, in a statement. “Our investigation showed that these exo-peptides were still processed, and T cells were still activated, but these responses were less efficient than for ‘ordinary’ Earth peptides.” “We therefore speculate that contact with extra-terrestrial microorganisms might pose an immunological risk for space missions aiming to retrieve organisms from exoplanets and moons,” Dr Schaefer added. “The world is now only too aware of the immune challenge posed by the emergence of brand new pathogens,” said Professor Neil Gow, a Deputy Vice-Chancellor at the University of Exeter. The research will be published in in the journal Microorganisms, with the title, ‘A weakened immune response to synthetic exo-peptides predicts a potential biosecurity risk in the retrieval of exo-microorganisms’. The discovery of liquid water at several locations in the solar system raises the possibility that microbial life could have evolved outside Earth, and could therefore be accidentally introduced into the Earth’s ecosystem. The issue of alien germs is a rising priority, as missions to other planets are becoming more common.

#### Future pandemics cause extinction

Bar-Yam 16 Yaneer Bar-Yam 7-3-2016 “Transition to extinction: Pandemics in a connected world” <http://necsi.edu/research/social/pandemics/transition> (Professor and President, New England Complex System Institute; PhD in Physics, MIT)

Watch as one of the more aggressive—brighter red — strains rapidly expands. After a time it gos extinct leaving a black region. Why does it go extinct? The answer is that it spreads so rapidly that it kills the hosts around it. Without new hosts to infect it then dies out itself. That the rapidly spreading pathogens die out has important implications for evolutionary research which we have talked about elsewhere [1–7]. In the research I want to discuss here, what we were interested in is the effect of adding long range transportation [8]. This includes natural means of dispersal as well as unintentional dispersal by humans, like adding airplane routes, which is being done by real world airlines (Figure 2). When we introduce long range transportation into the model, the success of more aggressive strains changes. They can use the long range transportation to find new hosts and escape local extinction. Figure 3 shows that the more transportation routes introduced into the model, the more higher aggressive pathogens are able to survive and spread. As we add more long range transportation, there is a critical point at which pathogens become so aggressive that the entire host population dies. The pathogens die at the same time, but that is not exactly a consolation to the hosts. We call this the phase transition to extinction (Figure 4). With increasing levels of global transportation, human civilization may be approaching such a critical threshold. In the paper we wrote in 2006 about the dangers of global transportation for pathogen evolution and pandemics [8], we mentioned the risk from Ebola. Ebola is a horrendous disease that was present only in isolated villages in Africa. It was far away from the rest of the world only because of that isolation. Since Africa was developing, it was only a matter of time before it reached population centers and airports. While the model is about evolution, it is really about which pathogens will be found in a system that is highly connected, and Ebola can spread in a highly connected world. The traditional approach to public health uses historical evidence analyzed statistically to assess the potential impacts of a disease. As a result, many were surprised by the spread of Ebola through West Africa in 2014. As the connectivity of the world increases, past experience is not a good guide to future events. A key point about the phase transition to extinction is its suddenness. Even a system that seems stable, can be destabilized by a few more long-range connections, and connectivity is continuing to increase. So how close are we to the tipping point? We don’t know but it would be good to find out before it happens. While Ebola ravaged three countries in West Africa, it only resulted in a handful of cases outside that region. One possible reason is that many of the airlines that fly to west Africa stopped or reduced flights during the epidemic [9]. In the absence of a clear connection, public health authorities who downplayed the dangers of the epidemic spreading to the West might seem to be vindicated. As with the choice of airlines to stop flying to west Africa, our analysis didn’t take into consideration how people respond to epidemics. It does tell us what the outcome will be unless we respond fast enough and well enough to stop the spread of future diseases, which may not be the same as the ones we saw in the past. As the world becomes more connected, the dangers increase. Are people in western countries safe because of higher quality health systems? Countries like the U.S. have highly skewed networks of social interactions with some very highly connected individuals that can be “superspreaders.” The chances of such an individual becoming infected may be low but events like a mass outbreak pose a much greater risk if they do happen. If a sick food service worker in an airport infects 100 passengers, or a contagion event happens in mass transportation, an outbreak could very well prove unstoppable.

## 1AC – Framing

#### The standard is maximizing expected well-being – to clarify, saving lives.

#### 1] Death outweighs— A] You don’t have any wellbeing if we’re all dead B] Reversibility - Someone who died can’t come alive again C] Objectivity- body count is the most objective way to calculate impacts

#### 2] Only consequentialism can explain degrees of wrongness – breaking a promise to eat lunch is not as bad as breaking one to take a dying person to the hospital – only the consequences explain why the second is worse which is the most intuitive

#### Extinction outweighs –

#### 1] Moral uncertainty and future generations

Pummer 15 [Theron, Junior Research Fellow in Philosophy at St. Anne's College, University of Oxford. “Moral Agreement on Saving the World” Practical Ethics, University of Oxford. May 18, 2015] AT

There appears to be lot of disagreement in moral philosophy. Whether these many apparent disagreements are deep and irresolvable, I believe there is at least one thing it is reasonable to agree on right now, whatever general moral view we adopt: that it is very important to reduce the risk that all intelligent beings on this planet are eliminated by an enormous catastrophe, such as a nuclear war. How we might in fact try to reduce such existential risks is discussed elsewhere. My claim here is only that we – whether we’re consequentialists, deontologists, or virtue ethicists – should all agree that we should try to save the world. According to consequentialism, we should maximize the good, where this is taken to be the goodness, from an impartial perspective, of outcomes. Clearly one thing that makes an outcome good is that the people in it are doing well. There is little disagreement here. If the happiness or well-being of possible future people is just as important as that of people who already exist, and if they would have good lives, it is not hard to see how reducing existential risk is easily the most important thing in the whole world. This is for the familiar reason that there are so many people who could exist in the future – there are trillions upon trillions… upon trillions. There are so many possible future people that reducing existential risk is arguably the most important thing in the world, even if the well-being of these possible people were given only 0.001% as much weight as that of existing people. Even on a wholly person-affecting view – according to which there’s nothing (apart from effects on existing people) to be said in favor of creating happy people – the case for reducing existential risk is very strong. As noted in this seminal paper, this case is strengthened by the fact that there’s a good chance that many existing people will, with the aid of life-extension technology, live very long and very high quality lives. You might think what I have just argued applies to consequentialists only. There is a tendency to assume that, if an argument appeals to consequentialist considerations (the goodness of outcomes), it is irrelevant to non-consequentialists. But that is a huge mistake. Non-consequentialism is the view that there’s more that determines rightness than the goodness of consequences or outcomes; it is not the view that the latter don’t matter. Even John Rawls wrote, “All ethical doctrines worth our attention take consequences into account in judging rightness. One which did not would simply be irrational, crazy.” Minimally plausible versions of deontology and virtue ethics must be concerned in part with promoting the good, from an impartial point of view. They’d thus imply very strong reasons to reduce existential risk, at least when this doesn’t significantly involve doing harm to others or damaging one’s character. What’s even more surprising, perhaps, is that even if our own good (or that of those near and dear to us) has much greater weight than goodness from the impartial “point of view of the universe,” indeed even if the latter is entirely morally irrelevant, we may nonetheless have very strong reasons to reduce existential risk. Even egoism, the view that each agent should maximize her own good, might imply strong reasons to reduce existential risk. It will depend, among other things, on what one’s own good consists in. If well-being consisted in pleasure only, it is somewhat harder to argue that egoism would imply strong reasons to reduce existential risk – perhaps we could argue that one would maximize her expected hedonic well-being by funding life extension technology or by having herself cryogenically frozen at the time of her bodily death as well as giving money to reduce existential risk (so that there is a world for her to live in!). I am not sure, however, how strong the reasons to do this would be. But views which imply that, if I don’t care about other people, I have no or very little reason to help them are not even minimally plausible views (in addition to hedonistic egoism, I here have in mind views that imply that one has no reason to perform an act unless one actually desires to do that act). To be minimally plausible, egoism will need to be paired with a more sophisticated account of well-being. To see this, it is enough to consider, as Plato did, the possibility of a ring of invisibility – suppose that, while wearing it, Ayn could derive some pleasure by helping the poor, but instead could derive just a bit more by severely harming them. Hedonistic egoism would absurdly imply she should do the latter. To avoid this implication, egoists would need to build something like the meaningfulness of a life into well-being, in some robust way, where this would to a significant extent be a function of other-regarding concerns (see chapter 12 of this classic intro to ethics). But once these elements are included, we can (roughly, as above) argue that this sort of egoism will imply strong reasons to reduce existential risk. Add to all of this Samuel Scheffler’s recent intriguing arguments (quick podcast version available here) that most of what makes our lives go well would be undermined if there were no future generations of intelligent persons. On his view, my life would contain vastly less well-being if (say) a year after my death the world came to an end. So obviously if Scheffler were right I’d have very strong reason to reduce existential risk. We should also take into account moral uncertainty. What is it reasonable for one to do, when one is uncertain not (only) about the empirical facts, but also about the moral facts? I’ve just argued that there’s agreement among minimally plausible ethical views that we have strong reason to reduce existential risk – not only consequentialists, but also deontologists, virtue ethicists, and sophisticated egoists should agree. But even those (hedonistic egoists) who disagree should have a significant level of confidence that they are mistaken, and that one of the above views is correct. Even if they were 90% sure that their view is the correct one (and 10% sure that one of these other ones is correct), they would have pretty strong reason, from the standpoint of moral uncertainty, to reduce existential risk. Perhaps most disturbingly still, even if we are only 1% sure that the well-being of possible future people matters, it is at least arguable that, from the standpoint of moral uncertainty, reducing existential risk is the most important thing in the world. Again, this is largely for the reason that there are so many people who could exist in the future – there are trillions upon trillions… upon trillions. (For more on this and other related issues, see this excellent dissertation). Of course, it is uncertain whether these untold trillions would, in general, have good lives. It’s possible they’ll be miserable. It is enough for my claim that there is moral agreement in the relevant sense if, at least given certain empirical claims about what future lives would most likely be like, all minimally plausible moral views would converge on the conclusion that we should try to save the world. While there are some non-crazy views that place significantly greater moral weight on avoiding suffering than on promoting happiness, for reasons others have offered (and for independent reasons I won’t get into here unless requested to), they nonetheless seem to be fairly implausible views. And even if things did not go well for our ancestors, I am optimistic that they will overall go fantastically well for our descendants, if we allow them to. I suspect that most of us alive today – at least those of us not suffering from extreme illness or poverty – have lives that are well worth living, and that things will continue to improve. Derek Parfit, whose work has emphasized future generations as well as agreement in ethics, described our situation clearly and accurately: “We live during the hinge of history. Given the scientific and technological discoveries of the last two centuries, the world has never changed as fast. We shall soon have even greater powers to transform, not only our surroundings, but ourselves and our successors. If we act wisely in the next few centuries, humanity will survive its most dangerous and decisive period. Our descendants could, if necessary, go elsewhere, spreading through this galaxy…. Our descendants might, I believe, make the further future very good. But that good future may also depend in part on us. If our selfish recklessness ends human history, we would be acting very wrongly.” (From chapter 36 of On What Matters)

#### 2] Mathematics

MacAskill 14 [William, Oxford Philosopher and youngest tenured philosopher in the world, Normative Uncertainty, 2014]

The human race might go extinct from a number of causes: asteroids, supervolcanoes, runaway climate change, pandemics, nuclear war, and the development and use of dangerous new technologies such as synthetic biology, all pose risks (even if very small) to the continued survival of the human race.184 And different moral views give opposing answers to question of whether this would be a good or a bad thing. It might seem obvious that human extinction would be a very bad thing, both because of the loss of potential future lives, and because of the loss of the scientific and artistic progress that we would make in the future. But the issue is at least unclear. The continuation of the human race would be a mixed bag: inevitably, it would involve both upsides and downsides. And if one regards it as much more important to avoid bad things happening than to promote good things happening then one could plausibly regard human extinction as a good thing.For example, one might regard the prevention of bads as being in general more important that the promotion of goods, as defended historically by G. E. Moore,185 and more recently by Thomas Hurka.186 One could weight the prevention of suffering as being much more important that the promotion of happiness. Or one could weight the prevention of objective bads, such as war and genocide, as being much more important than the promotion of objective goods, such as scientific and artistic progress. If the human race continues its future will inevitably involve suffering as well as happiness, and objective bads as well as objective goods. So, if one weights the bads sufficiently heavily against the goods, or if one is sufficiently pessimistic about humanity’s ability to achieve good outcomes, then one will regard human extinction as a good thing.187 However, even if we believe in a moral view according to which human extinction would be a good thing, we still have strong reason to prevent near-term human extinction. To see this, we must note three points. First, we should note that the extinction of the human race is an extremely high stakes moral issue. Humanity could be around for a very long time: if humans survive as long as the median mammal species, we will last another two million years. On this estimate, the number of humans in existence in the The future, given that we don’t go extinct any time soon, would be 2×10^14. So if it is good to bring new people into existence, then it’s very good to prevent human extinction. Second, human extinction is by its nature an irreversible scenario. If we continue to exist, then we always have the option of letting ourselves go extinct in the future (or, perhaps more realistically, of considerably reducing population size). But if we go extinct, then we can’t magically bring ourselves back into existence at a later date. Third, we should expect ourselves to progress, morally, over the next few centuries, as we have progressed in the past. So we should expect that in a few centuries’ time we will have better evidence about how to evaluate human extinction than we currently have. Given these three factors, it would be better to prevent the near-term extinction of the human race, even if we thought that the extinction of the human race would actually be a very good thing. To make this concrete, I’ll give the following simple but illustrative model. Suppose that we have 0.8 credence that it is a bad thing to produce new people, and 0.2 certain that it’s a good thing to produce new people; and the degree to which it is good to produce new people, if it is good, is the same as the degree to which it is bad to produce new people, if it is bad. That is, I’m supposing, for simplicity, that we know that one new life has one unit of value; we just don’t know whether that unit is positive or negative. And let’s use our estimate of 2×10^14 people who would exist in the future, if we avoid near-term human extinction. Given our stipulated credences, the expected benefit of letting the human race go extinct now would be (.8-.2)×(2×10^14) = 1.2×(10^14). Suppose that, if we let the human race continue and did research for 300 years, we would know for certain whether or not additional people are of positive or negative value. If so, then with the credences above we should think it 80% likely that we will find out that it is a bad thing to produce new people, and 20% likely that we will find out that it’s a good thing to produce new people. So there’s an 80% chance of a loss of 3×(10^10) (because of the delay of letting the human race go extinct), the expected value of which is 2.4×(10^10). But there’s also a 20% chance of a gain of 2×(10^14), the expected value of which is 4×(10^13). That is, in expected value terms, the cost of waiting for a few hundred years is vanishingly small compared with the benefit of keeping one’s options open while one gains new information.

## 1AC – Underview

#### No China war

Nye 21 – Joseph S. Nye, Jr. is a professor at Harvard University and author of Do Morals Matter? Presidents and Foreign Policy from FDR to Trump, March 2nd ("What Could Cause a US-China War?", Project Syndicate, Available online at https://www.project-syndicate.org/commentary/what-could-cause-us-china-war-by-joseph-s-nye-2021-03, Accessed 3-3-2021)

CAMBRIDGE – When China’s foreign minister, Wang Yi, recently called for a reset of bilateral relations with the United States, a White House spokesperson replied that the US saw the relationship as one of strong competition that required a position of strength. It is clear that President Joe Biden’s administration is not simply reversing Trump’s policies. Some analysts, citing Thucydides’ attribution of the Peloponnesian War to Sparta’s fear of a rising Athens, believe the US-China relationship is entering a period of conflict pitting an established hegemon against an increasingly powerful challenger. I am not that pessimistic. In my view, economic and ecological interdependence reduces the probability of a real cold war, much less a hot one, because both countries have an incentive to cooperate in a number of areas. At the same time, miscalculation is always possible, and some see the danger of “sleepwalking” into catastrophe, as happened with World War I. History is replete with cases of misperception about changing power balances. For example, when President Richard Nixon visited China in 1972, he wanted to balance what he saw as a growing Soviet threat to a declining America. But what Nixon interpreted as decline was really the return to normal of America’s artificially high share of global output after World War II. Nixon proclaimed multipolarity, but what followed was the end of the Soviet Union and America’s unipolar moment two decades later. Today, some Chinese analysts underestimate America’s resilience and predict Chinese dominance, but this, too, could turn out to be a dangerous miscalculation. It is equally dangerous for Americans to over- or underestimate Chinese power, and the US contains groups with economic and political incentives to do both. Measured in dollars, China’s economy is about two-thirds the size of the US economy, but many economists expect China to surpass the US sometime in the 2030s, depending on what one assumes about Chinese and American growth rates. Will American leaders acknowledge this change in a way that permits a constructive relationship, or will they succumb to fear? Will Chinese leaders take more risks, or will Chinese and Americans learn to cooperate in producing global public goods under a changing distribution of power? Recall that Thucydides attributed the war that ripped apart the ancient Greek world to two causes: the rise of a new power, and the fear that this created in the established power. The second cause is as important as the first. The US and China must avoid exaggerated fears that could create a new cold or hot war. Even if China surpasses the US to become the world’s largest economy, national income is not the only measure of geopolitical power. China ranks well behind the US in soft power, and US military expenditure is nearly four times that of China. While Chinese military capabilities have been increasing in recent years, analysts who look carefully at the military balance conclude that China will not, say, be able to exclude the US from the Western Pacific.2 On the other hand, the US was once the world’s largest trading economy and its largest bilateral lender. Today, nearly 100 countries count China as their largest trading partner, compared to 57 for the US. China plans to lend more than $1 trillion for infrastructure projects with its Belt and Road Initiative over the next decade, while the US has cut back aid. China will gain economic power from the sheer size of its market as well as its overseas investments and development assistance. China’s overall power relative to the US is likely to increase.1 Nonetheless, balances of power are hard to judge. The US will retain some long-term power advantages that contrast with areas of Chinese vulnerability. One is geography. The US is surrounded by oceans and neighbors that are likely to remain friendly. China has borders with 14 countries, and territorial disputes with India, Japan, and Vietnam set limits on its hard and soft power. Energy is another area where America has an advantage. A decade ago, the US was dependent on imported energy, but the shale revolution transformed North America from an energy importer to exporter. At the same time, China became more dependent on energy imports from the Middle East, which it must transport along sea routes that highlight its problematic relations with India. The US also has demographic advantages. It is the only major developed country that is projected to hold its global ranking (third) in terms of population. While the rate of US population growth has slowed in recent years, it will not turn negative, as in Russia, Europe, and Japan. China, meanwhile, rightly fears “growing old before it grows rich.” India will soon overtake it as the most populous country, and its labor force peaked in 2015. America also remains at the forefront in key technologies (bio, nano, information) that are central to twenty-first-century economic growth. China is investing heavily in research and development, and competes well in some fields. But 15 of the world’s top 20 research universities are in the US; none is in China. Those who proclaim Pax Sinica and American decline fail to take account of the full range of power resources. American hubris is always a danger, but so is exaggerated fear, which can lead to overreaction. Equally dangerous is rising Chinese nationalism, which, combined with a belief in American decline, leads China to take greater risks. Both sides must beware miscalculation. After all, more often than not, the greatest risk we face is our own capacity for error.