**FRAMEWORK**

**I affirm the resolution.**

**The standard is maximizing expected wellbeing.**

**Prefer it:**

**1] Actor specificity: every policy benefits some and harms others, which also means side constraints freeze action.**

**2] Lexical pre-requisite: threats to bodily security preclude the ability for moral actors to effectively act upon other moral theories since they are in a constant state of crisis that inhibits the ideal moral conditions which other theories presuppose**

**3] Only consequentialism explains degrees of wrongness—if I break a promise to meet up for lunch, that is not as bad as breaking a promise to take a dying person to the hospital. Only the consequences of breaking the promise explain why the second one is much worse than the first. Intuitions outweigh—they’re the foundational basis for any argument and theories that contradict our intuitions are most likely false even if we can’t deductively determine why.**

**4] Phenomenal introspection --- it’s the most epistemically reliable --- historical moral disagreement over internal conceptions of morality such as questions of race, gender, class, religion, etc prove the fallibility of non-observational based ethics --- introspection means we value happiness because we can determine that we each value it --- just as I can observe a lemon’s yellowness, we can make those judgements about happiness.**

#### **5] Extinction is a distinct phenomenon that requires prior consideration**

**Burke 16**

**Burke et al 16** Associate Professor of International and Political Studies @ UNSW, Australia, 2016 (Anthony, Stefanie Fishel is Assistant Professor, Department of Gender and Race Studies at the University of Alabama, Audra Mitchell is CIGI Chair in Global Governance and Ethics at the Balsillie School of International Affairs, Simon Dalby is CIGI Chair in the Political Economy of Climate Change at the Balsillie School of International Affairs, and, Daniel J. Levine is Assistant Professor of Political Science at the University of Alabama, “Planet Politics: Manifesto from the End of IR,” Millennium: Journal of International Studies 1–25)

8. Global ethics must respond to mass extinction. In late 2014, the Worldwide Fund for Nature reported a startling statistic: according to their global study, 52% of species had gone extinct between 1970 and 2010.60 This is not news: for three decades, conservation biologists have been warning of a ‘sixth mass extinction’, which, by definition, could eliminate more than three quarters of currently existing life forms in just a few centuries.61 In other words, it could threaten the practical possibility of the survival of earthly life. Mass extinction is not simply extinction (or death) writ large: **it is a qualitatively different phenomena that demands its own ethical categories.** It cannot be grasped by aggregating species extinctions, let alone the deaths of individual organisms. Not only does it erase diverse, irreplaceable life forms, their **unique histories** and **open-ended possibilities**, but it **threatens the ontological conditions of Earthly life**.

IR is one of few disciplines that is explicitly devoted to the pursuit of survival, yet it has almost nothing to say in the face of a possible mass extinction event.62 It utterly lacks the conceptual and ethical frameworks necessary to foster diverse, meaningful responses to this phenomenon. As mentioned above, Cold-War era concepts such as ‘nuclear winter’ and ‘omnicide’ gesture towards harms massive in their scale and moral horror. However, they are asymptotic: they imagine nightmares of a severely denuded planet, yet they do not contemplate the **comprehensive negation** that a mass extinction event entails. In contemporary IR discourses, where it appears at all, extinction is treated as a problem of scientific management and biopolitical control aimed at securing existing human lifestyles.63 Once again, this approach fails to recognise the reality of extinction, which is a **matter of being and nonbeing**, not one of life and death processes.

Confronting the enormity of a possible mass extinction event requires a total overhaul of human perceptions of what is at stake in the disruption of the conditions of Earthly life. The question of what is ‘lost’ in extinction has, since the inception of the concept of ‘conservation’, been addressed in terms of financial cost and economic liabilities.64 Beyond reducing life to forms to capital, currencies and financial instruments, the dominant neoliberal political economy of conservation imposes a homogenising, Western secular worldview on a planetary phenomenon. Yet the **enormity, complexity, and scale** of mass extinction is so huge that humans need to **draw on every possible resource in order to find ways of responding**. This means that they need to mobilise multiple worldviews and lifeways – including those emerging from indigenous and marginalised cosmologies. Above all, it is crucial and urgent to realise that extinction is a **matter of global ethics**. It is not simply an issue of management or security, or even of particular visions of the good life. Instead, it is about staking a claim as to the goodness of life itself. If it does not fit within the existing parameters of global ethics, then it is these boundaries that need to change.

9. An Earth-worldly politics. Humans are worldly – that is, we are fundamentally worldforming and embedded in multiple worlds that traverse the Earth. However, the Earth is not ‘our’ world, as the grand theories of IR, and some accounts of the Anthropocene have it – an object and possession to be appropriated, circumnavigated, instrumentalised and englobed.65 Rather, it is a complex of worlds that we share, co-constitute, create, destroy and inhabit with countless other life forms and beings.

The formation of the Anthropocene reflects a particular type of worlding, one in which the Earth is treated as raw material for the creation of a world tailored to human needs. Heidegger famously framed ‘earth’ and ‘world’ as two countervailing, conflicting forces that constrain and shape one another. We contend that existing political, economic and social conditions have pushed human worlding so far to one extreme that it has become almost entirely detached from the conditions of the Earth. Planet Politics calls, instead, for a mode of worlding that is responsive to, and grounded in, the Earth. One of these ways of being Earth-worldly is to embrace the condition of being entangled. We can interpret this term in the way that Heidegger66 did, as the condition of being mired in everyday human concerns, worries, and anxiety, to prolong existence. But, in contrast, we can and should reframe it as authors like Karen Barad67 and Donna Haraway68 have done. To them and many others, ‘entanglement’ is a radical, indeed fundamental condition of being-with, or, as Jean-Luc Nancy puts it, ‘being singular plural’.69 This means that no being is truly autonomous or separate, whether at the scale of international politics or of quantum physics. World itself is singular plural: what humans tend to refer to as ‘the’ world is actually a multiplicity of worlds at various scales that intersect, overlap, conflict, emerge as they surge across the Earth. World emerges from the poetics of existence, the collision of energy and matter, the tumult of agencies, the fusion and diffusion of bonds.

Worlds erupt from, and consist in, the intersection of **diverse forms of being** – material and intangible, organic and inorganic, ‘living’ and ‘nonliving’. Because of the tumultuousness of the Earth with which they are entangled, ‘**worlds’ are not static, rigid or permanent. They are permeable and fluid**. They can be **created**, **modified** – and, of course, destroyed. Concepts of violence, harm and (in)security that focus only on humans ignore at their peril the destruction and severance of worlds,70 **which undermines the conditions of plurality that enables life on Earth to thrive.**

**Plan: States should ban the appropriation of space by private entities.**

**ADVANTAGES**

**Private companies will colonize mars given the ability to appropriate space**

**Bensaid 20,**

[https://www.trtworld.com/magazine/elon-musk-s-astonishing-mission-to-colonise-mars-here-s-how-he-ll-do-it-42246#:~:text=SpaceX%20eventually%20wants%20to%20launch,number%20Musk%20keeps%20referring%20to.]

**Musk believes humanity needs to leave Earth to ensure the survival of our species in the case of catastrophe or disaster**. On Tuesday December 10, two days after SpaceX’s starship launch was cancelled a mere 1.3 seconds before lift-off, the giant gleaming steel rocket exploded on landing after reaching an altitude of 12.5 km, performing a flip and returning back to its launch pad. A week earlier, SpaceX’s founder Elon Musk gave the test flight 2 in 3 chances of failure. In a bout of excitement, he tweeted out, “Mars, here we come!!” But even before the failure of its largest prototype spaceship, SpaceX was already busy working on two newer prototypes. For Musk, who has single-handedly revitalised spaceflight, it’s all about moving fast, learning from mistakes, and developing technology and engineering methods that haven’t even been created yet, on the go, on the fly. SpaceX knew many things could go wrong with Starship. After all, the first two Starships blew up. But that’s the idea. SpaceX’s engineers have a daily struggle with the very difficult challenge of getting the world’s largest spaceship and rocket out of Earth’s gravity into orbit, while ensuring that it can land, and fly again. For Musk, the only way this can be achieved is through trial and error, getting closer and closer to the right design everytime. That’s exactly what SpaceX did to its ‘Raptor’ engine. “Like, we’re on Raptor engine 23 or something, Maybe 24. It’s lighter, cheaper, better in almost every way than Raptor version one, which sucked and blew up, basically. One of about six or seven Raptors that blew up, I’ve lost count.” The current (eighth) Starship prototype the company tried to launch is 16 stories tall. What’s more, it’s not even complete. It will require another 23-storey booster rocket to lift it into orbit while preserving its fuel, before yet another rocket refuels it in space. Musk’s vision is to eventually build one Starship a week. "I think we need, probably, on the order of 1,000 ships," he says. Why the tall order? SpaceX eventually wants to launch an average of three Starship rockets a day, each carrying a 100-ton payload. **A 1,000 Starship fleet would be capable of taking nearly 100,000 people to Mars everytime their planetary orbits sync, or every 26 months.** It all adds up to the golden number Musk keeps referring to. One million people. That’s how many people he believes need to live on Mars for the population to become sustainable, and distinct from earth. More specifically, that’s how many people he estimates are needed to recreate Earth’s entire industrial base, so that they can build, manufacture or process anything without relying on earth. At the heart of it all, Musk is driven by the need to ensure humanity becomes a multi-planetary species, which he believes is essential to our survival. “If something goes wrong with planet Earth, he pontificates, “that’s it. It’s game over.” When he set out to realise his dream of colonising Mars, Musk quickly realised it was prohibitively expensive to push anything out of Earth’s orbit. NASA used to pay $94,996 per kilogram of weight on any given mission. Some Space Shuttle missions cost upwards of half a billion dollars, and once booster rockets got a Space Shuttle into space, they were discarded and fell back into the ocean. That was until Musk happened. One of SpaceX’s first priorities was reducing the cost of launches by building a self-landing rocket. After multiple crashes and burns, SpaceX finally succeeded in landing a rocket in 2016, 12 years after it was founded. A landing rocket was a rocket that could be reused multiple times, improving the company's profits, and bringing Musk's dreams closer to reality. SpaceX currently charges around $150 million for 70 tons of payload delivered to low earth orbit. That amounts to nearly $285 a kilogram, a far cry from the old days of spaceflight. Musk wants to lower that further, to $10 a kilogram, which would make it viable to send people to Mars. After pushing for development into better, more powerful engines, **SpaceX quickly became a NASA and Department of Defence private contractor,** offering budget space delivery with great value. The profits it made were reinvested in bigger rockets and stronger engines to make the commercial launches it does for NASA seem relatively tiny. SpaceX has since supplanted NASA in the space race. In February 2019, **an independent report requested by the US House of Representatives to determine if NASA could fly past Mars** in 2033 **concluded** that the orbital mission would be “infeasible”, believing **2039 to be a more realistic date.** Not to be outperformed, Amazon’s owner Jeff Bezos set up Blue Origin, which also has its eyes on Mars and a slice of the solar pie. After all, space holds deep commercial promise and a new frontier of unexploited resources. One NASA report estimated that metals and minerals found in our solar system’s asteroid belt could exceed $100 billion for six billion people on earth. But why Mars? Musk believes it's for lack of a better choice. Venus has lead-melting temperatures, crushing atmospheric pressure, acidic rain and hot winds. Earth’s moon doesn’t have much in the way of resources, not to mention no atmosphere. With a day equal to 29 Earth days, the lack of atmosphere would make life incredibly cold, or hot. Mercury is similarly hot during the day, and incredibly cold at night. Jupiter, Saturn, Uranus and Neptune are just condensed balls of gas that can never be habitable, with incredible amounts of pressure at their surface. Jupiter and Saturn’s moons are possible candidates, but they’re further and colder than Mars. Pluto is even further and colder. An artist's rendition of what a Martian city may look like. An artist's rendition of what a Martian city may look like. (SpaceX) That pretty much makes Mars a dreamy candidate. It’s cold, but not too cold. Dark, but not much darker than earth. It’s not too far, has a day nearly the same length as Earth’s (which is important for growing food). Its gravity is a third of the Earth’s, has a lot of frozen water, and a significant amount of carbon dioxide, which our planet’s plants readily turn into oxygen, and which are essential to ‘terraforming’ Mars. Essentially, **terraforming would try to make Mars permanently more Earthlike, possibly through global warming, until it could support plants that would do the majority of the work.** But even that’s getting ahead of Musk, who readily admits there are so many problems with getting to Mars that he just started with the biggest ones. Leviathan Ultimately, SpaceX hopes to send up its recently exploded StarShip into orbit on the back of the ‘Super Heavy Booster’, or as Musk more commonly refers to it, the “Big F\*\*\*\*\*\*g Rocket,” or BFR for short. He has a point. SpaceX’s largest rocket, the Falcon Heavy, is already the most powerful booster rocket in human history, and twice as strong as the next best rocket. It can carry nearly 13 tons into Space. But that’s not enough. Enter the BFR, which will be able to take a few hundred tons to space initially, and eventually 1,000 tons. To put it simply, SpaceX’s current best rocket can manage little more than 1% of the BFR’s total payload. That’s why it’s planned to be 25-storeys high. Its engine, the powerful Raptor, can lift a stack of 172 cars, or an entire Boeing 747. The BFR has 42 of them. This gargantuan Booster sends Starship into space, where it connects to a similar ready booster, which pushes it throughout its journey to Mars. On the long journey to Mars, the spaceship will provide zero gravity games, movies, lecture halls, and restaurants. To sum up, it is a zero-gravity cruise-ship that Musk hopes will eventually cost $500,000 per individual. Here’s the catch though. There’s a troubling clause in the legal fine print for a Starlink service, **SpaceX**’s web of space-borne satellites are set to provide Earth, and hopefully Mars, with internet someday. “For services provided on Mars, or in transit to Mars via Starship or other colonization spacecraft,” it **reads**, “**the parties recognize Mars as a free planet and that no Earth-based government has authority or sovereignty over Martian activities,”** the governing law section states. That doesn’t leave much room for opting out, but it raises the question, who will run things on Mars? In a nutshell, **SpaceX will not recognise any international laws**, but will make its own. While reasonable in principle, life on Mars is bound to be hard, dirty and dangerous. For instance, if you change your mind, and decide you don’t want to spend the rest of your life working one job, you can’t exactly get on a flight and go back home. How will the Martian colony punish crime? How will it regulate labour, or even childbirth, which many scientists say is deeply unsafe in radiation-heavy space? Who will reap the profits of the eventual commercial space industry? In spite of the dangers of possibly paying your way into indentured servitude to benefit a larger entity, when the Mars One Project stopped accepting submissions for a one-way colonial trip in August 2013, the Dutch group announced it received over 4,000 serious applicants.In one video submission made by an applicant from a developing country, the candidate emphasised his kind nature and willingness to work hard. When asked why he wanted to leave Earth, he responded, “I’ve been trying to find a job for ages. There’s nothing for me here.”

#### **Colonizing Mars brings geopolitical tensions to space – any developments will be weaponized**

**Duke 20** [(Sgt. Joshua, served as a US Army intelligence analyst, including 24 months in Iraq in support of Operation Iraqi Freedom I, II, III, and IV. He holds a BA in intelligence studies with a concentration in counterintelligence from American Military University and is now serving in the United States Marine Corps. Sergeant Duke’s research focus is on national security and intelligence, including new approaches to counterterrorism using counterintelligence-based models; autonomous weaponry developments and their applications to international law, armed conflict, and US national security; and the future impacts of the space domain on global economics, intelligence operations, and US national security. He is also the author of “From Missiles to Microchips: Nation-States, Non-State Actors, and the Evolution of Intelligence” (Global Security Review, 2020); “Paid to Kill: An Examination of the Evolution of Combatants for Hire” (Global Security Review, 2020); and “Cyber World War: The People’s Republic of China, Anti-American Espionage, and the Global Cyber Arms Race” (Global Security Review, 2020, forthcoming).) “Conflict and Controversy in the Space Domain: Legalities, Lethalities, and Celestial Security” Wild Blue Yonder, 9/29/2020. https://www.airuniversity.af.edu/Wild-Blue-Yonder/Article-Display/Article/2362296/conflict-and-controversy-in-the-space-domain-legalities-lethalities-and-celesti/] BC

Part 3: Mars Domination

**Mars is widely accepted by the scientific community to be the most plausible planet for the first human habitation on a celestial body and, consequently, the most likely location for the first space colony and eventually a second planet for humankind**. Thus, **Mars is a desirable goal for nations involved in space exploration for many reasons**. **The territory on Mars, for example, will most likely become marketable for economic value to civilians in the long term**. **The Outer Space Treaty prevents ownership of territory on celestial bodies but makes no mention of ownership or sale for profit of structures built on, or items brought to, celestial bodies**, **just as there is no explicit language in the treaty preventing profit-based resource exploitation on celestial bodies by either governments, organizations, or private nationals**.32 Additionally, **the inevitability of Mars becoming a second planet inhabited by humanity must be considered, along with all of the implications of living spaces and ownership of property that will eventually follow**. **Denying this inevitability and claiming it as outlawed by international law due to the prohibition on appropriating territory on a celestial body would essentially equate owning property on Earth as also outlawed by international law**. **After all, Earth is also a celestial body**. **Language in the treaty encourages expansion into space and essentially says that if persons, governments, or organizations build something on a celestial body, they own that building**33 **and can do what they want with it, including selling it. They cannot, however, claim to own the planet's ground outside the building—yet**. **Resources on Mars, while still not mapped out as substantially as lunar resources have been, will likewise create new markets for economic prosperity and national wealth, including more 3He deposits from solar winds like those found in lunar regolith along with substantially high concentrations of iron.**34

In addition to buildings constructed on celestial bodies, **spacecraft and facilities constructed in space and on celestial bodies are also considered to be the territory of the owning nation**, **which means that the UN Charter applies to facilities and spacecraft in space and on celestial bodies**. **UN Charter Article 2(4), in particular, protects space explorers and potential future residents on Mars by prohibiting the "use of force against the territorial integrity" of another nation party to the treaty**,3**5 which all space-faring nations are. Article 51 further dictates that if attacked, "the inherent right of . . . self-defense" shall not be impaired.36 Article V of the Outer Space Treaty prescribes that, in space, all humans are bound to "render all possible assistance to" each other as "envoys of Mankind."37 Essentially, a peaceful international course is possible—even mandated—for human expansion into space**. **Unfortunately, the PRC and the RF regard space and celestial bodies as territorial goals**,38 **leading to the assumption that attempts will be made to control and defend such territories as necessary to achieve space superiority, control over space resources, and managerial power over the future colonization of Mars.**

**Control over Mars, in addition to affecting resource exploitation, transportation, and scientific advancements, also has implications for the direction of humanity in space. Establishment of a human colony, or human colonies, on Mars will eventually lead to territorial spaces, development of the land and air (potentially involving terraforming the planet for atmospheric enhancement), and security issues.** While an established colony on the Red Planet is still likely decades away, **trends within the PRC and RF governments suggest that any established colony on Mars under their jurisdiction would be authoritarian, weaponized, and secret**. **Given the nature of weather on Mars, fortified structures are easily justified, and the lack of a conventional weapons ban on celestial bodies makes weaponization of such a colony both legal and desirable**, mainly because of the third inherently desired factor—secrecy. **The inevitability of PRC and RF presence on Mars also suggests that any US developments will also include fortifications and weaponization. While the Outer Space Treaty mandates cooperation between nations on celestial bodies, the extreme distance between Earth and Mars means that a compliance verification system with effective monitoring and enforcement will be complicated, if not impossible, for the foreseeable future. For these reasons, a nation that effectively controls near-Earth space and establishes a security presence on the Moon will effectively be in a position to control Mars.**

#### **Independently, private space colonization shreds OST norms – that greenlights militarization**

**Wheeling 19** [(Kate, a staff writer at Pacific Standard, where she specializes in criminal justice and the environment.) “OUTER SPACE TREATIES DIDN'T ANTICIPATE THE PRIVATIZATION OF SPACE TRAVEL. CAN THEY BE ENFORCED” Pacific Standard, 8/14/2019. https://psmag.com/social-justice/outer-space-treaties-didnt-anticipate-the-privatization-of-space-travel-can-they-be-enforced] BC

**But settling space without repeating the same mistakes on Earth will require a robust policy framework**. While our motivations to settle space have broadened and our ability to do so has advanced, **the only legal framework for settling space comes from a deliberately vague international treaty drafted during the dawn of the space age**. **The rapid commercialization of space in recent years has left space law experts debating how to interpret the treaty's flexible language.**

Of course, **the idea of a long-term settlement in space for any purpose is still technologically and economically unfeasible**. **But the rise of billionaire-backed, private space companies such as Elon Musk's SpaceX and Bezos' Blue Origin, with lofty goals like Mars settlements and moving heavy industry into artificial space colonies, has made space settlements more realistic than ever.**

Historically, **space has been viewed as a "common heritage of humanity"—a region preserved for all current and future generations, protected from exploitation**. **This idealistic framing was born out of** an age of conflict on Earth. In 1967, when tensions between the United States and the Soviet Union were high and the space race was well underway, both nations drafted and signed onto a legally binding, international agreement known as **the Outer Space Treaty**. (More than 100 other countries have since become parties to the treaty.) It was a remarkably cooperative document for its time.

"At that time, **there was a real concern that the Cold War was going to extend itself into outer space**," says P.J. Blount, a professor of air and space law at the University of Mississippi School of Law. The 17-article treaty was drafted to preserve space as a peaceful and communal zone, where any activities would be for the benefit of all humankind. **The treaty bars weapons of mass destruction and military installations on celestial bodies, and it encourages states to share both knowledge gained from scientific and exploratory endeavors and responsibility for the safety of all astronauts, which the treaty designates as "envoys of mankind."**

Even throughout the Cold War, Blount notes, the U.S. and the Soviet Union cooperated in space, trading moon rocks and telemetry data on human spaceflight to advance both science and safety.

"**On the face of it, it's a very optimistic document**," says Lucianne Walkowicz, an astronomer at Chicago's Adler Planetarium. "It really frames space as a peaceful sanctuary."

"Inspired by the great prospects opening up before mankind as a result of man's entry into outer space," **as the treaty itself reads, it was an intentionally vague document, designed to guide space exploration as science and technology advanced and new issues arose**. **It requires states to guard against the contamination of other planets, but doesn't specify how to do so; it allows for stations and installations on celestial bodies for peaceful purposes, but doesn't speculate what those activities might be; and it bans governments from "appropriating" outer space, but doesn't define what the term means.**

"**There's a lot of debate over this particular clause**," Blount says. "**It's sort of ambiguous, but I would argue that it really means that states aren't supposed to go out and claim sovereign territory**."

So while governments can't claim land on other worlds, they can set up stations for scientific purposes. **But there's no discussion in the Outer Space Treaty, or the four other international space treaties that followed it, of the idea of a long-term settlement on other planets. What does that mean for the private companies with plans to set up settlements on the moon or Mars?**

When the treaty was drafted, the Soviet Union wanted to outlaw all non-governmental activities in space, but the capitalist U.S. insisted that outer space be open for business**. The compromise was that the treaty allows for commercial activities, but requires that federal governments take responsibility for the actions of both their space agencies and non-governmental actors in space**. The idea was to keep a private actor from accidentally kicking off a war. **"This is, within the world of international law, extraordinary," Blount says. "If you go into space and you do something terrible, the state itself might very well be on the hook for what you've done."**

**But exactly how much the state has to authorize and supervise the activities of companies like SpaceX or Blue Origin is up for debate.** **What agency, for example, should companies turn to for approval for space settlements? The questions only get more complicated from there. Under the current law, settlements would be inextricably linked to the nations that authorized them to begin with. So Elon Musk's city on Mars would likely be governed by U.S. law. But what happens when settlers no longer feel like citizens of the U.S.—or even of Earth?**

"**If you have an actual settlement, where people are living and working permanently, at some point that settlement is no longer going to feel represented by its terrestrial state**," Blount says. **Imagine a second generation that has never set foot on Earth. "It's a 'no-taxation-without-representation' problem all over again," he says. "That's one of those places where you find yourself in the gap in the law."**

**SpaceX and Blue Origin are not so different from the contractors that NASA has always been working with such as Boeing or Lockheed Martin,** according to Walkowicz. "**Private companies have always had a role in space exploration**," she says. **The difference is that the new generation of private rocket companies are lobbying for greater autonomy**. "**There are a lot of companies that are advocating for the ability and right to do whatever they want**," Walkowicz says. "Why would you want to have to pay for the protection of another world if your ultimate goal is to exploit it and take its resources?"

On multiple occasions, Bezos has outlined his vision for moving heavy polluting industries off of Earth, leaving the planet to be "zoned residential." Other smaller start-ups with less stable capital but equally ambitious plans to mine the moon or asteroids for precious metals and water helped to shepherd through legislation in the U.S. giving private industry more leeway in space. Such bills include the SPACE Act, which President Barack Obama signed into law in 2015—a piece of legislation that, for the first time, gave corporations a right to the resources they extract from other celestial bodies.

"**It's the same-old, same-old that we see here on Earth all the time**," Walkowicz says, "**where companies don't want to have to really preserve the environment that they also plan to strip mine, because the two are incompatible**."

**How does that square with the Outer Space Treaty? It doesn't, really. But that's not all that surprising**. "A **lot of the things people are thinking about, and often expressly making plans for, are in direct conflict with treaties**," Walkowicz says.

"If you look at the colonization of the Americas in particular, there were lots of treaties that the United States had with American Indian nations—hundreds of them, in fact—all of which have been broken," she says. "What history tells us is that we have to decide whether we want to continue to do things the way that we've always done things, or whether we want to try and uphold some of those high-minded principles that are in the Outer Space Treaty."

#### **Space war causes extinction –**

**David 5/11** [(Leonard, an award-winning space journalist who has been reporting on space activities for more than 50 years. Currently writing as Space.com's Space Insider Columnist among his other projects, Leonard has authored numerous books on space exploration, Mars missions and more, with his latest being "Moon Rush: The New Space Race" published in 2019 by National Geographic. He also wrote "Mars: Our Future on the Red Planet" released in 2016 by National Geographic. Leonard has served as a correspondent for SpaceNews, Scientific American and Aerospace America for the AIAA. He was received many awards, including the first Ordway Award for Sustained Excellence in Spaceflight History in 2015 at the AAS Wernher von Braun Memorial Symposium.) “Is war in space inevitable?” Space.com, 5/11/2021. https://www.space.com/is-space-war-inevitable-anti-satellite-technoloy] BC

Here on Earth, the air, land, and sea are zones of conflict, clashes and combat. **There is a growing perception that next up is the ocean of space, transformed into an arena for warfare.**

**There is ongoing chatter regarding military use of space by various nations**. **The freshly established U.S. Space Force, for instance, is busily shaping how best to protect U.S. and allied interests in the increasingly contested and congested space domain.**

**What conditions could lead to clashes in space?** Is such a situation a given, or **can conflicts be short-circuited ahead of time? Could nations "slip into" off-planet muscle-flexing, quarreling and actual warfighting in space that might spark confrontation here on terra firma?**

Space.com contacted several leading military space and security experts, asking for their opinions on the current status of the militarization of space.

**Pass interference**

**The term "warfare in space" could entail things that are already taking place, said Mark Gubrud, an adjunct assistant professor in the Curriculum in Peace, War & Defense at the University of North Carolina, Chapel Hill. He pointed to jamming satellite communications, laser dazzling of photo-snapping satellites, hacking systems to selectively block or eavesdrop on phone or data streams, and probing systems to see if they can be hacked.**

**"While the full extent of such activities may not be known, they appear to occur sporadically up to now**," Gubrud said. According to some reports, he said, the U.S. and perhaps others have made extensive use of the ability to intercept and interfere with commercial telecom traffic, though this is an asymmetric capability of major powers that presents little risk of escalation.

Gubrud said that **all of these forms of harmful interference could potentially lead to escalation risks as they are more widely and commonly practiced and as adversaries develop reciprocal capabilities.**

"Therefore**, we should build on the United Nations Outer Space Treaty with a further treaty that bans all forms of harmful interference and weapons for causing interference,**" he said.

Absence of binding commitments

**The greatest danger will arise from a massive proliferation of Earth-based anti-satellite systems that are able to affect spacecraft in geosynchronous orbit and beyond, or the pre-deployment of various types of such weapons in space that would allow them to reach their targets within minutes or seconds**, rather than hours, Gubrud said.

**"Here the potential for rapid escalation becomes a severe threat to nuclear stability, as the main confronting powers would almost certainly be the US, Russia and China**," he said. **The only good news here is that this hasn't happened yet**, he added, probably **because there is enough recognition of how dangerous it would be**.

"So really, **the path to war in space is a space arms race, one that has long been postponed but that is only made more imminent and potentially explosive as technology advances in the absence of binding commitments to space arms control**," Gubrud concluded.

Tailgating

**Space is already weaponized by dual-use robotic spacecraft serving as weapons to disable our satellites**, said Brian Chow, an independent policy analyst with over 25 years' experience as a senior physical scientist specializing in space and national security.

"**Because their peaceful uses are important to space prosperity, they should not be banned**," Chow said. **"Actually, we can accept some rules and measures so that we can enjoy the benefits of these spacecraft and prevent them from harming our satellites at the same time**."

Chow senses that **the present problem is that the international community has not prohibited spacecraft, whether peaceful or hostile, from staying arbitrarily close to satellites operated by another nation. An adversary is not prevented from placing its dual-use spacecraft close to our satellites in peacetime.**

**"Once these spacecraft are in place, mounting attacks from such a close range would give us insufficient warning time to fashion a defense and save our targeted satellites**," Chow told Space.com.

**The international community is ambiguous about whether a nation is allowed to tailgate another country's satellites**, Chow said. Also**, the current U.S. national security space strategy is ambiguous about preemptive self-defense, including when it faces a threat from space stalkers, he said.**

Dangerous ambiguities

**The uncertainties surrounding preemption and stalking are dangerous**, Chow said. For instance, **China could reason that space stalkers would be the best type of anti-satellite system, because it would present the United States with two bad choices.**

"First, **the United States could preemptively destroy the space stalkers to save the targeted satellites so as to maintain space support to military operations during crisis and war**," Chow said. "However, **without discussing and resolving these two ambiguities with the international community in peacetime, the United States could be condemned as the aggressor who fired the first shot, which led to a war in space possibly spreading to Earth — something both sides tried to avoid**," Chow said.

Secondly, **Chow said that the United States may not be able to fight effectively without the support of some critical satellites**.

"**Facing these two bad choices, the United States might end up not intervening at all. This would be the perfect outcome for China**, as it prevented U.S. intervention without firing a single shot," Chow said. "**If we keep using the current space policy without necessary and needed changes, the U.S. and other nations could 'stumble into' such conflicts**."

**Privatization allows for rapid-acquisition, faster war-readiness and higher-war likeliness in space**

Schmitt 19

[Ms. Schmitt (Candidate, BS, Georgia Institute of Technology) is a student in the Sam Nunn School of International Affairs where she is pursuing a bachelor’s degree in International Affairs and Modern Languages with a specialization in French and Arabic. https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Volume-33\_Issue-2/V-Schmitt\_Bettinger.pdf]

“We must expect that **war of any kind will extend into space in any future conflict**, and we have to change the way we think and prepare for that eventuality,” Air Force Chief of Staff Gen David L. Goldfein told the Air Force Association in February 2018.1 Considering President Trump’s recent promotion of a military department specializing in space operations, **conflict in outer space is becoming an increasingly concerning possibility for US officials.**2 This conflict could be the result of a number of different scenarios: **space war could occur as an isolated incident, a preliminary strike in preparation for a terrestrial conflict, or an escalation of an existing terrestrial conflict.** Regardless of the means by which the US arrives at the brink of a space war, the US government (USG) and military must possess the tools necessary to create a successful deterrent against potential adversaries. Should deterrence fail, the US must retain the ability to support ground forces via the exploitation of space—the “ultimate high ground.”3 With these requirements in place, General Goldfein’s statement gains new urgency. Yet, it is possible that changing the way we think about the eventuality of space conflict could mean looking back to heritage processes to ensure military readiness. For instance, if an adversary is prepared to inhibit the functionality of “x” number of US on-orbit systems, could the US deter the adversary from attacking by rapidly doubling or even tripling its available space assets? The difficulty of producing and launching space assets precludes the possibility of rapid acquisition; however, **the temporary nationalization of existing civilian-owned assets in space for governmental and military purposes could abridge an otherwise lengthy space acquisitions process.** Although the duration of nationalization may span weeks to months—even years—an accurate assessment of the “temporary” nature of such a program is dependent on several factors. These factors include the continued presence of an adversary counterspace threat during a space war must be considered, preconflict contractual agreements, and the schedule for formal reconstitution of key on-orbit systems at the completion of a space war. The formal 62 AIR & SPACE POWER JOURNAL SUMMER 2019 Schmitt & Bettinger reconstitution may be on the order of years based on **the current space acquisitions process that typically takes 5–10 years to replace a given space system.4 This timeline may be shortened, though, with rapid-acquisitions solutions focused on commercial-off-the-shelf components and systems within a wider “responsive space” acquisitions architecture seeking to deliver stop-gap systems to mitigate short-term capability gaps.** The use of the descriptor temporary hereafter is meant to capture the finite nature of the program but is intentionally vague due to the scope of the present analysis.

**Vote aff because appropriative privatization entails colonization, warfare is unavoidable, and capabilities for warfare are greatly increased in the neg resulting in accelerated extinction.**

**TURNS & BLOCKS**

#### **Extinction isn’t white paranoia and apocalyptic reps are good**

**Thompson 18** [Nicole Akoukou. Chicago-based creative writer. 4-6-2018. "Why I will not allow the fear of a nuclear attack to be white-washed." RaceBaitR. http://racebaitr.com/2018/04/06/2087/#]

**I couldn’t spare empathy for a white** woman **whose biggest fear was something that hadn’t happened yet and might not. Meanwhile, my most significant fears were in motion**: **women and men dying in cells** after being wrongly imprisoned, **choked out for peddling cigarettes, or shot to death** during ‘routine’ traffic stops. I twitch when my partner is late, worried that a cantankerous cop has brutalized or shot him because he wouldn’t prostrate himself. **As a woman of color, I am aware of** the **multiple types of violence that threaten me currently—not theoretically. Street harassment**, excessively affecting me as a Black woman, has blindsided me since I was eleven. A premature body meant **being** **catcalled** before I’d discussed the birds and the bees. It meant being **followed, whistled at, or groped**. As an adult, while navigating through neighborhoods with extinguished street lights, I noticed the correlation between women’s safety and street lighting—as well as the fact that Black and brown neighborhoods were never as brightly lit as those with a more significant white population. I move quickly through those unlit spaces, never comforted by the inevitable whirl of red and blue sirens. In fact, it’s always been the contrary. Ever so often, cops approach me in their vehicle’s encouraging me to “Hurry along,” “Stay on the sidewalk,” or “Have a good night.” My spine stiffening, I never believed they endorsed my safety. Instead, I worried that I’d be accused of an unnamed accusation, corned by a cop who preys on Black women, or worse. A majority of my 50-minute bus ride from the southside of Chicago to the north to join these women for the birthday celebration was spent reading articles about citywide shootings. I began with a Chicago Tribute piece titled “33 people shot, seven fatally, in 13 hours,” then toppled into a barrage of RIP posts on Facebook and ended with angry posts about police brutality on Tumblr. You might guess, by the time I arrived to dinner I wasn’t in the mood for the “I can’t believe we’re all going to die because Trump is an idiot” shit. I shook my head, willing the meal to be over, and was grateful when the check arrived just as someone was asking me about my hair. My thinking wasn’t all too different from Michael Harriot’s ‘Why Black America Isn’t Worried About the Upcoming Nuclear Holocaust.” While the meal was partly pleasant, **I departed thinking, “fear of nuclear demolition is just some white shit**.” Sadly, that thought would not last long. **I still vibe with Harriot’s statement, “Black people have lived under the specter of having our existence erased on a white man’s whim since we stepped on**to the **shore** at Jamestown Landing.” **However**, a friend—a Black friend—ignited my nuclear paranoia by sharing theories about when it might happen and who faced the greatest threat. In an attempt to ease my friend’s fear, I leaned in to listen but accidentally toppled down the rabbit hole too. I forked through curated news feeds. I sifted through “fake news,” “actual news,” and foreign news sources. Suddenly, an idea took root: **nuclear strike would disproportionately impact Black people, brown people, and low-income individuals. North Korea won’t target the plain sight racists of Portland**, Oregon, **the violently microaggressive liberals of the rural Northwest, or the white-hooded klansmen** **of** Diamondhead, **Mississippi. No, under the instruction of the supreme leader Kim Jong-un, North Korea will likely strike densely populated urban areas**, such as Los Angeles, Chicago, Washington D.C., and New York City. **These locations stand-out as targets for a nuclear strike because they are densely populated** U.S. population centers. **Attacking the heart of the nation or populous cities would translate to more casualties**. With that in mind, it’s not lost on me that **the most populous cities in the United States boast sizeable diverse populations, or more plainly put: Black populations.** This shit stresses me out! There’s a creeping chill that follows me, a silent alarm that rings each time my Google alert chimes letting me know that Donald Trump has yet again provoked Kim Jong-Un, a man who allegedly killed his very own uncle. I’ve grown so pressed by the idea of nuclear holocaust that my partner and I started gathering non-perishables, candlesticks, a hand-crank radio, and other must-buy items that can be banked in a shopping cart. **The practice of preparing for a nuclear holocaust sometimes feels comical, particularly when acknowledging that there has long been a war on Black people in this country**. Blackness is bittersweet in flavor. We are blessed with the melanized skin, the MacGyver-like inventiveness of our foremothers, and our blinding brightness—but the anti-blackness that we experience is also blinding as well as stifling. We are stuck by rigged systems, punished with the prison industrial complex, housing discrimination, pay discrimination, and worse. We get side-eyes from strangers when we’re “loitering,” and the police will pull us over for driving “too fast” in a residential neighborhood. We get murdered for holding cell phones while standing in our grandmother’s backyard. The racism that strung up our ancestors, kept them sequestered to the back of the bus and kept them in separate and unequal schools still lives. It lives, and it’s more palpable than dormant. To me, this means one thing: Trump’s America isn’t an unfortunate circumstance, it’s a homecoming event that’s hundreds of years in the making, no matter how many times my white friends’ say, “He’s not my president.” **In light of this homecoming, we now flirt with a new, larger fear of a Black genocide**. **America has always worked towards Black eradication through a steady stream of life-threatening inequality, but nuclear war on American soil would be swift**. And **for this reason I’ve grown tired of whiteness** **being at the center of the nuclear conversation. The race-neutral approach to the dialogue, and a tendency to continue to promote the idea that missiles will land in suburban and rural backyards, instead of inner-city playgrounds, is false.** “The Day After,” the iconic, highest-rated television film in history, aired November 20, 1983. More than 100 million people tuned in to watch a film postulating a war between the Soviet Union and the United States. The film, which would go on to affect President Ronald Reagan and policymakers’ nuclear intentions, shows the “true effects of nuclear war on average American citizens.” The Soviet-targeted areas featured in the film include Higginsville, Kansas City, Sedalia, Missouri, as well as El Dorado Springs, Missouri. They depict the destruction of the central United States, and viewers watch as full-scale nuclear war transforms middle America into a burned wasteland. Yet unsurprisingly, the **devastation from the attack is completely white-washed, leaving out the more likely victims which are the more densely populated (Black) areas**. **Death tolls would be high for white populations, yes, but large-scale losses of Black and brown folks would outpace that number, due to placement and poverty. That number would be pushed higher by limited access to premium health care, wealth, and resources. The effects of radiation sickness, burns, compounded injuries, and malnutrition would throttle Black and brown communities and would mark us for generations. It’s for that reason that we have to do more to foster** disaster **preparedness among Black people where we can. Black people deserve the space to explore nuclear unease, even if we have competing threats, anxieties**, and worries. Jacqui Patterson, Director of the Environmental and Climate Justice Initiative, once stated: African American communities are disproportionately vulnerable to and impacted by natural (and unnatural) catastrophes. Our socio-economic vulnerability is based on multiple factors including our lack of wealth to cushion us, our disproportionate representation in lower quality housing stock, and our relative lack of mobility, etc.

**Generation ship solves for uninhabitable earth, we don’t need to colonize mars or appropriate space to prevent extinction.**

**Levyis 16**

**[Neil Levyis a senior research fellow of the Oxford Uehiro Centre for Practical Ethics and professor of philosophy at Macquarie University in Sydney. He is the author of Consciousness and Moral Responsibility (2014). https://aeon.co/ideas/would-it-be-immoral-to-send-out-a-generation-starship]**

https://aeon.co/ideas/would-it-be-immoral-to-send-out-a-generation-starship

If **human beings** are ever to colonise other planets – which might become necessary for the survival of the species, given how far we have degraded this one – they **will almost certainly have to use generation ships**: spaceships that will support not just those who set out on them, but also their descendants. The vast distances between Earth and the nearest habitable planets, combined with the fact that **we are unlikely ever to invent a way of travelling that exceeds the speed of light**, ensures that many generations will be born, raised and die on board such a ship before it arrives at its destination. A generation ship would have to be a whole society in microcosm, with hospitals and schools, living quarters and perhaps entertainment districts, a security force, maybe even a judiciary. It would need to be able to provide food for its crew, and that might require agriculture or aquaculture, perhaps even domestic animals (which might also be needed for the colonisation effort). Its design therefore presents a major challenge: not just to engineers but also to social scientists. How should the crew be selected and the environment structured to minimise interpersonal conflict? What size of population is optimal for it to remain committed to the single overarching project of colonising a new planet without too much of a risk of self-destructive boredom or excessive narrowing of the gene pool? Does mental health require that a quasi-natural environment be recreated within the ship (with trees, grass and perhaps undomesticated birds and small animals)? As well as the technological and social challenges confronting the designers of such ships, there are fascinating philosophical and ethical issues that arise. The issue I want to focus on concerns the ethics of a project that locks the next generation into a form of living, the inauguration of which they had no say over, and that ensures their options are extremely limited. A generation ship can work only if most of the children born aboard can be trained to become the next generation of crew. They will have little or no choice over what kind of project they pursue. At best, they will have a range of shipboard careers to choose between: chef, gardener, engineer, pilot, and so on. Given that allocation to roles must be tightly controlled, they might not even have that degree of choice, since once a sufficient number of people have enrolled in chef training, for example, there will be no more places available. They will not be able to choose a life of contemplation, of withdrawal into a religious community or (to take a role that is more common in the society their parents leave behind) of working in a service industry. They will not be able to choose part-time or full-time work, and so on. Of course, such questions arise for many of us, here and now. The differences between Earth and generation ships are differences in scale, not in kind. Parents typically want their children to support the way of life, the nation, the institution that they think is valuable (for instance, many parents would be distressed by their children marrying outside their religion, and religious schools are justified for many in part by the fact that they make it more likely that dating and marriage will be within the community). Some people face the knowledge that their children will have few options and fewer good ones (for instance, those people who live in very impoverished communities) and a similar issue arises for people who are carriers of genes for option-limiting conditions (such as Huntington’s disease). However, does the fact that a child will (or might) have few good options make reproduction morally impermissible? **Children born on board generation ships might**, in fact, **be better off** (with **access to better medical care, better nutrition, education, and so on), than many born into poverty today**. But they will still be locked into a project they did not choose. In the United States, the Amish have the legal right to take their children out of schooling early, in order to limit their exposure to different ways of life. Those of us who worry that their doing so limits the children’s right to an open future should be even more worried by locking children in to a much greater extent than dreamt of by the Amish. After all, adults can, and do, leave Amish communities. But no one gets to leave the generation ship, and few or none will get to choose what role they play aboard. Further, those born aboard will be more limited in all of their choices than any human anywhere should be. For example, many millions of women around the world have no control over whether they bear children: most of us believe that this is intolerable, and that everyone should have control over their own reproduction. But those born on board a generation ship will have no effective choice over whether they become parents. The success of the enterprise will depend on (at least most of) them having children, which ensures that they will be (at minimum) under great pressure to reproduce. They will have little choice over whether they partner up, too, and perhaps not much choice over whom they partner with (once some have partnered up, others must settle for those who remain). The only way around these problems would be to design and build ships massive enough to house an entire complex society that presents a wide array of options and ensures a range of lifestyles can be pursued. The enormous costs of such a ship and the difficulty of propulsion for anything of that size suggest that it’s not a realistic option. Whether generation ships would be ethically permissible, despite locking children into a project and way of life that they didn’t choose, seems to depend on whether the goal – say, **the survival of the species – is itself sufficiently valuable to justify it.** That’s not a question I will attempt to answer. Given that generation ships remain a long way off, it’s not a pressing concern. But at different scales and in different forms, **most children on Earth today were born into constrained futures, whether through poverty, religious beliefs or impending environmental degradation.** Asking about the permissibility of generation ships might give us a fresh perspective on the permissibility of the constraints we impose now on human lives, here on the biggest generation ship of them all – our planet.

**By using both geological processes and carbon capture, states and private entities can significantly reduce greenhouse gasses in the atmosphere**

**Moore 08**

**[Lisa Moore, Ph.D., a scientist in the Climate and Air program at Environmental Defense, https://blogs.edf.org/climate411/2008/02/26/ghg\_lifetimes/]**

Many people don’t realize that the greenhouse gases we emit can stay in the atmosphere for decades, centuries or even millennia. That’s why **it’s so important that we cap emissions as soon as possible**. Here’s a table showing a selection of greenhouse gases, their global warming potential (GWP), and their lifetimes: Greenhouse GasLifetime (Years)100-Year GWP Carbon Dioxide (CO2)hundreds1 Methane (CH4)1225 Nitrous Oxide (N2O)114298 Hydrofluorocarbon-23 (CHF3)26414,800 Sulphur hexafluoride (SF6)3,20022,800 PFC-14 (CF4)50,0007,390 Source: Table 2.14 in the IPCC AR4 WG-I Report. Original table lists many more gases. Notice that the carbon dioxide lifetime is “hundreds of years”, rather than a specific number. The IPCC Third Assessment Report defines a gas’s lifetime as the amount of the gas in the atmosphere divided by the rate at which it is removed from the atmosphere. That sounds simple enough, except that not all gases are removed by just one (or mainly one) process. Ironically, the gas that accounts for the greatest proportion of global warming, carbon dioxide (CO2), is the hardest to pin down. When CO2 is released into the atmosphere, about three-quarters of it dissolves into the ocean over a few decades. The rest is neutralized by a variety of longer-term geological processes, which can take thousands of years. From IPCC Fourth Assessment Report, Working Group I (AR4, WG-I) Executive Summary of Chapter 7: **About 50% of a CO2 increase will be removed from the atmosphere within 30 years, and a further 30% will be removed within a few centuries. The remaining 20% may stay in the atmosphere for many thousands of years.** From U.S Greenhouse Gas Inventory Reports: Atmospheric lifetime: 50-200 years. No single lifetime can be defined for CO2 because of the different rates of uptake by different removal processes. From RealClimate post "How long will global warming last?": My model indicates that about 7% of carbon released today will still be in the atmosphere in 100,000 years. I calculate a mean lifetime, from the sum of all the processes, of about 30,000 years. That’s a deceptive number, because it is so strongly influenced by the immense longevity of that long tail. If one is forced to simplify reality into a single number for popular discussion, several hundred years is a sensible number to choose, because it tells three-quarters of the story, and the part of the story which applies to our own lifetimes. For other gases, a meaningful lifetime is easier to calculate because one process dominates their removal from the atmosphere: Methane is mostly scrubbed from the atmosphere by hydroxyl radicals (a chemical reaction). Nitrous oxide is destroyed by photolytic reactions (chemical reactions involving photons or light) in the stratosphere. As you can see from the chart, some gases have extraordinarily long lifetimes. Because emission rates are vastly higher than removal rates, greenhouse gases are accumulating in the atmosphere and will affect climate for generations to come.

**Carbon capture is viable, with zero emissions being emitted from humans on earth and carbon capture the earth can be rehabilitated**

**Conca 19,**

**https://energypost.eu/extract-co2-from-our-air-use-it-to-create-synthetic-fuels/**

Carbon Capture needs to take off, but nobody knows how it’s going to happen. We need innovation, scrutinised, tested and funded. Jim Conca looks at a method of extracting CO2 directly from the air that’s being pioneered by Carbon Engineering in Canada, backed by private investors and government agencies. It grew out of academic work at the University of Calgary and Carnegie Mellon University. It’s **“Direct Air Capture” system can remove a ton of CO2 from the air for about $100 today**. Conca describes how **one plant can capture about a million tons of CO2 per year, so tens of thousands will be needed to reduce atmospheric CO2 to normal levels**; nobody should be surprised by the scale required. On top of that, their **“Air to Fuel” technology uses the CO2 to produce synthetic fuel**s for less than $4/gallon (slightly more expensive than fossil fuels, but similar to biofuels). Low-carbon rules and fuel standards can make them very competitive with any fuel. If you want to kill two birds with one stone a process that removes atmospheric CO2 and uses it to create hydrocarbon fuels to displace petroleum products seems a great way to do it, concludes the author. **Extracting CO2 from the air is one of the best ways to reverse climate change without resorting to expensive technologies, convoluted tax schemes or preventing billions of people from getting the energy they need to have a good life.** If you could then make gasoline, diesel, or jet fuel from it, then you’d kill two birds with one stone. That stone is Carbon Engineering. Since we are failing to curb global carbon emissions at all, we are left with using our huge brains, which got us into this problem in the first place, to try to wangle our way out of it. Design of Carbon Engineering air contactor that would collectively capture about a million tons of CO2 per year, equivalent to the annual emissions of 250,000 cars. / SOURCE: Carbon Engineering Radical thinking Whether that’s solar engineering or cloud seeding to reduce incident solar radiation, or reforestation, or carbon capture and sequestration from burning fossil fuels, or ocean iron fertilisation or putting huge mirrors in space, humans think we can engineer our way around any issue. And for the most part, we can. We just need to choose wisely so we don’t make matters worse or break the bank. The best most direct strategy, that has the least bad side-effects, is to remove carbon directly from the atmosphere and make something useful out of it – like fuel – that would further lessen the burden on the environment. Schematic of how Carbon Engineering’s Direct Air Capture system works. / SOURCE: Carbon Engineering Based in Canada, Carbon Engineering’s Direct Air Capture system directly removes CO2 from the atmosphere, purifies it, and produces a pipeline-ready compressed CO2 liquid using only energy and water. This CO2 can be combined with non-fossil fuel-generated hydrogen, to produce ultra-low carbon intensity hydrocarbon fuels such as gasoline, diesel, and Jet Fuel-A. The pipeline CO2 can also be used for industrial purposes including production of steel and concrete, coatings and carbon fibers, or enhanced oil recovery. From its pilot plant in Squamish, British Columbia, Carbon Engineering has successfully developed and demonstrated its technologies and has been removing CO2 from the atmosphere since 2015 and converting it into fuels since 2017. Carbon Engineering’s Direct Air Capture pilot plant in Squamish, British Columbia. / SOURCE: Carbon Engineering This technology is not fringe, but is supported by Bill Gates, Canadian Natural Resources Limited, Occidental Petroleum and Chevron, among others. Removing CO2 at $100/ton Presently, Carbon Engineering’s Direct Air Capture system can remove a ton of CO2 from the air for about $100. **Individual systems would be set to capture about a million tons of CO2 per year, requiring some tens of thousands of systems to keep up with global emissions and reduce atmospheric CO2 to normal levels by 2040.** There are just under 70,000 gas stations in the United States alone, so that isn’t very many to save the planet. For the next step, Carbon Engineering’s Air to Fuel technology produces synthetic, liquid transportation fuels, such as gasoline, diesel, and Jet-A. The process combines CO2 captured from the atmosphere through their Direct Air Capture system with hydrogen to produce hydrocarbon fuels. A Carbon Engineering staff member holds clean synthetic fuel made from Carbon Engineering’s Direct Air Capture system and hydrogen split from water. / SOURCE: Carbon Engineering Add hydrogen to produce carbon fuels If the hydrogen is produced from water using nuclear or renewable energy, then the fuel is carbon-neutral. And these fuels are drop-in compatible with today’s transportation infrastructure, engines and aircraft. These fuels can presently be produced by Carbon Engineering for less than $4/gallon, making them slightly more expensive than fossil fuels, but similar to biofuels. Low-carbon mandates and fuel standards make them very competitive with any fuel. And the costs will continue to come down. Small units, located anywhere But unlike biofuels, CE fuel doesn’t take much land space or water and is independent of weather or geographic location. The fuel also has a high cetane rating, can be blended with fossil fuels to any degree, and doesn’t have the other contaminants that fossil fuels have, like sulphur, nitrogen and particulates. Making fuel out of the extracted CO2 is not just a side bar to this approach. It could also remove some of the necessity to transport fuels around the country, and the world, to support strategic missions like those of our military. Liquid fuel and water comprise the majority of the mass transported to deployed military forces. Resupply of fuel and drinking water for troops in-theater costs lives, about 4 lives for every 100 convoys. To dramatically reduce these, our military wants to deploy small nuclear reactors whose resupply is once every several years or more. Those SMRs could also run Carbon Engineering’s CO2 extraction-to-fuel systems in places where renewables are not feasible, like in remote sites and for most military missions. The United States Nuclear Navy wants to do just that. And they can use the excess energy from nuclear reactors that already exist on their ships. They can even separate hydrogen from water using the copper-chlorine process, a thermochemical process for which one step needs heat at exactly the core temperature of a nuclear reactor (530°C) on board an aircraft carrier. For that matter, CO2 can also be extracted from seawater. Increased atmospheric CO2 from hydrocarbon use has also acidified the oceans in a crisis separate from global warming. So wouldn’t it be nice to remove some of that and remake hydrocarbons that could be used to displace petroleum products like gasoline that helped cause this in the first place.

**Mining isn’t appropriation**

**Wrench 19**

[John G. Wrench, Non-Appropriation, No Problem: The Outer Space Treaty Is Ready for Asteroid Mining, 51 Case W. Res. J. Int'l L. 437 (2019) Available at: https://scholarlycommons.law.case.edu/jil/vol51/iss1/11]

And, ambitious they are. U.S.-based businesses like Planetary Resources and Deep Space Industries have plans to profit from space mining.34 **Scientists believe that asteroids and other celestial objects are abundant with precious metals, including those used to create a wide range of technology**.35 In January of 2018, Planetary Resources accomplished a step in its resource mining plans, by launching a satellite capable of detecting water. Because water can be used to create rocket-fuel, identifying water on asteroids would essentially create “launch pads for long distance travel.”36 Similarly, Deep Space Industries plans to launch a spacecraft capable of prospecting near- [w]e’re not going to leave flags and footprints and then come home, to not go back for another 50 years.” In response to what it deems “some misunderstanding,” the Deep Space Industries’ general counsel has reassured the international community that **the non-appropriation principle prohibits ownership—not the “use”38—of celestial bodies. Luxembourg interprets the OST similarly. In 2017, it passed a law granting businesses operating within its jurisdiction rights in resources extracted in outer space.**39 Through the law, Luxembourg plans to invest at least $230 million to encourage businesses to establish offices within its jurisdiction.40 The plan seems to be working: Planetary Resources applauded the law as a step towards “stability and predictability” for asteroid mining,41 while Deep Space Industries’ prospecting spacecraft will now be co-funded by Luxembourg