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#### **Ambiguities in the OST that allow private appropriation have kicked off a race to develop space, setting the stage for a debris crisis. Current laws fail due to lax rules and forum shopping.**

Dovey 21 [Ceridwen Dovey, “Space Exploration At What Price?,” Readers Digest Asia Pacific, 5/1/21. <https://www.pressreader.com/australia/readers-digest-asia-pacific/20210501/281487869174485>] CT

One environmental risk all stakeholders agree on is that posed by space debris. There’s already about 5000 satellites in orbit around Earth, of which roughly 2000 are operational, plus hundreds of millions of tiny pieces of debris. Ninety-five per cent of the stuff in low-Earth orbit is classified as ‘space junk’. More space debris makes accessing space costlier in terms of loss of equipment (and possibly of human life). There’s also the risk of the Kessler effect: a cascade of collisions, to the point where the most useful orbital slots become permanently clogged. “We are in the process of messing up space, and most people don’t realise it because we can’t see it the way we can see fish kills, algal blooms or acid rain,” Michael Krepon, an expert on nuclear and space issues, said in 2015. Maybe we’ll understand only when it’s too late, “when we can’t get our satellite television and our telecommunications ... when we get knocked back to the 1950s”. The current clashes over space are rooted in the nitty-gritty of international space law. There are five multilateral UN treaties governing space, most importantly the 1967 Outer Space Treaty (OST), which has been ratified by 109 states, including all major spacefaring nations. It defines outer space as a global commons, the province of all humanity, free to be used and explored “for the benefit and in the interests of all countries”, “on a basis of equality” and only for “peaceful purposes”. Article II of the OST has become the major sticking point in the new space race. It forbids “national appropriation by claim of sovereignty, by means of use or occupation, or by any other means”. No nation can make a territorial claim on the Moon or on any other celestial bodies, such as asteroids. While the OST contains no explicit ban of appropriation by private enterprise, Steven Freeland, a professor specialising in space law at Western Sydney University and Australia’s representative to the UN Committee on the Peaceful Uses of Outer Space (COPUOS), says discussions at the time of the OST negotiations clearly show the states parties, including the US, were “of the opinion that Article II prohibited both public and private appropriation”. Yet this perceived legal uncertainty is the loophole that commercial companies are now exploiting. They’ve actively lobbied for an interpretation of OST Article II in the domestic space law of certain countries, to allow for private ownership of resources extracted from the Moon or other celestial bodies. They argue that, because the OST declares all humans are free to “use” space, companies can exercise this right by mining anywhere they like. They won’t claim ownership of the land itself, but will claim ownership of the resources they mine there. They’ve already had a major win in this regard. The space industry lobby in the US put pressure on members of Congress to reinterpret the US’s obligations under international space law, to become more ‘business friendly’. The outcome was the 2015 Commercial Space Launch Competitiveness Act, signed into law by President Obama. Since then, companies owned by US citizens have been given the right to claim ownership of – and sell – any resources they mine off-Earth. Further emboldened by the Trump administration, the “commercial [space] industry is becoming far more aggressive in how it lobbies for its own interests” in the US, Freeland says. There have been Acts proposed in recent years to enable a corporate space culture of “permissionless innovation”, with little regulatory oversight. In a 2017 speech, President Trump’s space law adviser Scott Pace said, “It bears repeating: outer space is not a ‘global commons’, not the ‘common heritage of mankind’, not ‘ res communis’ [area of territory that is not subject to legal title of any state], nor is it a public good.” Even if you accept the US government’s interpretation of Article II – that space resources, but not the territory on which they’re located, can be owned – what happens if someone mines an asteroid out of existence, which is an act of outright appropriation? Should the public trust that companies mining in space will do the right thing? We’re still uncovering the full extent of terrestrial mining companies’ cover-ups. For instance, inhouse scientists at Exxon – now Exxon-Mobil, one of the biggest oil and gas companies in the world – knew long ago that burning fossil fuels was responsible for global warming, but they actively buried those findings and discredited climate change science for decades. We live in a world where ‘meta-national’ companies can accrue and exercise more wealth and power than traditional nation-states. Silicon Valley is believed to be becoming more powerful than not only Wall Street but also the US government. Branson and other space billionaires like to reassure the masses they’re “democratising” space: just as plane travel started out for the wealthy and gradually became cheaper, so too will space travel. Yet this conveniently overlooks the fact that railroads, airlines and now space industries have all been heavily subsidised by taxpayers. “When we take a step back and notice that private corporations are often even less accountable than governments, then it seems mistaken to say these decisions have been democratised,” Ryan Jenkins, an emerging sciences ethicist at California Polytechnic State University, says. “They’ve merely been privatised.” Lenient supervision. In 2017, Luxembourg – already a corporate tax haven, complicit in international investor tax avoidance and evasion – followed the US’s lead and passed a space-resources law that allows companies to claim resources they extract from space as private property. Guardian journalist Atossa Araxia Abrahamian recounted a chilling comment from an American space executive: “We just want to work with a government who won’t get in the way.” Companies anywhere in the world can stake resource claims in space under this new law; their only requirement is an office in Luxembourg. This sets a murky precedent of ‘regulatory forum-shopping’, where companies choose to incorporate in states where they’ll be most leniently supervised. In 2018, a Silicon Valley start-up called Swarm Technologies illegally launched four miniature satellites known as CubeSats into space from India. They’d been refused launch permission in the US due to safety concerns over whether the satellites could be tracked once in orbit. Fined US$900,000 by the US Federal Communications Commission, the company was subsequently given permission to start communicating with its satellites, and launched more CubeSats as part of a payload on a SpaceX rocket that November. In January 2019, the company raised $25 million in venture capital. Space start-ups that are prepared – unlike Swarm Technologies – to play by the rules are nonetheless still proposing to launch their own swarms of hundreds or thousands of satellites into very low orbits around Earth. SpaceX has already launched over 1000 internet-beaming Starlink satellites, aiming to have a constellation of at least 30,000 in orbit eventually. The UK’s Royal Astronomical Society said these satellites will “compromise astronomical research” due to light pollution, and questioned why there’d been no proper consultation with the scientific community before launch.

### Advantage 1: Space Debris

#### Increasing space debris levels inevitably set off a chain of collisions.

Chelsea Muñoz-Patchen, 19 - (J.D. Candidate at The University of Chicago Law School., "Regulating the Space Commons: Treating Space Debris as Abandoned Property in Violation of the Outer Space Treaty," University of Chicago, 2019, 12-6-2021, https://cjil.uchicago.edu/publication/regulating-space-commons-treating-space-debris-abandoned-property-violation-outer-space)//AW

Debris poses a threat to functioning space objects and astronauts in space, and may cause damage to the earth’s surface upon re-entry.29 Much of the small debris cannot be tracked due to its size and the velocity at which it travels, making it impossible to anticipate and maneuver to avoid collisions.30 To remain in orbit, debris must travel at speeds of up to 17,500 miles per hour.31 At this speed even very small pieces of debris can cause serious damage, threatening a spacecraft and causing expensive damage.32 There are millions of these very small pieces, and thousands of larger ones.33 The small-to-medium pieces of debris “continuously shed fragments like lens caps, booster upper stages, nuts, bolts, paint chips, motor sprays of aluminum particles, glass splinters, waste water, and bits of foil,” and may stay in orbit for decades or even centuries, posing an ongoing risk.34 Debris ten centimeters or larger in diameter creates the likelihood of complete destruction for any functioning satellite with which it collides.35 Large nonfunctional objects remaining in orbit are a collision threat, capable of creating huge amounts of space debris and taking up otherwise useful orbit space.36 This issue is of growing importance as more nations and companies gain the ability to launch satellites and other objects into space.37 From February 2009 through the end of 2010, more than thirty-two collision-avoidance maneuvers were reportedly used to avoid debris by various space agencies and satellite companies, and as of March 2012, the crew of the International Space Station (ISS) had to take shelter three times due to close calls with passing debris.38 These maneuvers require costly fuel usage and place a strain on astronauts.39 Furthermore, the launches of some spacecraft have “been delayed because of the presence of space debris in the planned flight paths.”40 In 2011, Euroconsult, a satellite consultant, projected that there would be “a 51% increase in satellites launched in the next decade over the number launched in the past decade.”41 In addition to satellites, the rise of commercial space tourism will also increase the number of objects launched into space and thus the amount of debris.42 The more objects are sent into space, and the more collisions create cascades of debris, the greater the risk of damage to vital satellites and other devices relied on for “weather forecasting, telecommunications, commerce, and national security.”43 The Space Debris Mitigation Guidelines44 were created by UNCOPUOS with input from the IADC and adopted in 2007.45 The guidelines were developed to address the problem of space debris and were intended to “increase mutual understanding on acceptable activities in space.”46 These guidelines are nonbinding but suggest best practices to implement at the national level when planning for a launch. Many nations have adopted the guidelines to some degree, and some have gone beyond what the guidelines suggest.47 While the guidelines do not address existing debris, they do much to prevent the creation of new debris. The Kessler Syndrome is the biggest concern with space debris. The Kessler Syndrome is a cascade created when debris hits a space object, creating new debris and setting off a chain reaction of collisions that eventually closes off entire orbits.48 The concern is that this cascade will occur when a tipping point is reached at which the natural removal rate cannot keep up with the amount of new debris added.49 At this point a collision could set off a cascade destroying all space objects within the orbit.50 In 2011, The National Research Council predicted that the Kessler Syndrome could happen within ten to twenty years.51 Donald J. Kessler, the astrophysicist and NASA scientist who theorized the Kessler Syndrome in 1978, believes this cascade may be a century away, meaning that there is still time to develop a solution.52

#### Collisions make orbit unusable, causing nuclear war, mass starvation, and economic destruction. Jonson 13

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Whatever the initial cause, the result may be the same. A satellite destroyed in orbit will break apart into thousands of pieces, each traveling at over 8 km/sec. This virtual shotgun blast, with pellets traveling 20 times faster than a bullet, will quickly spread out, with each pellet now following its own orbit around the Earth. With over 300,000 other pieces of junk already there, the tipping point is crossed and a runaway series of collisions begins. A few orbits later, two of the new debris pieces strike other satellites, causing them to explode into thousands more pieces of debris. The rate of collisions increases, now with more spacecraft being destroyed. Called the "Kessler Effect", after the NASA scientist who first warned of its dangers, these debris objects, now numbering in the millions, cascade around the Earth, destroying every satellite in low Earth orbit. Without an atmosphere to slow them down, thus allowing debris pieces to bum up, most debris (perhaps numbering in the millions) will remain in space for hundreds or thousands of years. Any new satellite will be threatened by destruction as soon as it enters space, effectively rendering many Earth orbits unusable. But what about us on the ground? How will this affect us? Imagine a world that suddenly loses all of its space technology. If you are like most people, then you would probably have a few fleeting thoughts about the Apollo-era missions to the Moon, perhaps a vision of the Space Shuttle launching astronauts into space for a visit to the International Space Station (ISS), or you might fondly recall the "wow" images taken by the orbiting Hubble Space Telescope. In short, you would know that things important to science would be lost, but you would likely not assume that their loss would have any impact on your daily life. Now imagine a world that suddenly loses network and cable television, accurate weather forecasts, Global Positioning System (GPS) navigation, some cellular phone networks, on-time delivery of food and medical supplies via truck and train to stores and hospitals in virtually every community in America, as well as science useful in monitoring such things as climate change and agricultural sustainability. Add to this the ~~crippling~~ of the US military who now depend upon spy satellites, space-based communications systems, and GPS to know where their troops and supplies are located at all times and anywhere in the world. The result is a nightmarish world, one step away from nuclear war, economic disaster, and potential mass starvation. This is the world in which we are now perilously close to living. Space satellites now touch our lives in many ways. And, unfortunately, these satellites are extremely vulnerable to risks arising from a half-century of carelessness regarding protecting the space environment around the Earth as well as from potential adversaries such as China, North Korea, and Iran. No government policy has put us at risk. It has not been the result of a conspiracy. No, we are dependent upon them simply because they offer capabilities that are simply unavailable any other way. Individuals, corporations, and governments found ways to use the unique environment of space to provide services, make money, and better defend the country. In fact, only a few space visionaries and futurists could have foreseen where the advent of rocketry and space technology would take us a mere 50 years since those first satellites orbited the Earth. It was the slow progression of capability followed by dependence that puts us at risk. The exploration and use of space began in 1957 with the launch of Sputnik 1 by the Soviet Union. The United States soon followed with Explorer 1. Since then, the nations of the world have launched over 8,000 spacecraft. Of these, several hundred are still providing information and services to the global economy and the world's governments. Over time, nations, corporations, and individuals have grown accustomed to the services these spacecraft provide and many are dependent upon them. Commercial aviation, shipping, emergency services, vehicle fleet tracking, financial transactions, and agriculture are areas of the economy that are increasingly reliant on space. Telestar 1, launched into space in the year of my birth, 1962, relayed the world's first live transatlantic news feed and showed that space satellites can be used to relay television signals, telephone calls, and data. The modern telecommunications age was born. We've come a long way since Telstar; most television networks now distribute most, if not ali, of their programming via satellite. Cable television signals are received by local providers from satellite relays before being sent to our homes and businesses using cables. With 65% of US households relying on cable television and a growing percentage using satellite dishes to receive signals from direct-to-home satellite television providers, a large number of people would be cut off from vital information in an emergency should these satellites be destroyed. And communications satellites relay more than television signals. They serve as hosts to corporate video conferences and convey business, banking, and other commercial information to and from all areas of the planet. The first successful weather satellite was TIROS. Launched in 1960, TIROS operated for only 78 days but it served as the precursor for today's much more long-lived weather satellites, which provide continuous monitoring of weather conditions around the world. Without them, providing accurate weather forecasts for virtually any place on the globe more than a day in advance would be nearly impossible. Figure !.1 shows a satellite image of Hurricane Ivan approaching the Alabama Gulf coast in 2004. Without this type of information, evacuation warnings would have to be given more generally, resulting in needless evacuations and lost economic activity (from areas that avoid landfall) and potentially increasing loss of life in areas that may be unexpectedly hit. The formerly top-secret Corona spy satellites began operation in 1959 and provided critical information about the Soviet Union's military and industrial capabilities to a nervous West in a time of unprecedented paranoia and nuclear risk. With these satellites, US military planners were able to understand and assess the real military threat posed by the Soviet Union. They used information provided by spy satellites to help avert potential military confrontations on numerous occasions. Conversely, the Soviet Union's spy satellites were able to observe the United States and its allies, with similar results. It is nearly impossible to move an army and hide it from multiple eyes in the sky. Satellite information is critical to all aspects of US intelligence and military planning. Spy satellites are used to monitor compliance with international arms treaties and to assess the military activities of countries such as China, Russia, Iran, and North Korea. Figure 1.2 shows the capability of modem unclassified space-based imaging. The capability of the classified systems is presumed to be significantly better, providing much more detail. Losing these satellites would place global militaries on high alert and have them operating, literally, in the blind. Our military would suddenly become vulnerable in other areas as well. GPS, a network of 24-32 satellites in medium-Earth orbit, was developed to provide precise position information to the military, and it is now in common use by individuals and industry. The network, which became fully operational in 1993, allows our armed forces to know their exact locations anywhere in the world. It is used to guide bombs to their targets with unprecedented accuracy, requiring that only one bomb be used to destroy a target that would have previously required perhaps hundreds of bombs to destroy in the pre-GPS world (which, incidentally, has resulted in us reducing our stockpile of non-GPS-guided munitions dramatically). It allows soldiers to navigate in the dark or in adverse weather or sandstorms. Without GPS, our military advantage over potential adversaries would be dramatically reduced or eliminated.

### Advantage 2: Conflict

#### National Appropriation -- Private appropriation guts the prohibition on national appropriation since states are obligated to supervise their citizens in space. AND, if states don’t actively restrict private appropriation national appropriation is inevitable, triggering interstate conflict – legal precedent and economic incentives. Counterplans don’t solve.

Ferreira-Snyman 21 [Anél Ferreira-Snyman, "Challenges to the Prohibition on Sovereignty in Outer Space - A New Frontier for Space Governance" PER / PELJ 2021(24) – DOIhttp://dx.doi.org/10. 17159/17273781/2021/v24i0a8685] CT

The role of the state in the establishment of private property rights in space cannot be ignored, however. Article VI of the Outer Space Treaty determines that states parties to the Treaty shall bear international responsibility for national activities in outer space including when such activities are carried on by non-governmental entities. The activities of nongovernmental entities in outer space, including on the moon and other celestial bodies, must also be authorised and continuously supervised by the appropriate state. Both the American and Luxembourg legislation on space resource extraction confirm this role of the state. Thus, since the state exerts control over the private company, the latter's activities may be attributed to the state.182 In this sense, the lines between private ownership and state sovereignty become blurred, as both require control over the space object to the exclusion of others. Therefore, de facto appropriation by private companies could arguably become legal once states start to recognise such rights,183 as already illustrated by the American and Luxembourg laws’ recognition of at least private appropriation of space resources. In this regard, Pershing submits that the acceptance of resource appropriation may lay the foundation for a "second shift" 184 in customary international law's interpretation of the non-appropriation principle:185¶ Should States buckle to private commercial pressure or independently recognize the economic benefits of domestic companies obtaining private property in celestial territory, States would have a newfound interest in recognizing and protecting in situ rights. The legal justifications for de jure or de facto cooperation in non-recognition would likely become subordinate to economic incentives – spurring the adoption of new legal arguments to support shifting State interests.¶ It therefore seems inevitable that once a private company has de facto control over a space object such as the moon or an asteroid, such control may become legal once the majority of states recognises or at least does not object to such appropriation. Arguably, this may open the door for a state to assert sovereignty (at least over time) over the space objects occupied by the private companies that are authorised and supervised186 by the particular state. In other words, the state could thus achieve "extraterrestrial sovereignty through its citizen's actions."187 In this regard Durkee188 argues that "private companies are themselves developing the international law of outer space." She explains this "attributed lawmaking" as follows:189¶ When a corporation whose activity is attributed to the state publically asserts a legal rule and acts on it and a nation does nothing, the nation implicitly accepts the corporate rule. In the absence of direct evidence if a nation's acts and assertions in support of a customary rule, the actions of private companies – which are attributed to the nation – become the best evidence of a nation's embrace of a particular interpretation of the Outer Space Treaty. The result … is that private companies may be forcing development of an international legal rule that is permissive to appropriation of space resources.¶ It has been suggested by some that the rule of first possession would inevitably be applied in outer space, analogous to the "first in time, first in right" property principle that was applied on Earth for centuries.190 In this regard Gruner even submits191 that the existing outer space treaty regime lacks legal certainty pertaining to property issues since it "overturns centuries of international law by rejecting the longstanding principle of national sovereignty."192 He therefore proposes applying the first possession rule in outer space by implementing a new concept of property where the discovering nation declares the particular space object res nullius humanitatus¶ meaning that it is a place where people can still have individual property rights and be rewarded for their labor based on first possession, but where settlers will act on behalf of the interests of humanity rather than a single terrestrial nation. In this manner, res nullius humanitatus would guarantee all humans equal access to the rewards offered by outer space, rather than a de facto equal share in the rewards reaped from such exploration and exploitation simply because they are human.193¶ The above suggestion thus still adheres to the principle of the common heritage of humankind, but argues for a wider interpretation of the principle, allowing for individual property rights.194 It remains to be seen, however, whether the major space-faring nations would be willing to consider such a suggestion, especially since the United States' executive order on space resources specifically states that the USA does not consider outer space to be a global commons.¶ Although the rule of first possession have been criticised for promoting a space race, colonialism and the possibility of an "unmitigated land rush", 195 it is agreed with arguments that this principle, if properly regulated, might provide the basis for establishing a property rights regime in outer space. As MacWhorter proposes:196¶ To avoid the conflicts inherent between rivalrous nations, though, acknowledging only limited rights in property through first possession is the appropriate first step. By ensuring that private property will be enforced once a mining venture has brought space material back to Earth, many of the practical consequences of total first possession incorporation may be avoided.¶ To circumvent the non-appropriation principle, a number of other alternatives to create some kind of sui generis right of ownership have been suggested 197 that could make the commercial development of outer space possible and viable for developers. These suggestions include certain "property-like rights" not constituting ownership, such as "concessions, mining licences, prospecting rights, and certain contractual rights"; 198 a "credit-swap" system;199 the leasing of outer space to nations and private companies;200 the creation of a public trust to manage property in outer space; 201 a hybrid property regime; 202 stewardship’ 203 lotteries; tradable credits; 204 and tenders.205 None of these proposals is without criticism and all of them require some involvement of the state, opening the door once again for the establishment of sovereignty through the activities of private entities under the control of the state. Nevertheless, suggestions like these are at least indicative of the dire need to start re-evaluating property rights in outer space law.¶ 3 The way forward for space governance?¶ In response to the adoption of the United States Commercial Space Launch Competitiveness Act, the Board of Directors of the International Institute of Space Law stated as follows:206¶ Whether the United States interpretation of Art. II of the Outer Space Treaty is followed by other states will be central to the future understanding and development of the non-appropriation principle. It can be a starting point for the development of international rules to be evaluated by means of an international dialogue in order to coordinate the free exploitation and use of outer space, including resource extraction, for the benefit and in the interest of all countries.¶ Different suggestions have been made by commentators on the way international legal rules pertaining to the use and development of outer space should be developed. These vary from adapting or amending the current Outer Space Treaty207 and/or Moon Agreement208 to developing a completely new legal framework209 to address specific issues.¶ The urgency of the need to clarify and develop legal rules relating to the exploitation of outer space, including the establishment of property rights, is vividly illustrated by the USA's recent unilateral release of the Artemis Accords.210 The Accords – named after NASA's Artemis programme, which aims to send the first women and the next man to the moon by 2024 - is a set of standards for the exploration of the moon211 and is intended to create a framework agreed on by the United States and its partners212 in the Artemis programme by clarifying some of the lacunae in the Outer Space Treaty. 213 The idea is to create an agreement without utilising the often cumbersome and long treaty-making process in the United Nations.214 Instead, the USA aims to reach agreement with "like-minded" nations since, according to American officials, working with non-space faring states would be unproductive.215 The unilateral creation of the Artemis Accords, however, has already been sharply criticised by Russia as an attempt by the United States to side-line the United Nations and to invade the moon in a manner similar to that in which it invaded Iraq and Afghanistan.216 It is also to be expected that China will not react favourably to the Accords,217 which are perceived by some academic commentators as expressing an "ambition for space hegemony" 218 by the United States. In addition, the deliberate exclusion of non-space-faring states from the creation of the legal framework is another clear confirmation of the United States' stance that outer space is not a global commons.¶ At first glance, the guiding principles of the Artemis Accords merely confirm the current outer space treaties, for example by determining that space activities must be conducted for peaceful purposes, that assistance must be provided to astronauts in distress and that space objects must be registered. The most controversial issues provided for in the Accords are the extraction and use of space resources219 and the intended establishment of so-called "safety zones" 220 around lunar landing sites.¶ Although the Artemis Accords do not mention property rights explicitly, they confirm the United States' interpretation of the Outer Space Treaty as expressed in its domestic legislation and subsequent executive order on the exploitation of space resources by determining that "space resource extraction and utilization can and will be conducted under the auspices of the Outer Space Treaty." 221 Therefore, by signing the Accords partners agree with this interpretation made by the United States. Should this interpretation be generally accepted by space-faring nations through bilateral and multilateral agreements, these rules for space mining and property rights may eventually become customary international law. This remains to be seen, however, since Russia has already indicated that any attempts to privatise space would be unacceptable.222 ¶ To avoid harmful interference with space activities, the Artemis Accords make provision for the establishment of safety zones around lunar bases. Although American officials have indicated that these zones do not technically amount to a territorial claim over the affected areas,223 it may be argued that such zones at least display some characteristics of territorial sovereignty by exerting control over a particular area on the moon to the exclusion of others. As Weaver points out, "'commercial' appropriation is much more subtle than outright legal appropriation" since the claimant does not make any (explicit) proclamation of sovereign control to the international community.224 Nevertheless, the outcome is in essence the same, since the benefits are gathered to the exclusion of others. The establishment of lunar safety zones seems to be similar to the rule of first possession, which strengthens the earlier argument that the principle of "first in time, first in right" might provide the basis for establishing property rights in space. According to American officials, a state nearing another state's operations in a safety zone has to consult the latter state first to prevent damage or interference.225 Although the Artemis Accords confirm that outer space must be used for peaceful purposes, one might expect that the United States' Space Force226 would play some role in the protection of American safety zones. This has obvious implications for the prohibition on the (active) militarisation and, even more seriously, weaponisation of outer space.227 One may also expect that states would want first to stake their claims to those lunar areas that are the richest in resources, a tendency which may create conflict between competing states. ¶ The practical implications of the Artemis Accords remain to be seen. However, in order to prevent that outer space "turns into the Wild West of the twenty-first century", 228 legal rules for the exploitation of outer space bodies have to be developed under the auspices of an international institution and not left to individual states or, for that matter, selected private companies. This would not only result in the fragmentation of outer space governance, which could create more legal uncertainty,229 but might also encourage "forum-shopping" by commercial operators to find domestic systems with minimum regulation of their activities.230 ¶ Given that time is of the essence, it is suggested that the UNCOPUOUS as an established body that has been specifically created to address issues relating to outer space is best suited to addressing this task. Although it may be argued that the UNCOPUOS's decision-making processes, which are based on the rule of consensus, are too slow, it is currently the only multilateral forum for the discussion of outer space matters.231 The creation of a completely new international law-making body to address urgent space issues is simply not realistic and would take even longer. Once the rules have been established, a permanent regulatory body, perhaps similar to the International Seabed Authority, could be created to oversee their implementation,232 also by means of states' national legislation, and to protect the rights of developing states. ¶ After the conclusion of the core UN space treaties in the 1960s and 1970s it became apparent that states were no longer willing to adopt further binding obligations regulating space activities and that international space law could therefore be developed only by adopting "soft law" instruments.233 Because of their non-mandatory character, these instruments are generally more easily negotiated by states than is the case with treaties.234 Thus, soft law235 documents are currently the main instruments for further developing and defining the norms of outer space.236 It is therefore to be expected that the rules for exploiting outer space bodies would also (initially at least) be in the form of soft law. Nevertheless, soft law guidelines have a legal value237 as they impact on the international law-making process by providing the premises from which customary international law might develop, and might eventually lead to the conclusion of a treaty.238 The work of the Hague International Space Resources Governance Working Group239 could play an important role in this process. The Working Group reflects a so-called bottom-up approach to norms development240 by representing the wider outer space community, including industry, states, international organisations, academia and NGOs. On 12 November 2019 the Working Group adopted the "Building Blocks for the Development of an International Framework on Space Resource Activities".241 The Building Blocks could thus form the basis for multilateral discussions on the development of softlaw rules for the regulation of commercial activities in outer space. ¶ The unregulated exploitation of outer space is not only a catalyst for conflict between states, but could also cause irreparable harm to the outer space environment because of human contamination and the creation of more space debris.242 The international community will have to act swiftly if the aspirations of using outer space for peaceful purposes and preserving it for future generations are to be fulfilled.

#### 2. Land grabs -- appropriation causes space racing and land-grabs between states and private entities making war inevitable

Tronchetti 08 [Fabio Tronchetti (LL.M Bologna University & Lecturer at the International Institute of Air and Space Law) “The Non-Appropriation Principle as a Structural Norm of International Law: A New Way of Interpreting Article II of the Outer pace Treaty,” Air & Space Law, Vol XXXIII/3 (June 2008).] CT

The first proposal of this group is a very radical one: it simply argues that the best solution for promoting the use of space resources and for securing the interests of private operators is to remove the non-appropriation principle.19 Thus, private individuals and entities would be free to appropriate celestial bodies and their resources and to be allowed to keep the profits and the benefits obtained therefrom. This solution would remove the legal uncertainty which has stopped private operators so far from investing in space exploitative activities and would give these operators the go-ahead for commercial activities. This proposal is not acceptable for several reasons. First of all, it is important to stress that every theory which calls for the abolition of the non-appropriation doctrine must be looked at with scepticism. Abrogation of the non-appropriation principle is not justified simply because it would make space commerce possible. On the contrary, the principle must remain the basis for present and future activities in outer space. Secondly, the only predictable result of the removal of the non-appropriation principle would be the beginning of a space race which is likely to adversely affect one of the main features of outer space, namely its peaceful nature. States and private operators, indeed, would start to compete in appropriating celestial bodies and the resources contained therein. In a similar scenario the risk of disputes between competing claimants would be high, and armed conflicts beyond the Earth’s boundaries would be inevitable. Moreover, it is questionable whether the removal of the non-appropriation principle would be beneficial to the development of space commerce. Once States have gained sovereignty over an area of outer space, they would surely impose tributes in the form of fees, royalties and other charges for the access, use or occupation of their space property. This would increase the cost of doing business in space and, as a consequence, would restrain rather than support the commercialization of space and its resources. Additionally, it is quite clear that when States and private operators would start appropriating areas of outer space, the principle established in Article I of the Outer space Treaty requiring the exploration and use of outer space to be carried out for the benefit and in the interests of all countries would progressively lose its relevance. States and private operators, indeed, would operate with the purpose of maximizing their investments and getting maximum profit from their activities. Thus, the requirement to use outer space as a means for generating benefits for all countries would effectively be cast aside. Therefore, this proposal must be firmly rejected. If accepted, not only would outer space would lose its res communis omnium nature, but it would also become the theatre of conflict and tensions among States and private operators.

#### Ownership disputes -- Private appropriation inevitably leads to overlapping claims causing armed conflict.

Tennen 10 [Leslie I. Tennen, Esq.\* “ Towards a New Regime for Exploitation of Outer Space Mineral Resources,” Nebraska Law Review, 88 (2010), 794. <https://advance-lexis-com.ezp-prod1.hul.harvard.edu/api/document?collection=analytical-materials&id=urn:contentItem:50MP-12V0-00CT-T042-00000-00&context=1516831>.] CT

a. Should Article II be Abrogated?

It has been asserted that the non-appropriation principle is an obstruction to the commercial development of space, and that article II, if not the entire Outer Space Treaty, should be abrogated. 61 The Outer Space Treaty permits states party to withdraw on one year's notice. 62 It seems unlikely that a major space power will seek to withdraw from the Outer Space Treaty in the foreseeable future, or that article II will be repealed anytime soon. Nevertheless, the abrogation of article II would not benefit the commercial development of space. First and foremost, the reasons which warranted the adoption of the non-appropriation principle in 1961 continue to be applicable today, notwithstanding the end of the Cold War. Abrogation of article II would result in a multitude of claims to orbits, locations, and entire moons and other celestial bodies. These claims would not have any uniformity in terms of method of discovery. That is, claims could be founded on any basis on which the claimant can assert that it was the first to "discover" the subject of the claim, 63 whether by exploration, use, landing, imaging, mapping, surveying, or telepossession. 64 As a matter of equity, the Russians, as successors to the Soviet Union, would have an historic justification to assert vast claims of ownership to near-Earth and cis-lunar space, and the Moon, Venus, and perhaps other celestial bodies, from their early triumphs during the initial days of the space age. However, claims would not be restricted to the technologically advanced states, as other nations would assert claims to space "properties." It can be anticipated that the Bogota Declaration, 65 [\*808] declaring claims to the geostationary orbit, would be resurrected in one form or another. In addition, private entities, if permitted to engage in appropriation, would overlay yet another level of claims, separate and distinct from the claims of states. Whether individual states would enact domestic laws recognizing and enforcing such private claims is a matter of pure speculation. It is difficult to envision a scenario whereby the various claims would not overlap and thereby conflict. Thus, it is foreseeable that international tensions between claiming states would arise, with the concomitant potential for the export of armed conflict from the confines of this planet to the heavens. 66 Pop has identified several theories which conceivably could give rise to claims to property, 67 but no matter what basis is utilized to provide theoretical justification for the assertion of claims, the enforcement of claims (i.e., the exclusion of others therefrom) in the final analysis ultimately devolves upon the successful application of military force. Armed conflict in space obviously would not engender an atmosphere conducive to private commercial ventures. Even where conflict or the threat of conflict may be averted, states claiming sovereign rights over space and celestial resources would be able to impose taxes, royalties, duties, auction fees, or other forms of economic tribute upon private entrepreneurs in exchange for the right to utilize the resources within the claimed territories, even where claims to those areas and resources overlap. 68 The corpus juris spatialis provides that states have the right to explore and utilize areas on or below the surface of celestial bodies. The abrogation of the non-appropriation principle of article II would transform the right to explore and utilize areas of celestial bodies into a commodity available only to those willing to pay the highest price. Monopolies and other anti-competitive practices could result. In this regard the non-appropriation principle is double-edged: article II not only prevents an entity from establishing a monopoly, it also prevents the competition from establishing one as well, and thereby creates a level playing field. 69 Those who advocate for the abrogation of article II fail to recognize that the non-appropriation principle is not solely dependent upon the Outer Space Treaty. As noted above, the prohibition on national appropriation was expressed by the community of nations in U.N. resolutions dating back to the early 1960s. The substance of article II of [\*809] the Outer Space Treaty was reaffirmed in article 11.2 of the Moon Agreement. More than 125 nations have signed or ratified the Outer Space Treaty; thus, the non-appropriation doctrine has received widespread acceptance among states for almost fifty years. In addition, state practice during the space age has been consistent with article II. 70 Thus, the non-appropriation principle has become part of customary international law, and as such, is binding on states independently of the Outer Space Treaty. 71 That is not to say, however, that a majority of the community of nations would not be able to agree to abrogate article II, or the entire Outer Space Treaty, if so inclined. However, there is no indication that states have expressed any official interest is so doing at this time.

#### Space conflicts go nuclear- both fast and probable.

Grego 15 [Laura Grego, an expert in space weapons and security; ballistic missile proliferation, and ballistic missile defense, "Preventing Space War", Union of Concerned Scientists, 07-05-2015 <https://allthingsnuclear.org/lgrego/preventing-space-war>] JDN

So says a very good New York Times editorial “Preventing a Space War” this week. Sounds right, if X-Wing fighters come to mind when you think space conflict. But in reality conflict in space is both more likely than one would think and less likely to be so photogenic. Space as a locus of conflict The Pentagon has known that space could be a flash point at least since the late 1990s when it began including satellites and space weapons in earnest as part of its wargames. The early games revealed some surprises. For example, attacking an adversary’s ground-based anti-satellite weapons before they were used could be the “trip wire” that starts a war: in the one of the first war games, an attack on an enemy’s ground-based lasers was meant to defuse a potential conflict and protect space assets, but instead was interpreted as an act of war and initiated hostilities. The games also revealed that disrupting space-based communication and information flow or “~~blinding~~” could rapidly escalate a war, eventually leading to nuclear weapon exchange. The war games have continued over the years with increased sophistication, but continue to find that conflicts can rapidly escalate and become global when space weapons are involved, and that even minor opponents can create big problems. The report back from the 2012 game, which included NATO partners, said these insights have become “virtually axiomatic.” Participants in the most recent Schriever war games found that when space weapons were introduced in a regional crisis, it escalated quickly and was difficult to stop from spreading. The compressed timelines, the global as well as dual-use nature of space assets, the difficulty of attribution and seeing what is happening, and the inherent vulnerability of satellites all contribute to this problem. Satellite vulnerability & solutions Satellites are valuable but, at least on an individual basis, physically vulnerable. Vulnerable in that they are relatively fragile, as launch mass is at a premium and so protective armor is too expensive, and a large number of low-earth-orbiting satellites are no farther from the earth’s surface than the distance from Boston to Washington, DC.

### Plan/Solvency

Since, in a just world, outer space would be treated as a global commons, and a global commons model precludes appropriation by private entries, then the appropriation of outer space by private entries is unjust.

Thus, the plan: States ought to adopt a binding international agreement that bans the appropriation of outer space by private entities by establishing outer space as a global commons subject to regulatory delimiting and global liability.

#### The aff:

#### solves debris by ensuring the sustainable and equitable use of outer space resources.

* prevents circumvention by aligning the interests of state parties.
* is normal means since it models numerous successful agreements governing all other global commons.

Vollmer 20 [Sarah Louise Vollmer (St. Mary's University School of Law), “The Right Stuff in Geospace: Using Mutual Coercion to Avoid an Inevitable Prison for Humanity,” 51 ST. MARY'S L.J. 777 (2020). <https://commons.stmarytx.edu/thestmaryslawjournal/vol51/iss3/6?utm\_source=commons.stmarytx.edu%2Fthestmaryslawjournal%2Fvol51%2Fiss3%2F6&utm\_medium=PDF&utm\_campaign=PDFCoverPages> ]CT

IV. NECESSITY FOR REGULATION TO PRESERVE THE HERITAGE OF MANKIND—A PROPOSAL ¶ Conceptually, all persons hold an implied property right in the space commons.111 As such, spacefaring entities and developing nations possess an equitable right to access and use orbital resources.112 But the sui generis nature of geospace presents a paradox requiring a unique regime for the sustainable usage of its resources.113 The international community cannot realize the advantages of the common heritage principle under a property regime because any conceivable assignment would violate the non-appropriation clause or unjustly enrich a particular interest.114 This means that only regulatory solutions can protect the interests inherent in a commons protected for the common heritage of mankind. ¶ A. The Motivations for International Compliance¶ The crux of a workable treaty lies in the consent of the parties to the agreement.115 Thereafter, signatories internalize the agreement’s object and purpose into their domestic law, or in the case of international organizations, into an institutional framework.116 To implement a binding international instrument, we must therefore ask the question: Why do nations follow international law,117 and how can we use those behavioral realities to construct a workable framework to ensure geospace survives?118¶ At the dawn of civilized society, depending on a particular jurisdiction’s values, the laws of nature and morality compelled obedience and social order.119 When nation-states concluded international agreements, it represented the coalescence of the various values-based systems, the overlap of which formed a universal understanding of the law of mankind.120 “[The] fundamental conceptual boundary between municipal and international law . . . view[s] international law largely in terms of contractual relations, therefore assigning to the ‘sovereign’ a central place in the construction of the two orders.”121 In other words, transnational cooperation operated through balancing the competing autonomy and values of the parties involved. Despite centuries of debate, values systems remain the principal motivating factor of compliance with international law.122 Effective regulatory regimes must, therefore, strike at the heart of what nation-states value the most, which is often related to national security.123¶ When entering an international agreement, whether or not a nation-state will ratify it informs us of the value a nation-state places on the instrument’s subject matter. That value equates to the utility a nation-state places on certain allowances or prohibitions.124 Incorporating these motivating factors with Hardin’s regulatory solution, any freedoms infringed upon must manifest a higher utility than currently realized. If COPUOS proposes a protocol for sustainable uses of space, the provisions must either have a negligible effect on the global community’s perceived utility of space access or substantially increase that utility. Assuming the propositioned regulatory scheme aligns with the values system of each nation-state, the probability of internalizing such regulations through domestic codification is high. ¶ To ascertain the interests of nation-states, we must look to the factors motivating current space utilization. Routine access to space undeniably aids our technological advancement. The ISS’s antigravity environment provides unique conditions to study medicine.125 Satellites provide real-time tracking of environmental conditions and transmit crucial information for disaster recovery planning.126 Space telescopes track objects with the potential to cause the extinction of life of Earth.127 Free from the veil of our hazy atmosphere, satellites can produce better imagery and ascertain the composition of potential resource deposits on celestial bodies.128 And simply receiving satellite imagery of our planet forces us to confront the realities of our fragile existence. These benefits signify the tangible realization of the OST’s object and purpose, which flow to all members of the global community.129 If we do not begin active decontamination and mitigation of space debris, the utility of geospace will cease to exist. Imagining our existence without these advances is a potent method to stress the criticality of unabated pollution in geospace.¶ B. Existing Proposals¶ Legal scholars have formulated several frameworks to mitigate space debris. Some recommend implementing a market-share liability regime, which assigns liability according to the volume of each nation-states’ exploits.130 Opponents of this construction rightfully highlight the inequities inherent in such a scheme. Considering the United States, Russia, and China make up the bulk of spacefaring activity, market-share liability would unduly burden these nations, and coerce a categorical exit from the space industry or a repeat of the Moon Treaty.131 Another scholar advocates for an environmental law approach, asserting that the space commons would benefit from a protocol closely mirroring the Madrid Protocol.132 While prospective applications of such a model could prevent additional accumulations, it would not feasibly abate the current collection of debris.133 The strengths of Mary Button’s mitigation proposal lie in the binding nature of the Madrid Protocol and compulsory environmental impact requirements. And though it advocates for a more collaborative conference mechanism, rather than the strict unanimous consent required of UNCOPUOS’s resolutions, it still shies away from compulsory requirements for active debris removal. Along with the Antarctic Treaty (ATS), the Law of the Sea (UNCLOS) also served as a model for the Corpus Juris Spatialis. But oddly, the law of salvage was omitted from the treaties. Unlike abandoned objects at sea, once a nation-state places an object into space, ownership exists in perpetuity. Sandra Drago addressed removing the OST’s property-in-perpetuity mechanism134 so as to permit the active salvage of inoperable satellites.135 Drago’s proposal is vital to any mitigation framework. But while this removes a substantial bar currently restricting debris removal, it does not address free-riding, and spacefaring enterprises are free to choose more lucrative space activities other than salvage operations.136 ¶ C. A Coercive Proposal¶ Mutual coercion lies at the core of Hardin’s solution.137 To summarize, law-abiding citizens make concessions to regulatory social constructs in the interest of conserving some utility otherwise lost.138 The coercive element lies in relinquishing one’s ability to exploit some freedom, the detriment of which cannot be realized at that moment in time.139 Conceding to a regime that tempers free exploitation of the commons allows everyone to benefit from the positive externalities of individual usage. Equated to space, nation-states currently concede to non-appropriation in the interest of maintaining equitable access. But because of the sui generis nature of geospace, even non-participants receive a benefit from the use of the commons. In effect, beneficiaries are free-riding from the capital investment of spacefaring nations and entities. This informs the structure of the ensuing two-part framework: geospace delimitation and global liability ¶ 1. Geospace Delimitation ¶ The history of regulatory delimitation illustrates its effectiveness at balancing the rights of individuals, sovereigns, and mankind. Each instance explained in Part II infra, arose out of public necessity to ensure and protect the maximum utility of the global commons, without the deleteriousness of inhabitability, sovereign interference, or over-exploitation.140 The regimes governing Antarctica, the High Seas, the Atmosphere, and the radio-frequency spectrum evidence that mutually coercive delimitation can honor the common heritage of mankind, without encroaching on the peaceful enjoyment and benefits attributable to these areas. ¶ a. Antarctica ¶ In the 1950s, there was concern that Antarctica would succumb to Cold War hysteria, becoming a target for international discord and nuclear arms testing.141 In a move to reestablish global scientific exchange, the international scientific community hosted the International Geophysical Year project, and after identifying the potential of Antarctica, sought to protect it from any ruinous power posturing.142 This necessity for regulating permissible activity resulted in the formation of the ATS.143 Subsequent technological advancement revealed mineral deposits, triggering commercial interest in exploiting its natural resources. The threat catalyzed the promulgation of the Madrid Protocol.144 Again, these delimitations did not sever humanity’s utility in Antarctica. Rather, mankind conceded to the prohibition of deleterious usage in the interest of preserving its scientific utility.145¶ b. The High Seas¶ Similar to Antarctica, the High Seas faced threats in the 1960s when nation-states began unilaterally and arbitrarily, extending resource recovery activities further into the depths of international waters.146 In the interest of equity, particularly the interests of landlocked nations, UNCLOS delimited sovereign access to the seas, allowing usage only within the established exclusive economic zones (EEZs).147 An annex to UNCLOS provided a procedural framework in which resource recovery enterprises could operate in international common areas beyond the EEZs, precluding the unilateral capture of global resources by one nation.148 Once more, a mutually coercive framework removed certain freedoms in the interest of mankind without unjustly limiting equitable access to resources. ¶ c. The Atmosphere¶ Divergent from the problems of the ice and sea, atmospheric regulation resolved an issue more analogous to geospace debris proliferation. Atmospheric utility is quite simple: breathable air and protection from deadly cosmic radiation. When satellite imagery revealed the sizable hole in the ozone layer, the Montreal Protocol to the Vienna Convention placed an outright ban on ozone-depleting chemicals in everyday consumables.149 This prohibition directly addressed the source of the negative externality, forcing humanity to internalize the externality through alternate investment in refrigerants. Recent evidence of the reduction of ozone loss validates the mutually coercive delimitation within the Montreal Protocol.150¶ d. Regulating the Telecommunication Spectrum¶ The business model and financial strategy of telecommunications entities influence satellite deployment planning. Typically, orbital placement aims to “maximize [a] potential user base,” and if that base happens to encompass, for instance, the continental United States, market competition drastically narrows the availability of slots for satellite positioning.151 Realizing that satellite acquisition becomes moot without conscientious “use of telemetry and control . . . required for spaceflight,”152 the Space Radiocommunication Conference convened to revise the Radio Regulations in 1963,153 granting the ITU authority to allocate radio frequencies among spacefaring entities.154 Originally, the ITU:¶ [A]llocated orbits and frequencies solely through a first-in-time system. This led to concern that developed countries would secure all of the available slots before developing countries had the technological capacity to use them. Although some orbits and frequencies are still allocated on a first-in-time basis, each state is now guaranteed a certain number of future orbits and frequencies, regardless of its current technological capacity.155¶ The FCC regulates the segment of the electromagnetic spectrum allocated to the United States.156 Arguably, the ITU and agencies like the FCC engage in de facto appropriation of the more highly sought-after orbits.157 Yet to an extent, the ITU’s delimiting of the radio-frequency spectrum remedied the negative externalities of non-appropriation in geospace, such as the overcrowding of active satellites and the resultant interference. Where the ITU’s scheme does not remedy the byproduct of geospace resource use, it succeeds in ensuring communication capabilities remain free from inequitable use.158¶ e. The OST’s Ineffective Delimitations¶ The recurrent theme among the aforementioned regulatory schemes is the preservation of utility within the commons concerned.159 The frameworks each provide a means to enjoy shared resources while removing the potential for destruction. The OST’s nonproliferation provisions properly regulate the usage of the space commons to further the enjoyment of space’s true utility: scientific discovery and telecommunications. Likewise, the Liability Convention reinforces the necessity to maintain heightened situational awareness to guarantee the mutual, uninterrupted enjoyment of activity in space.160 But nation-states exploit the loop-holes within these documents to avoid internalizing some of their externalities. Specifically, the Liability Convention only assigns liability for damage caused to space objects when fault can actually be determined.161 Though it would be simple to assign fault to a collision caused by an intact and inoperative satellite, it is virtually impossible to identify the owner of smaller pieces of debris. Further, while the ITU reserves slots for nations not represented in space,162 it does nothing to stop those capable of reaching geospace from littering the commons and destroying the utility of reserved slots.163 Holistically, none of the delimitations in the Corpus Juris Spatialis negate the cause of the growing belt of debris in geospace.¶ As a sui generis resource, the mere occupation of LEO or GSO equates to the reduction of the overall utility of geospace. When an entity launches a rocket into space, the accompanying payload causes either (1) temporary reduction of the aggregate utility of geospace or (2) permanent reduction of the aggregate utility of geospace.164¶ The first delimitation prong will recommend bifurcating the applicability of the Corpus Juris Spatialis, with separate regimes for outer space and geospace. While the commercialization of outer space is not overly injurious to the international commons or interests of developing nations, the overcrowding of affluent spacefaring entities vying for orbital acquisition puts immense pressure on the finite resources within geospace. Therefore, demarcating the upper limit of geospace will allow entities to continue exploring the universe without imposing the restrictions placed on those seeking geospace positioning.165 This modification will allow continued use of both regions, but coerce more sustainable usage of geospace with the assistance of the secondary prong below. ¶ 2. Global Liability ¶ Operating under the theory that humanity holds an implied property right in the global commons but limited under the non-appropriation clause to protect those interests through traditional property mechanisms, the logical alternative is to impose liability on actions violative of the global interest.166 Further, assuming humanity collectively benefits from utilization of this commons, then humanity likewise must internalize the cost of the negative externalities imposed.167 This means that spacefarers, as members of the global collective, hold both the right and obligation to protect that right for others.168 Therefore, anyone utilizing or benefitting from the utilization of the geospace commons has an equitable duty to ensure its sustainability. Under traditional tort theories, when one has a duty, breach of that duty causally linked to a measurable injury is actionable. In terms of the duty to humanity when utilizing geospace, the culmination of Kessler Syndrome represents the measurable injury.¶ Kessler informed the scientific community in 1970 of the probable cataclysmic chain-reaction and destructive conclusion of unabated geospace debris pollution.169 This theory, reiterated consistently since its dissemination, materialized in 2009.170 Fundamentally, every spacefaring entity and approving launching state knows of this monumental threat to the utility of geospace. Yet to date, mitigation guidelines remain non-binding, and four-figure satellite constellations continue to receive approval.171 To incorporate a time-honored risk calculation method, the Hand Formula is instructive and evidences a trend toward unapologetic endangerment to the utility of geospace in isolation of the associated tort regime.¶ Let us assume the burden to mitigate space debris is $18.5 million172 but the probable magnitude of not mitigating the accumulation of space debris equates to reverting our technological capabilities back to the 1800s. Considering the accumulation of debris from the accidental or intentional breakup of geospace satellites, the probability of Kessler Syndrome fully concluding in the absence of a comprehensive mitigation protocol is one hundred percent.173 While difficult to quantify, the value of our scientific progress attributable to the advent of space travel far outstrips the burden to mitigate space debris. Should Kessler Syndrome become our reality, the measurable injury is the cost of reestablishing global communications without the usage of satellite relays. To add insult to injury, the invaluable utility of geospace will cease to exist.¶ A viable alternative would institute a regime of shared global liability which makes consideration of capital investors as well as nonparticipating beneficiaries in the interest of equity. That is, should the inevitable prison for humanity become a reality, the entire global community will be liable to pay an equitable share of the overall cost of recovery efforts.174 The Liability Convention should undergo a similar trifurcation, adding this new scheme to the current strict and absolute liability mechanisms.175 As such, shared global liability will consider the responsibility of nation-states and private entities in isolation.176 This will coerce cooperation among all agencies, nations, and private entities because the equitable share of responsibility will drive collective resolution. ¶ V. CONCLUSION¶ In light of the emerging global sentiments regarding environmental conservation and sustainability, instituting a regime that clearly defines a legal consequence in the event of environmental ruin boasts greater coercive force than non-binding resolutions. 9 This international agreement aligns with the universal value that the international community places on the utility of geospace.177 In essence, it protects geospace by forcing the signatory to face the reality of their negative externalities. It is unlikely that a nation-state exists that does not value space exploration and the benefits attributable.¶ In April of 2019, in the spirit of the Sustainable Development Goals (SDGs), COPUOS adopted an agenda that focused on the long-term sustainability of the space commons, space traffic management, equitable uses of GSO, and the mitigation of space debris.178 Mindful of space’s critical role in attaining many of the SDGs, the Committee put forth guidelines to facilitate capacity building without prejudice to any one nation-states’ economic capabilities. To be sure, the Guidelines for the Long-Term Sustainability of Outer Space Activities are an important step forward, but many delegates reiterated the importance of developing binding instruments, particularly in light of developments in “space resource exploitation, large constellations, and space debris remediation.”179 ¶ Looking forward, research continues to advance the availability of debris mitigation mechanisms, such as the European Space Agency’s newly-commissioned ClearSpace-1 satellite.180 Mission objectives increasingly include end-of-life procedures to place satellites in appropriate orbits to decrease clutter in areas where active satellites operate.181 In the context of private entities, Planetary Resources—originally positioned to become a principle player in the space mining industry—merged with Consensys Space and quickly launched TruSat, a crowd-sourced situational awareness forum that compiles the reports of private citizens to track objects in geospace.182 These developments instill confidence in the international community’s sentiments toward ameliorating this ever-approaching catastrophe. It is with great hope that this trend continues, and COPUOS promulgates binding regulations to ensure the sustainability of geospace for the common heritage of mankind. “But we can never do nothing. That which we have done for thousands of years is also action. It also produces evils.”183

#### Treating space as a commons solves orbital debris. Current non-binding agreements are not enough.

Silverstein & Panda ‘3/9 - Benjamin Silverstein [research analyst for the Space Project at the Carnegie Endowment for International Peace. MA, International Relations, Syracuse University Maxwell School of Citizenship and Public Affairs BA, International Affairs, George Washington University] and Ankit Panda [Stanton Senior Fellow in the Nuclear Policy Program at the Carnegie Endowment for International Peace. AB, Princeton University], “Space Is a Great Commons. It’s Time to Treat It as Such.” *Carnegie Endowment for International Peace* (Web). March 9, 2021. Accessed Dec. 13, 2021. <<https://carnegieendowment.org/2021/03/09/space-is-great-commons.-it-s-time-to-treat-it-as-such-pub-84018>> AT

The failure to manage Earth orbits as a commons undermines safety and predictability, exposing space operators to growing risks such as collisions with other satellites and debris. The long-standing debris problem has been building for decades and demands an international solution.¶ Competing states need to coalesce behind a commons-based understanding of Earth orbits to set the table for a governance system to organize space traffic and address rampant debris. New leadership in the United States can spur progress on space governance by affirming that Earth orbits are a great commons. So far, President Joe Biden and his administration have focused on major space projects, but a relatively simple policy declaration that frames Earth orbits as a great commons can support efforts to negotiate space governance models for issues like debris mitigation and remediation. The Biden administration can set the stage to pursue broad space policy goals by establishing a consensus among states, particularly those with the most invested in Earth orbits, that space is a great commons.¶ THE PRESSING NEED FOR SPACE GOVERNANCE¶ The Earth orbits that provide the majority of benefits to states and commercial ventures represent only a tiny fraction of outer space as a whole. Competition for the limited volume of these Earth orbits is especially fierce since two satellites cannot be in the same place at the same time and not all orbits are equally useful for all missions. The number of objects residing in Earth orbits is now at an all-time high, with most new objects introduced into orbits at altitudes of between 400 and 700 kilometers above sea level. Millions of pieces of debris in Earth orbits pose a threat to continuing space operations. For instance, the final U.S. space shuttle missions faced 1-in-300 odds of losing a space vehicle or crew member to orbital debris or micrometeoroid impacts.¶ Collisions with fragments of orbital litter as small as a few millimeters across can ruin satellites and end missions. Current technologies cannot track all of these tiny pieces of debris, leaving space assets at the mercy of undetectable, untraceable, and unpredictable pieces of space junk. Some researchers have determined that the debris population in low Earth orbit is already self-sustaining, meaning that collisions between space objects will produce debris more rapidly than natural forces, like atmospheric drag, can remove it from orbit.¶ States—namely the United States, Russia, China, and India—have exacerbated this debris accumulation trend by testing kinetic anti-satellite capabilities or otherwise purposefully fragmenting their satellites in orbit. These states, along with the rest of the multilateral disarmament community, are currently at an impasse on establishing future space governance mechanisms that can address the debris issue. A portion of this impasse may be attributable to disparate views of the nature of outer space in the international context. Establishing a clear view among negotiating parties that Earth orbits should be treated as a great commons would establish a basis for future agreements that reduce debris-related risks.¶ Beyond debris-generating, kinetic anti-satellite weapons tests, revolutionary operating concepts challenge existing space traffic management practices. For instance, commercial ventures are planning networks of thousands of satellites to provide low-latency connectivity on Earth and deploying them by the dozens. States are following this trend. Some are considering transitioning away from using single (or few) exquisite assets in higher orbits and toward using many satellites in low Earth orbits. These new operational concepts could lead to an increase in collision risks.¶ Without new governance agreements, problems related to debris, heavy orbital traffic, and harmful interference will only intensify. Debris in higher orbits can persist for a century or more. The costs of adapting to increasingly polluted orbits would be immense, and the opportunity costs would be even higher. For instance, all else being equal, hardening satellites against collisions increases their mass and volume, in turn raising launch costs per satellite. These costs, rooted in a failure to govern space as a commons, will be borne by all space actors, including emerging states and commercial entities.¶ EXISTING FORMS OF SPACE GOVERNANCE¶ A well-designed governance system, founded on a widespread understanding of Earth orbits as a great commons, could temper these risks. Currently, space is not wholly unregulated, but existing regulations are limited both in scope and implementation. Many operators pledge to follow national regulations and international guidelines, but decentralized accountability mechanisms limit enforcement. These guidelines also do not cover the full range of potentially risky behaviors in space. For example, while some space operators can maneuver satellites to avoid collisions, there are no compulsory rules or standards on who has the right of way.¶ At the interstate level, seminal multilateral agreements provide some more narrow guidance on what is and is not acceptable in space. Most famously, the Outer Space Treaty affirms that outer space “shall be free for exploration and use by all states without discrimination of any kind” and that “there shall be free access to all areas of celestial bodies.” Similar concepts of Earth orbits being a great commons arise in subsequent international texts. Agreements like the Liability Convention impose fault-based liability for debris-related collisions in space, but it is difficult to prove fault in this regime in part because satellite owners and operators have yet to codify a standard of care in space, and thus the regime does not clearly disincentivize debris creation in orbit. Other rules of behavior in Earth orbits have been more successful in reducing harmful interference between satellite operations, but even these efforts are limited in scope.¶ States have acceded to supranational regulations of the most limited (and thus most valuable) Earth orbits. The International Telecommunication Union (ITU) coordinates, but does not authorize, satellite deployments and operations in geosynchronous orbits and manages radiofrequency spectrum assignments in other regions of space to reduce interference between satellites. These coordination activities are underpinned by the ITU’s constitution, which reminds states “that radio frequencies and any associate orbits . . . are limited natural resources,” indicating a commons-based approach to governing the radiofrequency spectrum. However, the union’s processes are still adapting to new operational realities in low Earth orbit, and these rules were never designed to address issues like debris.

#### Since the national appropriation is banned by the OST, banning private appropriation would ipso facto result in space being a global commons, so the plan is not extra T and is normal means.

Neto 21 [Bittencourt Neto, Olava de O. “Chapter 1: Outer Space as a Global Commons and the Role of Space Law,” A Research Agenda for Space Policy, Edward Elgar Publishing, Cheltenham, UK, 2021. https://www.elgaronline.com/view/edcoll/9781800374737/9781800374737.00009.xml] CT

Over the past years, the proliferation of space activities and the diversification of space actors have offered plenty of opportunities but also posed challenges to outer space’s long-term sustainability. The rapidly transforming space sector and growing global space economy have enabled many satellite applications and services, while outer space and orbital slots have become more congested with an increasing space debris population. The commercialization of space activities has denounced a growing interest in private, non-governmental uses of outer space, including space resources. As such, outer space continues to prove itself as a strategic domain from scientific, economic, and security standpoints. As far as international law is concerned, novel debates have emerged about the ontological nature of outer space. Incredibly vast, magnificent, and complex by nature, it constitutes a unique domain, unlike anywhere else on Earth. Throughout the years, outer space has been subject to a specific international framework based on legal principles established at the dawn of the Space Age, notably open access to and non-appropriation of outer space. Space law treaties and international instruments govern space activities and provide relevant input concerning the legal status of outer space. The 1967 Outer Space Treaty (OST), in its first article, solemnly declares that the exploration and use of outer space “shall be the province of mankind”. Therefore, a common interest and shared fate await humankind as we advance through the cosmos. Collective action, based on international cooperation and mutual assistance, is of the essence. Nevertheless, a universal definition and delimitation of outer space, as a distinct domain on Planet Earth, remains to be multilaterally accorded (Bittencourt, 2015). Given the evolving nature of space activities and economy, the legal status of outer space has led to intensive debates in various fora. By constituting a resource domain to which all nations have access, but to which none has the right to claim sovereignty, outer space may be understood as an example of global commons – similarly to the high seas, deep seabed, and Antarctica (Buck, 1998, p. 6). Therefore, outer space and its natural resources, including those located at the Moon and other celestial bodies, are not subject to national appropriation by any means. The legal status of outer space as a global commons is of extraordinary importance and relevance for space law and space policy. Indeed, it influences the application and interpretation of the legal framework developed for the governance of outer space activities, vis-à-vis the domain and its resource units. To accurately assess this scenario, a comparative approach is followed. The specific features of global commons and legal ramifications justify further appraisal to comprehend definitions and correlated concepts well.¶ 2. Key problems and conflicts¶ In space law as in space policy, words matter. By legally classifying outer space as a global commons, relevant political consequences, both national and international, naturally ensue. In order to properly understand the nuances and avoid misconceptions, one should revisit principles of international law. Centuries of customs, often based on Roman law concepts, have led to important regulations and definitions. The proper evaluation of those concepts may illuminate the path forwards.¶ Global Commons Concept¶ Legally defining “global commons” has proved to be a challenge, leading to incompatible views. Global commons are socially constructed, as explained by John Vogler, being determined by “shifts in human knowledge, capability and perceptions of scarcity” (Vogler, 2012, p. 61). As a legal concept, its roots may be traced back to Roman law. More specifically, reference should be made to the notions of res nullius and res communis, applicable to domains not subjected to rights of a specific subject. Res nullius is understood as encompassing things belonging to no one or areas free to be acquired by occupatio.1 Terrae nullius, a derivative international law concept, is applicable to unclaimed areas that may be occupied by states (Rose, 2003; Shaw, 2017, p. 372). Not subjected to exclusive sovereignty, global commons may either be unowned resource domains, or deemed as belonging to the international community in totum. Soroos explains that unowned domains can be regarded as commons if generally understood that they cannot be claimed by any individual actor, neither partially nor as a whole. A regulatory scheme may eventually be accorded by users, to reflect shared interests. On the other hand, domains considered as belonging to the international community presume that all states are their partial owners, therefore legitimized to take part in the decision-making processes related to its uses (Soroos, 2001, p. 45).

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## Case

### general

#### Nuclear weapons cause extinction

Ernst Ulrich **von Weizsäcker** & Anders **Wijkman 18**. von Weizsäcker is a German scientist and politician, member of the German Bundestag and currently serves as co-president of the Club of Rome; Wijkman is a Swedish politician and co-president of the Club of Rome. 2018. “C’mon! Don’t Tell Me the Current Trends Are Sustainable!” Come On! : Capitalism, Short-Termism, Population and the Destruction of the Planet, edited by Ernst Ulrich von Weizsäcker and Anders Wijkman, Springer New York, pp. 1–61. Springer Link, doi:10.1007/978-1-4939-7419-1\_1.

1.6.2 Nuclear Weapons: The Forgotten Threat68 A nearly forgotten threat is the spectre of nuclear weapons. Nuclear weapons are the most deadly of all mass killing devices. They put civilization, the human future and the future of life on the planet at serious risk. They are illegal, immoral and waste resources that otherwise could be used to meet human needs. Humankind needs to find a path to abolish nuclear weapons before these weapons abolish us. And yet, since the end of the Cold War, nuclear weapons have generally been viewed with complacency by the world’s societies . These weapons, in the arsenals of nine countries, are largely kept out of sight and out of mind. To the extent that possessing and threatening to use nuclear force makes it into the public consciousness and discourse, they are justified on the grounds of nuclear deterrence, that is, the threat of nuclear retaliation. But that remains an unproven hypothesis about human behaviour and a potentially destabilizing one at that. Society is beginning to forget that an all-out nuclear war could lead to a Nuclear Winter , potentially sending temperatures to their lowest levels in 18,000 years, triggering an ice age, and destroying a large part of life on earth. The Nuclear Non-Proliferation Treaty (NPT) of 1970 divided the world into nuclear ‘haves’ and ‘have-nots’. As defined by the NPT, the nuclear (NPT) are those countries which had manufactured and exploded a nuclear weapon prior to January 1, 1967. France and China were added to the nuclear ‘haves’, when they later joined the treaty. Three countries never joined the treaty – Israel, India and Pakistan – and went on to develop nuclear arsenals; and one country, North Korea, withdrew from the treaty in 2003 and is playing an evil poker game building up a nuclear arms arsenal. All nine nuclear-armed countries are now engaged in modernizing their nuclear arsenals. The United States plans to spend $1 trillion doing so over the next three decades. Other nuclear-armed states also have ambitious modernization plans. The waste of resources and lost-opportunity costs are staggering. Beyond this, however, modernization of nuclear arsenals is making the weapons smaller, more accurate and more efficient. All this sums to making the weapons more usable by military commanders and thus more likely to be used. Modernizing nuclear arsenals is a clear violation of the NPT (Fig. 1.7). [[FIGURE 1.7 OMITTED]] Jonathan Granoff of the Global Security Institute adds: If less than 1% of the 14,000 nuclear weapons in the arsenals of the nine possessor states in the world were to explode, tons of debris would enter the stratosphere, lower the earth’s temperature, destroy the stability of the ozone layer, cause cancers and other horrible diseases to spread, and end agriculture as we know it. In sum, a nuclear exchange of the arsenals of only two of the nuclear powers, say India and Pakistan, could end civilization everywhere – as would a robust first strike from the arsenals of Russia or the United States .69 A quarter century after the end of the Cold War, some 2000 nuclear weapons remain on high alert, ready to be fired within minutes of an order to do so, meaning that civilization could be destroyed in a single afternoon of nuclear exchange. In July 2016, an International Peoples’ Tribunal on Nuclear Weapons and the Destruction of Human Civilisation was held in Sydney, Australia, condemning politicians and the nuclear weapons industry for violating human rights by still ‘modernizing’ nuclear arsenals and seriously considering the use of these weapons. The threat is global and the solution must also be global. It will require negotiations with the aim of truly prohibiting and eliminating nuclear weapons. These will not be easy, as there will be many interests at the bargaining table. It will require a new legal instrument for the phased, verifiable, irreversible elimination of nuclear weapons. It must result in a treaty that accomplishes the elimination of nuclear weapons , without leaving the world dominated by conventional forces. In the end, it must be a treaty that changes the dynamics of the planet from the insanity of Mutual Assured Destruction (MAD) to the needed new reality of Planetary Assured Security and Survival (PASS).

#### No impact to A.I.

— AT: Musk, Hawking, and Bostrom

Shermer 17 — Michael Shermer (Publisher of Skeptic magazine, a monthly columnist for Scientific American, and a Presidential Fellow at Chapman University), April 2017, “Why Artificial Intelligence Is Not an Existential Threat,” Skeptic, vol. 22, no. 2, pp. 29–35.

Why AI is not an Existential Threat First, most AI doomsday prophecies are grounded in the false analogy between human nature and computer nature, or natural intelligence and artificial intelligence. We are thinking machines, but natural selection also designed into us emotions to shortcut the thinking process because natural intelligences are limited in speed and capacity by the number of neurons that can be crammed into a skull that has to pass through a pelvic opening at birth, whereas artificial intelligence need not be so restricted. We don't need to compute the caloric value of foods, for example, we just feel hungry. We don't need to calculate the waist-to-hip ratio of women or the shoulder-to-waist ratio of men in our quest for genetically healthy potential mates; we just feel attracted to someone and mate with them. We don't need to work out the genetic cost of raising someone else's offspring if our mate is unfaithful; we just feel jealous. We don't need to figure the damage of an unfair or non-reciprocal exchange with someone else; we just feel injustice and desire revenge. Emotions are proxies for getting us to act in ways that lead to an increase in reproductive success, particularly in response to threats faced by our Paleolithic ancestors. Anger leads us to strike out, fight back, and defend ourselves against danger. Fear causes us to pull back, retreat, and escape from risks. Disgust directs us to push out, eject, and expel that which is bad for us. Computing the odds of danger in any given situation takes too long. We need to react instantly. Emotions shortcut the information processing power needed by brains that would otherwise become bogged down with all the computations necessary for survival. Their purpose, in an ultimate causal sense, is to drive behaviors toward goals selected by evolution to enhance survival and reproduction. AIs -- even AGIs and ASIs -- will have no need of such emotions and so there would be no reason to program them in unless, say, terrorists chose to do so for their own evil purposes. But that's a human nature problem, not a computer nature issue. To believe that an ASI would be "evil" in any emotional sense is to assume a computer cognition that includes such psychological traits as acquisitiveness, competitiveness, vengeance, and bellicosity, which seem to be projections coming from the mostly male writers who concoct such dystopias, not features any programmer would bother including, assuming that it could even be done. What would it mean to program an emotion into a computer? When IBM's Deep Blue defeated chess master Garry Kasparov in 1997, did it feel triumphant, vengeful, or bellicose? Of course not. It wasn't even "aware" -- in the human sense of self-conscious knowledge -- that it was playing chess, much less feeling nervous about possibly losing to the reigning world champion (which it did in the first tournament played in 1996). In fact, toward the end of the first game of the second tournament, on the 44th move, Deep Blue made a legal but incomprehensible move of pushing its rook all the way to the last row of the opposition side. It accomplished nothing offensively or defensively, leading Kasparov to puzzle over it out of concern that he was missing something in the computer's strategy. It turned out to be an error in Deep Blue's programming that led to this fail-safe default move. It was a bug that Kasparov mistook as a feature, and as a result some chess experts contend it led him to be less confident in his strategizing and to second-guess his responses in the subsequent games. It even led him to suspect foul play and human intervention behind Deep Blue, and this paranoia ultimately cost him the tournamentt.[ 13] Computers don't get paranoid, the HAL 9000 computer in 2001 notwithstanding. Or consider Watson, the IBM computer built by David Ferrucci and his team of IBM research scientists tasked with designing an AI that could rival human champions at the game of Jeopardy! This was a far more formidable challenge than Deep Blue faced because of the prerequisite to understand language and the often multiple meanings of words, not to mention needing an encyclopedic knowledge of trivia (Watson had access to Wikipedia for this). After beating the all-time greatest Jeopardy! champions Ken Jennings and Brad Rutter in 2011, did Watson feel flushed with pride after its victory? Did Watson even know that it won Jeopardy!? I put the question to none other than Ferrucci himself at a dinner party in New York in conjunction with the 2011 Singularity Summit. His answer surprised me: "Yes, Watson knows it won Jeopardy!" I was skeptical. How could that be, since such self-awareness is not yet possible in computers? "Because I told it that it won," he replied with a wry smile. Sure, and you could even program Watson or Deep Blue to vocalize a Howard Dean-like victory scream when it wins, but that is still a far cry from a computer feeling triumphant. This brings to mind the "hard problem" of consciousness -- if we don't understand how this happens in humans, how could we program it into computers? As Steven Pinker elucidated in his answer to the 2015 Edge Question on what to think about machines that think, "AI dystopias project a parochial alpha-male psychology onto the concept of intelligence. They assume that superhumanly intelligent robots would develop goals like deposing their masters or taking over the world." It is equally possible, Pinker suggests, that "artificial intelligence will naturally develop along female lines: fully capable of solving problems, but with no desire to annihilate innocents or dominate the civilization."[ 14] So the fear that computers will become emotionally evil are unfounded, because without the suite of these evolved emotions it will never occur to AIs to take such actions against us. What about an ASI inadvertently causing our extinction by turning us into paperclips, or tiling the entire Earth's surface with solar panels? Such scenarios imply yet another emotion -- the feeling of valuing or wanting something. As the science writer Michael Chorost adroitly notes, when humans resist an AI from undertaking any form of global tiling, it "will have to be able to imagine counteractions and want to carry them out." Yet, "until an AI has feelings, it's going to be unable to want to do anything at all, let alone act counter to humanity's interests and fight off human resistance." Further, Chorost notes, "the minute an A.I. wants anything, it will live in a universe with rewards and punishments -- including punishments from us for behaving badly. In order to survive in a world dominated by humans, a nascent A.I. will have to develop a humanlike moral sense that certain things are right and others are wrong. By the time it's in a position to imagine tiling the Earth with solar panels, it'll know that it would be morally wrong to do so."[ 15] From here Chorost builds on an argument made by Peter Singer in The Expanding Circle (and Steven Pinker in The Better Angels of Our Nature[ 16] that I also developed in The Moral Arc[ 17] and Robert Wright explored in Nonzero[ 18]), and that is the propensity for natural intelligence to evolve moral emotions that include reciprocity, cooperativeness, and even altruism. Natural intelligences such as ours also includes the capacity to reason, and once you are on Singer's metaphor of the "escalator of reason" it can carry you upward to genuine morality and concerns about harming others. "Reasoning is inherently expansionist. It seeks universal application," Singer notes.[ 19] Chorost draws the implication: "AIs will have to step on the escalator of reason just like humans have, because they will need to bargain for goods in a human-dominated economy and they will face human resistance to bad behavior."[ 20] Finally, for an AI to get around this problem it would need to evolve emotions on its own, but the only way for this to happen in a world dominated by the natural intelligence called humans would be for us to allow it to happen, which we wouldn't because there's time enough to see it coming. Bostrom's "treacherous turn" will come with road signs ahead warning us that there's a sharp bend in the highway with enough time for us to grab the wheel. Incremental progress is what we see in most technologies, including and especially AI, which will continue to serve us in the manner we desire and need. Instead of Great Leap Forward or Giant Fall Backward, think Small Steps Upward. As I proposed in The Moral Arc, instead of Utopia or dystopia, think protopia, a term coined by the futurist Kevin Kelly, who described it in an Edge conversation this way: "I call myself a protopian, not a Utopian. I believe in progress in an incremental way where every year it's better than the year before but not by very much -- just a micro amount."[ 21] Almost all progress in science and technology, including computers and AI, is of a protopian nature. Rarely, if ever, do technologies lead to either Utopian or dystopian societies. Pinker agrees that there is plenty of time to plan for all conceivable contingencies and build safeguards into our AI systems. "They would not need any ponderous 'rules of robotics' or some newfangled moral philosophy to do this, just the same common sense that went into the design of food processors, table saws, space heaters, and automobiles." Sure, an ASI would be many orders of magnitude smarter than these machines, but Pinker reminds us of the AI hyperbole we've been fed for decades: "The worry that an AI system would be so clever at attaining one of the goals programmed into it (like commandeering energy) that it would run roughshod over the others (like human safety) assumes that AI will descend upon us faster than we can design fail-safe precautions. The reality is that progress in AI is hype-defyingly slow, and there will be plenty of time for feedback from incremental implementations, with humans wielding the screwdriver at every stage."[ 22] Former Google CEO Eric Schmidt agrees, responding to the fears expressed by Hawking and Musk this way: "Don't you think the humans would notice this, and start turning off the computers?" He also noted the irony in the fact that Musk has invested $1 billion into a company called OpenAI that is "promoting precisely AI of the kind we are describing."[ 23] Google's own DeepMind has developed the concept of an AI off-switch, playfully described as a "big red button" to be pushed in the event of an attempted AI takeover. "We have proposed a framework to allow a human operator to repeatedly safely interrupt a reinforcement learning agent while making sure the agent will not learn to prevent or induce these interruptions," write the authors Laurent Orseau from DeepMind and Stuart Armstrong from the Future of Humanity Institute, in a paper titled "Safely Interruptible Agents." They even suggest a precautionary scheduled shutdown every night at 2 AM for an hour so that both humans and AI are accustomed to the idea. "Safe interruptibility can be useful to take control of a robot that is misbehaving and may lead to irreversible consequences, or to take it out of a delicate situation, or even to temporarily use it to achieve a task it did not learn to perform or would not normally receive rewards for this."[ 24] As well, it is good to keep in mind that artificial intelligence is not the same as artificial consciousness. Thinking machines may not be sentient machines. Finally, Andrew Ng of Baidu responded to Elon Musk's ASI concerns by noting (in a jab at the entrepreneur's ambitions for colonizing the red planet) it would be "like worrying about overpopulation on Mars when we have not even set foot on the planet yet."[ 25] Both Utopian and dystopian visions of AI are based on a projection of the future quite unlike anything history has given us. Yet, even Ray Kurzweil's "law of accelerating returns," as remarkable as it has been has nevertheless advanced at a pace that has allowed for considerable ethical deliberation with appropriate checks and balances applied to various technologies along the way. With time, even if an unforeseen motive somehow began to emerge in an AI we would have the time to reprogram it before it got out of control. That is also the judgment of Alan Winfield, an engineering professor and co-author of the Principles of Robotics, a list of rules for regulating robots in the real world that goes far beyond Isaac Asimov's famous three laws of robotics (which were, in any case, designed to fail as plot devices for science fictional narratives).26 Winfield points out that all of these doomsday scenarios depend on a long sequence of big ifs to unroll sequentially: "If we succeed in building human equivalent AI and if that AI acquires a full understanding of how it works, and if it then succeeds in improving itself to produce super-intelligent AI, and if that super-AI, accidentally or maliciously, starts to consume resources, and if we fail to pull the plug, then, yes, we may well have a problem. The risk, while not impossible, is improbable."[ 27]

#### Cosmic rays thump

Saplakoglu 18 — Yasemin Saplakoglu (Staff Writer, biomedical engineering bachelors from the University of Connecticut and a science communication graduate certificate from the University of California, Santa Cruz), 10-5-2018, “No Particle Accelerators Will Not Destroy the Planet, But Humans Might,” Live Science, https://www.livescience.com/63759-future-threats-to-humanity.html

"The stakes are very high this century," said British cosmologist Martin Rees. "It's the first century when human beings … can determine the planet's future." [10 Technologies That Will Transform Your Life] For the past couple of days, news outlets have been reporting that Rees' new book "On the Future: Prospects for Humanity" (Princeton University Press, 2018) makes a rather spectacular claim: If things go wrong, particle accelerators that slam subatomic particles together at immense speeds — like the Large Hadron Collider near Geneva, Switzerland,— could turn Earth into a dense sphere or black hole. In fact, Rees told Live Science in a recent interview, his book claims the opposite: The probability of this happening is very, very low.

The idea of the LHC forming mini-black holes has been circulating for a while and is not something to worry about, he said. "I think people quite rightly thought about this question before they did the experiments, but they were reassured," he said. The reassurance mainly comes from the fact that nature already performs such experiments — to an extreme. Cosmic rays, or particles with much higher energies than those created in particle accelerators, frequently collide in the galaxy, and haven't yet done anything disastrous like rip space apart, Rees said. "It's not stupid to think about these things, but on the other hand, they're not serious worries," he said. But in contrast, "if you're doing something where you have no guidance from nature, then you’ve got to be a bit careful." It's in these cases that technology can be a realistic threat for the future, he said. When nature doesn't know the answer Gene editing, for example, can yield new organic products that don't exist in nature, Rees said. Sometimes, if "you tinker with a virus, then of course you can't be quite sure what the consequences are," he said. "It may well be that you can create a form of a virus which has not arisen through natural mutations." There's much conversation around gene drives, for example — modifications that are being considered for mosquitoes to reduce disease transmission. Gene drives essentially tweak the genetic code to alter the likelihood of inheriting certain traits, and can lead to "unpredictable environmental effects," he said. Technology is also making it easier for one person's actions to have far-reaching consequences, he said. "Just a few people anywhere in the world can cause something which has global consequences in a way they couldn’t [before]," Rees said. One example is a cyberattack. Technology also does incredible things, especially in medicine and space travel. And as such, "things can go extremely well," Rees said. "But there are all these hazards along the way because of misuse of technologies." The second major threat to the future is our collective influence on the climate, environment and biodiversity, he said. So, it's important to have international conversations about how to combat the pressures humanity has placed on the world, he added. And it's much easier to solve the world's problems, such as by combating climate change, than by packing up our things and going to a new planet, he said. "It’s a dangerous illusion to think that we can escape the world's problems by going to Mars," Rees said. In fact, robots — who will likely be better-adapted to space travel than humans — will mostly be the ones exploring the cosmos. [Super-Intelligent Machines: 7 Robotic Futures] Rees doesn't think robots are truly a threat for the future. "I don't worry as much as some people do about AI taking over," Rees said. Humans evolved from earlier primates because of natural selection, and the traits that were favored were intelligence and aggression, he said. Electronics "are not engaged in a struggle for survival as in Darwinian selection, so there's no reason why they should be aggressive," he said. For that reason, they probably won't kill off the human race and expand into the universe. That would be too "anthropomorphic" of them, he said. "They might just want to sit and think," he said.