# **MINING CP**

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#### **Counterplan: The appropriation of resources from asteroids constrained by “beneficial use” in outer space by private entities is just.**

#### **“Beneficial use” solves every deficit AND provides incentives- appropriation is key**

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[Ross, "The doctrine of appropriation and asteroid mining: Incentivizing the private exploration and development of outer space", Oregon Review of International Law 17, 2015, 183-204, accessed 1-9-22]

THE CURRENT INTERNATIONAL TREATIES THAT REGULATE THE OWNERSHIP OF ASTEROIDS *FAIL TO INCENTIVIZE* THE DEVELOPMENT AND EXPLORATION OF OUTER SPACE

Currently, there are two outdated international treaties that attempt to adjudicate the use and exploration of space. The first treaty, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (1968), is an archaic but influential agreement ratified by nearly all of the world nations that have successfully launched a shuttle into space.47 The second treaty, The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (1979), was an attempt to reform some of the principles from the Outer Space Treaty that failed to garner popular acceptance because it was not signed by any nations with national space programs.48 While both treaties attempt to deal with many issues, including the ownership of celestial bodies, both fail to allow for the ownership and development of asteroids by government or private entities. Because they were written during the space race in a period of international distrust, it makes sense that these treaties would be concerned with tempering the race to establish sovereign control over celestial bodies. However, as space exploration shifts from being financed and controlled by national governments to being financed by private industry, these concerns may be less important.49

NASA (National Aeronautics and Space Administration), the U.S. space program, was once a well-funded program. It was the focus of the American people in 1961 when President John F. Kennedy announced before a joint session of Congress the ambitious goal of sending a man to the moon.50 The funding for NASA has dwindled in modern times, and the organization now gets around 0.5% of the federal budget, which is the lowest it has been since Kennedy’s 1961 speech.51

Despite a decrease in national space program funding, corporate space missions are on the rise. In 2010, President Obama proposed that NASA exit the business of flying astronauts from Earth to low Earth orbit and move it to private companies.52 Several companies have stepped up to bat, and corporate space programs now include space tourism, supply missions, and in one case a one-way colonization mission to Mars.53 Corporate interest in space tourism and development demonstrates a strong *private* commercial *interest* in space as an industry, which could serve to finance the exploration of space in a period where national governments do not have an active financial interest in space. However, under current international treaties, the ownership of asteroids is prohibited, preventing corporations willing to invest in asteroid mining from having a secure claim.

A. The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (1967) Prohibits Commercial Property Claims

The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty of 1967), is currently the most influential source of international legislation regarding space law.54 Ratified in 1967 by most of the U.N. nations that had successfully launched a shuttle into space, the Outer Space Treaty of 1967 carries much more weight than the subsequent “Moon Treaty” of 1978.

The Outer Space Treaty of 1967 addresses many different issues, including the military development of space,55 the commission of aid to distressed astronauts,56 international liability for damage caused by space objects,57 and the guaranteed cooperation between state-actors in space.58 While the agreement does an admirable job dealing with many of these issues, it fails to grant any kind of ownership claims over celestial bodies.

Under the Outer Space Treaty of 1967, both government and private entities are prohibited from claiming ownership over celestial bodies. Article II of the agreement explicitly states that, “Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.”59

While this statement seems reasonable for preventing a government from, say, claiming the moon, it makes no distinction between the moon and asteroids, planets, meteorites, comets, or other celestial bodies. By preventing the ownership of celestial bodies, even those that have no utility beyond the resources they contain, the treaty effectively destroys the financial gain that could motivate corporations to explore and develop space.

B. The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (1979) Also Fails to Recognize the Need to Provide Ownership Rights in Celestial Bodies

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies of 1979 (The Moon Treaty) also fails to create property rights in celestial bodies in a way that would incentivize space travel.60 Widely considered a failure, the Moon Treaty was an attempt to reform the Outer Space Treaty of 1967, but it was not ratified by any nation that had successfully launched a shuttle into space.

The Moon Treaty took an idealistic approach to international space law, and if it were more effective it would have established an international regime to carry out its goals.61 The stated goals of the regime were to develop the natural resources of the moon and other celestial bodies, rationally manage those resources, and expand opportunities for parties to use and share the resources.62

While the creation of said regime never occurred, it is clear the drafters of the Moon Treaty clearly foresaw the need for international agreement regarding space resources. Among other things, the Moon Treaty prohibits state parties from developing a military presence on the moon or any other celestial body,63 or excluding other state parties from scientific investigation in space.64 The Moon Treaty also attempts to require that any scientific discoveries useful to mankind be shared with the Secretary-General of the United Nations as well as the public and the international scientific community.65 Unlike the Outer Space Treaty of 1967, the Moon Treaty calls for the U.N. to maintain control over space, and has numerous provisions that call for approval by the Secretary-General of the United Nations before a state party can act.

The Moon Treaty was an attempt to rationally manage space resources by creating an international regime to oversee space development. It fell short, however, by failing to grant substantive commercial rights that would incentivize space travel, making no distinction between planets, comets, asteroids, or space debris with respect to its provisions (like the Outer Space Treaty), and by applying its provisions exclusively to state parties with few references to private action.66

Article 11, paragraph 2 of The Moon Treaty states that “[t]he moon is not subject to national appropriation by any claim of sovereignty, by means of use or occupation, or by any means.”67 Thus, under the Moon Treaty, no entity can lay claim of ownership upon anything in space, regardless of the purpose of the claim. The agreement goes further to say explicitly that the surface, subsurface, and the natural resources in place on the moon will not become property of any state; international intergovernmental or nongovernmental organization; national organization or nongovernmental entity; or of any natural person.68 Put differently, the Moon Treaty explicitly prohibits both private and government actors from making commercial claims over the moon, and since the treaty is meant to apply to any celestial body within the solar system, it follows that the same rule applies to space resources like those found on asteroids. While protecting space resources for science is certainly a laudable goal, the Moon Treaty prevents commercial claims in space, effectively stonewalling space’s development. One can hardly imagine a corporation spending the tremendous amount of money necessary to launch a space mission if the only payoff would be the chance to do research that would ultimately have to be shared with the public, including the corporation’s competitors.

Like the Outer Space Treaty of 1968, the shortcomings of the Moon Treaty demonstrate the need for new international legislation regarding the right to own and use space resources like asteroids. The exploration and development of space could be incentivized and facilitated by a new international treaty that affords property rights to private and government entities in asteroids. The doctrine of appropriation would be a logical governing rule.

III THE APPLICATION OF THE DOCTRINE OF APPROPRIATION TO ASTEROID MINING WOULD INCENTIVIZE CORPORATE SPACE EXPLORATION WHILE PREVENTING WASTE AND ABSTRACT CLAIMS

Like water during the expansion of the American West, the exploration of space can be financed and *incentivized* by *granting rights in resources* to those who secure new resources and put them to *beneficial use*. Some legal scholars have suggested the traditional rule of capture be applied to asteroids,69 or that rights to asteroids be purchased directly from an international agency and owned as chattel.70 However, like water during America’s westward expansion, asteroids are not easily classified under traditional property regimes. Thus, a doctrine of appropriation would be more appropriate for asteroids than a traditional rule of capture or a chattel system, because a system based on the traditional *rule of capture* or chattel would result in *waste*, *abstract claims*, and *complicated legal issues*.

First, asteroid claims cannot be adjudicated under the traditional rule of capture, or as chattel, because such systems would be incredibly wasteful. As of now, scientists have observed approximately 450,000 asteroids in our solar system.71

But only a fraction of the observable bodies will be cost effective to mine. While it might one day be possible for a single entity to finance several mining missions at once, current costs associated with such a venture would limit almost any space-mining program to one or two asteroids, at least initially.72 The traditional rule of capture could allow an entity to quickly claim multiple asteroids merely by landing on them and planting a flag, without requiring the entity to show it can reasonably use the resources they have claimed. Even worse would be a system where the same corporation could claim asteroids simply by discovering their existence and registering the claim. Allowing this type of unregulated claim would incentivize larger corporations capable of space travel to quickly claim reachable asteroids, but the claims could easily outpace those entities’ realistic expectations on what they could use. Under a traditional rule of capture system, the solar system could be divvied up long before the resources could conceivably be mined. A rule similar to the doctrine of appropriation used for water claims in the United States would alleviate this concern by limiting claims to those where a claimant can show a reasonable beneficial use for the resource.

Another concern posed by the traditional rule of capture or chattel system would be the creation of abstract claims. Some legal scholars have advocated for a system where asteroids would be categorized as chattel, and rights in asteroids would be granted to an entity that could identify an asteroid and register ownership of it with an international agency.73 The advantage of such a system would be that it would allow an international agency to keep track of asteroids, and it would allow for the mapping of the reachable solar system. The problem with this approach, however, is that it would result in abstract claims. If an entity could claim the rights to an asteroid without actual possession, there is nothing to prevent that company from claiming ownership long in advance of any real possibility of landing on it. One of the reasons for creating the doctrine of appropriation was to limit abstract claims over resources that were not being used in any reasonable way. Just as the plaintiffs in Hague had no recourse against the third party who wasted the natural gas reserve, there would be no cause of action against an entity that has the rights to an asteroid, but chooses not to exercise them.74 This may be particularly harmful to society because asteroids contain volatiles that may be essential to creating rocket fuel in space, which, in turn, may be crucial to deep space exploration.

Using asteroid-bound volatiles to make rocket fuel would reduce the cost and increase the range of space exploratory missions, possibly improving the human race’s ability to explore and develop space. Under a system were entities could claim asteroids without actual possession, those entities could exclude others from landing on the asteroids and using such resources, even when such resources are languishing unused in space. To prevent the creation of such abstract claims over asteroids, the doctrine of appropriation could be modified as to only grant rights only to entities who are able to demonstrate both actual possession and beneficial use. This would ensure that asteroids claims are limited to those where the resources are actually being used, thus, maximizing the utility of such celestial bodies to society.

Finally, asteroids cannot be adjudicated under the traditional rule of capture or a chattel system because their unique propensity to collide with other celestial bodies would result in vexing legal issues. Pop culture has popularized the notion of an asteroid crashing into the surface of Earth in movies and books, but interspace collisions may be a real concern. Asteroids are constantly moving through space, and they often crash into other asteroids or space debris, and sometimes onto the surface of planets. So real is the concern that space agencies regularly keep track of NEOs, or Near Earth Objects, which include around 10,000 asteroids large enough to be tracked in space.75 Imagine the scenario in the popular movie Armageddon, where society wrestles with the mechanics of destroying a huge asteroid that is headed straight for Earth.76 It would be strange, indeed, if the situation were further complicated by an entity owning the asteroid. Would the Earth have to compensate the company for the loss of resources, or would the company be forced to assume liability for the damage caused by the collision? What if the asteroid, rather than crashing into Earth, crashed instead into another asteroid owned by different entity? It makes sense that a company with actual possession of an asteroid should have a claim for actual mining equipment destroyed, but it seems unreasonable to treat the entire rock as the entity’s chattel. By limiting asteroid claims under a doctrine of appropriation-like system, society will be saved the headache of attempting to adjudicate such absurd situations.

Because the traditional rule of capture or a chattel system for the ownership of asteroids would result in waste, abstract claims, and absurd legal dilemmas, a modified doctrine of appropriation should replace existing outdated international space law relating to asteroids.

CONCLUSION

The doctrine of appropriation is a *reasonable rule for adjudicating asteroid claims*, and it could easily be modified to apply to asteroid mining. In the context of water rights, the doctrine of appropriation requires that the claimant be a landowner in order to claim the right to use a water source. It does not make sense, however, for the international community to grant complete ownership over asteroids toa single entity, so the landowner requirement of the rule should be removed. A similar modification would need to be made to the "beneficial use" language of the doctrine.

In the context of water rights, an appropriator obtains rights only to water that he or she can reasonably put to beneficial use. The metals contained in asteroids have a high level of *marketability*. For that reason, a mining entity could potentially put any amount of obtained metal to beneficial use, in the sense that the resources can be sold. This, however, would defeat the purpose of the rule, which is to limit such unreasonable claims. To ameliorate this problem, the doctrine of appropriation could be modified to define "*beneficial use* "constructively by providing that beneficial use is assumed for any resources that have been removed from the asteroid that the mining entity can reasonably hope to transport to market in a return journey. With the astronomical cost of undertaking a trip to such an asteroid, this modification would *limit* mining entities to only what they can carry back, thereby leaving the *untapped resources available* to other entities capable of making the same trip. Considering the size and profitability of metal deposits on asteroids, this modification to the doctrine of appropriation would *not be overly burdensome* to corporate interests. At the same time, it would satisfy the economic imperative of *promoting the rapid development of asteroid resources*.

By changing the landowner requirement, and qualifying the “beneficial use" language, the doctrine of appropriation would be essentially ready for application to asteroid mining claims. The only other changes necessary would be some additional requirements that are common to other space related provisions, like those found in the Outer Space Treaty of 1968. For example, a reporting requirement or clause guaranteeing asylum for other astronauts. A functional rule might read something like this:

State parties or private entities may, upon actual possession, lay claim to natural resources found on or below the surface of asteroids. Rights to appropriate are given in order of seniority, starting with the first party to land on the surface of the asteroid and establish control over the resources, be it water, methane, metal, or any other beneficial substances. A party will be said to have established control over a resource once he has mined the substance and removed it from the asteroid. A senior appropriator may use as much of the asteroid's resources as he can take from the asteroid and put to beneficial use, and may continue to enlarge his share until another junior appropriator begins to appropriate resources from source for beneficial use. For the purposes of this Agreement, "beneficial use “refers to the amount of resources that an appropriator has removed from the asteroid that the actor may reasonably hope to bring home in a return voyage. Resources in excess of what an appropriator can reasonably hope to transport to market in a single voyage do not qualify as having a beneficial use, and are therefore not yet claimed. This means that the extraction of metal from an asteroid does not serve to provide ownership if the appropriator plans on letting the resources languish until another voyage is undertaken to secure the resources and bring them back to Earth. Junior appropriators receive rights in the source of resources (the asteroid) as they find it, and may prevent the senior appropriator from enlarging his share to the junior appropriator’s detriment under a no-injury rule. No state party will attempt to hinder other parties from landing on or using the asteroid, and parties will assist other entities on an asteroid, should they need emergency assistance. Mining claims on asteroids will be reported to the Secretary-General of the United Nations, and state parties agree to release the location of the asteroid, and any scientific findings to the United Nations, the general public, and the scientific community. In the event that the asteroid is on a collision course with any other celestial body, all state parties agree to follow the course of action suggested by the United Nations. Should the United Nations decide the asteroid must be destroyed, no state party may claim liability for resources contained within the asteroid, but not yet captured. This provision applies only to asteroids as classified by the scientific community, and does not apply to planets, comets, meteorites, or any other celestial body not mentioned.

There is no doubt that asteroids may be *extremely beneficial* to mankind, both as a source of resources and as a jumping-off point to far off locations in space. The human-race has progressed scientifically and technologically to the point that space travel is *within commercial reach*, and the need for new international laws governing the ownership of space has never been more apparent. The Outer Space Treaty of 1968 made great strides in developing rational rules for space and many of its provisions should be maintained in their original form. However, by allowing ownership of asteroids under the doctrine of appropriation, the international community can *incentivize* the exploration and *development* of space in a way that reflects the needs of society in general, *without vesting an absolute monopoly* in a single entity. The doctrine of appropriation helped drive American westward expansion, and its application to space mining would help drive the human race in its expansion into the space, the final frontier.

#### **Commercial mining solves extinction** from scarcity, o-pop, climate change, terror, war, shortages, inequality, and disease- **timeframe is mere decades- only mining solves BUT now is key**

Pelton, 17 -- a member of the Executive Board of the International Association for the Advancement of Space Safety

[Dr. Joseph N., former Chairman of the Board of Trustees and Vice President and Dean of the International Space University as well as the Director Emeritus of the Space and Advanced Communications Research Institute (SACRI) at George Washington University, The New Gold Rush: The Riches of Space Beckon!, Springer, 2017, accessed 1-9-22]

*Are* We *Humans Doomed to Extinction?* What will we do when Earth’s resources are used up by humanity? The world is now hugely *over populated*, with billions and billions crammed into our *overcrowded cities*. By 2050, we may be 9 billion strong, and by 2100 well over 11 billion people on Planet Earth. Some at the United Nations say we might even be an amazing 12 billion crawling around this small globe. And over 80 % of us will be living in congested cities. These cities will be ever more vulnerable to *terrorist attack*, *natural disaster*, and other plights that come with overcrowding and a *dearth of jobs* that will be fueled by rapid automation and the rise of artificial intelligence across the global economy. We are already *rapidly running out of water and minerals*. *Climate change* is threatening our very existence. Political leaders and even the Pope have cautioned us against inaction. Perhaps the naysayers are right. *All humanity is at tremendous risk*. Is there no hope for the future? This book is about hope. We think that there is literally heavenly hope for humanity. But we are not talking here about divine intervention. We are envisioning a new space economy that recognizes that there is more water in the skies that all our oceans. There is a *new wealth* of *natural resources* and *clean energy* in the reaches of outer space—more than most of us could ever dream possible. There are those that say why waste money on outer space when we have severe problems here at home? Going into space is not a waste of money. It *is our future*. It is our hope for new jobs and resources. The great challenge of our times is to reverse public thinking to see space not as a resource drain but as the doorway to opportunity. The new space frontier can literally open up a “gold rush in the skies.” In brief, we think there is new hope for humanity. We see a new a pathway to the future via new ventures in space. For too long, space programs have been seen as a money pit. In the process, we have overlooked the great abundance available to us in the skies above. It is important to recognize there is already the beginning of a new gold rush in space—a pathway to astral abundance. “New Space” is a term increasingly used to describe radical new commercial space initiatives—many of which have come from Silicon Valley and often with backing from the group of entrepreneurs known popularly as the “space billionaires.” New space is *revolutionizing* the space industry with *lower cost* space transportation and space systems that represent significant cost savings and new *tech*nological breakthroughs. “New Commercial Space” and the “New Space Economy” represent more than a new way of looking at outer space. These new pathways to the stars could prove vital to human survival. If one does not believe in spending money to probe the mysteries of the universe then perhaps we can try what might be called “calibrated greed” on for size. One only needs to go to a cubesat workshop, or to Silicon Valley or one of many conferences like the “Disrupt Space” event in Bremen, Germany, held in April 2016 to recognize that entrepreneurial New Space initiatives are changing everything [ 1 ]. In fact, the very nature and dimensions of what outer space activities are today have changed forever. It is no longer your grandfather’s concept of outer space that was once dominated by the big national space agencies. The entrepreneurs are taking over. The hopeful statements in this book and the hard economic and technical data that backs them up are more than a minority opinion. It is a topic of growing interest at the World Economic Forum, where business and political heavyweights meet in Davos, Switzerland, to discuss how to stimulate new patterns of global economic growth. It is even the growing view of a group that call themselves “space ethicists.” Here is how Christopher J. Newman, at the University of Sunderland in the United Kingdom has put it: Space ethicists have offered the view that space exploration is not only desirable; it is a *duty* that we, as a species, must undertake in order *to secure the survival of humanity* over the longer term. Expanding both the resource base and, eventually, the habitats available for humanity means that any expenditure on space exploration, far from being viewed as frivolous, can legitimately be rationalized as an ethical investment choice. (Newman) On the other hand there are space ethicists and space exobiologists who argue that humans have created ecological ruin on the planet—and now space debris is starting to pollute space. These countervailing thoughts by the “no growth” camp of space ethicists say we have no right to colonize other planets or to mine the Moon and asteroids—or at least no right to do so until we can prove we can sustain life here on Earth for the longer term. However, for most who are planning for the new space economy the opinion of space philosophers doesn’t really float their boat. Legislators, bankers, and aspiring space entrepreneurs are far more interested in the views of the super-rich capitalists called the space billionaires. A number of these billionaires and space executives have already put some very serious money into enterprises intent on creating a new pathway to the stars. No less than five billionaires with established space ventures—Elon Musk, Paul Allen, Jeff Bezos, Sir Richard Branson, and Robert Bigelow—have invested millions if not billions of dollars into commercializing space. They are developing new technologies and establishing space enterprises that can bring the wealth of outer space down to Earth. This is not a pipe dream, but will increasingly be the economic reality of the 2020s. These wealthy space entrepreneurs see *major new economic opportunities*. To them space represents the last great frontier for enterprising pioneers. Thus they see an ever-expanding space frontier that offers opportunities in low-cost space transportation, satellite solar power satellites to produce clean *energy* 24h a day, space *mining*, space *manufacturing* and production, and eventually space *habitats* and colonies as a trajectory to a better human future. Some even more visionary thinkers envision the possibility of terraforming Mars, or creating new structures in space to protect our planet from cosmic hazards and even raising Earth’s orbit to escape the rising heat levels of the Sun in millennia to come. Some, of course, will say this is sci-fi hogwash. It can’t be done. We say that this is what people would have said in 1900 about airplanes, rocket ships, cell phones and nuclear devices. The skeptics laughed at Columbus and his plan to sail across the oceans to discover new worlds. When Thomas Jefferson bought the Louisiana Purchase from France or Seward bought Alaska, there were plenty of naysayers that said such investment in the unknown was an extravagant waste of money. A healthy skepticism is useful and can play a role in economic and business success. Before one dismisses the idea of an impending major new space economy and a new gold rush, it might useful to see what has already transpired in space development in just the past five decades. The world’s first geosynchronous communications satellite had a throughput capability of about 500 kb / s. In contrast, today’s state of the art Viasat 2 —a half century later— has an impressive throughput of some 140 Gb/s. This means that the relative throughput is nearly 300,000 greater, while its lifetime is some ten times longer (Figs. 1.1 and 1.2 ). Each new generation of communications satellite has had more power, better antenna systems, improved pointing and stabilization, and an extended lifetime. And the capabilities represented by remote sensing satellites, meteorological satellites , and navigation and timing satellites have also expanded their capabilities and performance in an impressive manner. When satellite applications first started, the market was measured in millions of dollars. Today commercial satellite services exceed a quarter of a billion dollars. Vital services such as the Internet, aircraft traffic control and management, international banking, search and rescue and much, much more depend on application satellites. Those that would doubt the importance of satellites to the global economy might wish to view on You Tube the video “If There Were a Day Without Satellites?” [ 2 ]. Let’s check in on what some of those very rich and smart guys think about the new space economy and its potential. (We are sorry to say that so far there are no female space billionaires, but surely this, too, will come someday soon.) Of course this twenty-first century breakthrough that we call the New Space economy will not come just from new space commerce. It will also come from the amazing new technologies here on Earth. *Vital new terrestrial technologies* will accompany this cosmic journey into tomorrow. *I*nformation *t*echnology, *robotics*, *a*rtificial *i*ntelligence and commercial space *travel systems* have now set us on a course to allow us humans to harvest the amazing riches in the skies—new natural resources, new energy, and even totally new ways of looking at the purpose of human existence. If we pursue this course steadfastly, it can be the beginning of a New Space renaissance. But if we don’t seek to realize our ultimate destiny in space, *Homo sapiens can end up in the dustbin of history*—just like literally millions of already failed species. In each and every one of the five mass extinction events that have occurred over the last 1.5 billion years on Earth, some 50–80 % of all species have gone the way of the T. Rex, the woolly mammoth, and the Dodo bird along with extinct ferns, grasses and cacti. On the other hand, the best days of the human race could be just beginning. If we are smart about how we go about discovering and using these riches in the skies and applying the best of our new technologies, it could be the start of a new beginning for humanity. Konstantin Tsiokovsky, the Russian astronautics pioneer, who first conceived of practical designs for spaceships, famously said: “A planet is the cradle of mankind, but one cannot live in a cradle forever.” Well before Tsiokovsky another genius, Leonardo da Vinci, said, quite poetically: “Once you have tasted flight, you will forever walk the earth with your eyes turned skyward, for there you have been, and there you will always long to return.” The founder of the X-Prize and of Planetary Resources, Inc., Dr. Peter Diamandis, has much more brashly said much the same thing in quite different words when he said: “The meek shall inherit the Earth. The rest of us will go to Mars.” The New Space Billionaires Peter Diamandis is not alone in his thinking. From the list of “visionaries” quoted earlier, Elon Musk, the founder of SpaceX; Sir Richard Branson, the founder of Virgin Galactic; and Paul Allen, the co-founder of Microsoft and the man who financed SpaceShipOne, the world’s first successful spaceplane have all said the future will include a vibrant new space economy. They, and others, have said that we can, we should and we soon shall go into space and realize the bounty that it can offer to us. The New Space enterprise is today indeed being led by those so-called space billionaires, who have an exciting vision of the future. They and others in the commercial space economy believe that the exploitation of outer space may open up a new golden age of *astral abundance*. They see outer space as a new frontier that can be a great source of new materials, energy and various forms of new wealth that might even save us from excesses of the past. This gold rush in the skies represents a new beginning. We are not talking about expensive new space ventures funded by NASA or other space agencies in Europe, Japan, China or India. No, these efforts which we and others call New Space are today being forged by imaginative and resourceful commercial entrepreneurs. These twenty-first century visionaries have the fortitude and zeal to look to the abundance above. New breakthroughs in technology and New Space enterprises may be able to create an “astral life raft” for humanity. Just as Columbus and the Vikings had the imaginative drive that led them to discover the riches of a new world, we now have a cadre of space billionaires that are now leading us into this New Space era of tomorrow. These bold leaders, such as Paul Allen and Sir Richard Branson, plus other space entrepreneurs including Jeff Bezos of Amazon and Blue Origin, and Robert Bigelow, Chairman of Budget Suites and Bigelow Aerospace, not only dream of their future in the space industry but also have billions of dollars in assets. These are the bright stars of an entirely new industry that are leading us into the age of New Space commerce. These space billionaires, each in their own way, are proponents of a new age of astral abundance. Each of them is launching new commercial space industries. They are literally transforming our vision of tomorrow. These new types of entrepreneurial aerospace companies—the New Space enterprises—give new hope and new promise of transforming our world as we know it today. The New Space Frontier What happens in space in the next few decades, plus corresponding new information technologies and advanced robotics, will change our world forever. These changes will redefine wealth, change our views of work and employment and upend almost everything we think we know about economics, wealth, jobs, and politics. These changes are about truly disruptive technologies of the most fundamental kinds. If you thought the Internet, smart phones, and spandex were disruptive technologies, just hang on. You have not seen anything yet. In short, if you want to understand a transition more fundamental than the changes brought to the twentieth century world by computers, communications and the Internet, then read this book. There are truly riches in the skies. Near-Earth asteroids largely composed of *platinum* and *r*are *e*arth *m*etals have an *incredible value*. *Helium-3* isotopes accessible in outer space could provide *clean* and *abundant energy*. There is far more *water* in outer space than is in our oceans. In the pages that follow we will explain the potential for a cosmic shift in our global economy, our ecology, and our commercial and legal systems. These can take place by the end of this century. And if these changes do not take place we will be in trouble. Our conventional petro-chemical energy systems will *fail* us economically and eventually blanket us with a hydrocarbon haze of smog that will threaten our health and our very survival. Our rare precious metals that we need for modern electronic appliances will *skyrocket in price*, and the *struggle between “haves” and “have nots” will grow increasingly ugly*. A lack of affordable and readily available *water*, natural *resources*, *food*, *health care* and medical supplies, plus systematic threats to urban security and *systemic warfare* are the *alternatives* to astral abundance. The choices between astral abundance and a downward spiral in global standards of living are stark. Within the *next few decades* these problems will be *increasingly real*. By then the world may almost be begging for new, out of- the-box thinking. International peace and security will be an indispensable prerequisite for exploitation of astral abundance, as will good government for all. No one nation can be rich and secure when everyone else is poor and insecure. In short, global space security and strategic space defense, mediated by global space agreements, are part of this new pathway to the future.

## **NC – Innovation DA**

Innovation DA

#### **Private companies solve best for innovation – reducing costs, investment, and high risk-tolerance. Regulation and lack of property rights kills**

**Weinzierl and Elbling 2021**

(“The Commercial Space Age Is Here,” Matt Weinzierl is the Joseph and Jacqueline Elbling Professor of Business Administration at HBS and a Research Associate at the NBER, Mehak Sarang is a Research Associate at Harvard Business School and the Lunar Exploration Projects Lead for the MIT Space Exploration Initiative, February 12, 2021, <https://hbr.org/2021/02/the-commercial-space-age-is-here>, accessed 1-15-2022)

In 2019, 95% of the estimated $366 billion in revenue earned in the space sector was from the space-for-earth economy: that is, goods or services produced in space for use on earth. The space-for-earth economy includes telecommunications and internet infrastructure, earth observation capabilities, national security satellites, and more. This economy is booming, and though research shows that it faces the challenges of overcrowding and monopolization that tend to arise whenever companies compete for a scarce natural resource, projections for its future are optimistic. **Decreasing costs for launch and space hardware in general have enticed new entrants into this market, and companies in a variety of industries have already begun leveraging satellite technology and access to space to drive innovation and efficiency in their earthbound products and services.** In contrast, the space-for-space economy — that is, goods and services produced in space for use in space, such as mining the Moon or asteroids for material with which to construct in-space habitats or supply refueling depots — has struggled to get off the ground. As far back as the 1970s, research commissioned by NASA predicted the rise of a space-based economy that would supply the demands of hundreds, thousands, even millions of humans living in space, dwarfing the space-for-earth economy (and, eventually, the entire terrestrial economy as well). The realization of such a vision would change how all of us do business, live our lives, and govern our societies — but to date, we’ve never even had more than 13 people in space at one time, leaving that dream as little more than science fiction. Today, however, there is reason to think that we may finally be reaching the first stages of a true space-for-space economy. SpaceX’s recent achievements (in cooperation with NASA), as well as upcoming efforts by Boeing, Blue Origin, and Virgin Galactic to put people in space sustainably and at scale, mark the opening of a new chapter of spaceflight led by private firms. These firms have both the intention and capability to bring private citizens to space as passengers, tourists, and — eventually — settlers, opening the door for businesses to start meeting the demand those people create over the next several decades with an array of space-for-space goods and services. Welcome to the (Commercial) Space Age In our recent research, we examined how the model of centralized, government-directed human space activity born in the 1960s has, over the last two decades, made way for a new model, in which public initiatives in space increasingly share the stage with private priorities. Centralized, **government-led space programs will inevitably focus on space-for-earth activities that are in the public interest,** such as national security, basic science, and national pride. This is only natural, as expenditures for these programs must be justified by demonstrating benefits for citizens — and the citizens these governments represent are (nearly) all on earth. **In contrast to governments, the private sector is eager to put people in space to pursue their own personal interests, not the state’s** — and then supply the demand they create. This is the vision driving SpaceX, which in its first twenty years has entirely upended the rocket launch industry, securing 60% of the global commercial launch market and building ever-larger spacecraft designed to ferry passengers not just to the International Space Station (ISS), but also to its own promised settlement on Mars. Today, the space-for-space market is limited to supplying the people who are already in space: that is, the handful of astronauts employed by NASA and other government programs. While SpaceX has grand visions of supporting large numbers of private space travelers, their current space-for-space activities have all been in response to demand from government customers (i.e., NASA). **But as decreasing launch costs enable companies like SpaceX to leverage economies of scale and put more people into space, growing private sector demand** (that is, tourists and settlers, rather than government employees) could turn these proof-of-concept initiatives into a sustainable, large-scale industry. This model — of selling to NASA with the hopes of eventually creating and expanding into a larger private market — is exemplified by SpaceX, but the company is by no means the only player taking this approach. For instance, while SpaceX is focused on space-for-space transportation, another key component of this burgeoning industry will be manufacturing. Made In Space, Inc. has been at the forefront of manufacturing “in space, for space” since 2014, when it 3D-printed a wrench onboard the ISS. Today, the company is exploring other products, such as high-quality fiber-optic cable, that terrestrial customers may be willing to pay to have manufactured in zero-gravity. But the company also recently received a $74 million contract to 3D-print large metal beams in space for use on NASA spacecraft, and future private sector spacecraft will certainly have similar manufacturing needs which Made In Space hopes to be well-positioned to fulfill. Just as SpaceX has begun by supplying NASA but hopes to eventually serve a much larger, private-sector market, Made In Space’s current work with NASA could be the first step along a path towards supporting a variety of private-sector manufacturing applications for which the costs of manufacturing on earth and transporting into space would be prohibitive. **Another major area of space-for-space investment is in building and operating space infrastructure such as habitats, laboratories, and factories.** Axiom Space, a current leader in this field, recently announced that it would be flying the “first fully private commercial mission to space” in 2022 onboard SpaceX’s Crew Dragon Capsule. Axiom was also awarded a contract for exclusive access to a module of the ISS, facilitating its plans to develop modules for commercial activity on the station (and eventually, beyond it). **This infrastructure is likely to spur investment in a wide array of complementary services to supply the demand of the people living and working within it.** For example, in February 2020, Maxar Technologies was awarded a $142 million contract from NASA to develop a robotic construction tool that would be assembled in space for use on low-Earth orbit spacecraft. Private sector spacecraft or settlements will no doubt have need for a variety of similar construction and repair tools. And of course, the private sector isn’t just about industrial products. **Creature comforts also promise to be an area of rapid growth, as companies endeavor to support the human side of life in the harsh environment of space.** In 2015, for example, Argotec and Lavazza collaborated to build an espresso machine that could function in the zero-gravity environment of the ISS, delivering a bit of everyday luxury to the crew. To be sure, people have dreamt of using the vacuum and weightlessness of space to source or make things that cannot be made on earth for half a century, and time and again the business case has failed to pan out. Skepticism is natural. Those failures, however, have been in space-for-earth applications. For example, two startups of the 2010s, Planetary Resources, Inc. and Deep Space Industries, recognized the potential of space mining early on. For both companies, however, the lack of a space-for-space economy meant that their near-term survival depended on selling mined material — precious metals or rare elements — to earthbound customers. When it became clear that demand was insufficient to justify the high costs, funding dried up, and both companies pivoted to other ventures. These were failures of space-for-earth business models — but the demand for in-space mining of raw building material, metals, and water will be enormous once humans are living in space (and are therefore far cheaper to supply). In other words, when people are living and working in space, we are likely to look back on these early asteroid mining companies less as failures and more as simply ahead of their time. Seizing the Space-for-Space Opportunity The opportunity presented by the space-for-space economy is huge — but it could easily be missed. To seize this moment, policymakers must provide regulatory and institutional frameworks that will enable the risk-taking and innovation necessary for a decentralized, private-sector-driven space economy. There are three specific policy areas we believe will be especially important: 1. **Enabling private individuals to take on greater risk than would be tolerable for government-employed astronauts.** First, **as part of a general shift to that more decentralized, market-oriented space sector, policymakers should consider allowing private space tourists and settlers to voluntarily take on more risk than states would tolerate for government-employed astronauts.** In the long run, ensuring high safety levels will be essential to convince larger numbers of people to travel or live in space, but in the early years of exploration, too great an aversion to risk will stop progress before it starts. An instructive analogy can be found in how NASA works with its contractors: In the mid-2000s, NASA shifted from using cost-plus contracts (in which NASA shouldered all the economic risk of investing in space) to fixed-price contracts (in which risk was distributed between NASA and their contractors). **Because of private companies’ greater tolerance for risk, this shift catalyzed a burst of activity in the sector** — sometimes referred to as “New Space.” A similar shift in how we approach voluntary risk-taking by private-sector astronauts may be necessary in order to launch the space-for-space economy. 2. Judiciously implementing government regulation and support. Second, as with most markets, developing a stable space economy will depend on judicious government regulation and support. NASA and the U.S. Commerce and State Departments’ recent recommitment to “create a regulatory environment in [low-Earth orbit] that enables American commercial activities to thrive” is a good sign that the government is on a path of continued collaboration with industry, but there’s still a long way to go. Governments should start by clarifying how property rights over limited resources such as water on Mars, ice on the Moon, or orbital slots (i.e., “parking spots” in space) will be governed. Recent steps — including NASA’s offer to purchase lunar soil and rocks, last April’s Executive Order on the governance of space resources, and the 2015 Commercial Space Launch Competitiveness Act — indicate that the U.S. government is interested in establishing some form of regulatory framework to support the economic development of space. In 2017, Luxembourg became the first European country to establish a legal framework securing private rights over resources mined in space, and similar steps have been taken at the domestic level in Japan and the United Arab Emirates. Moreover, nine countries (though Russia and China are notably missing) have signed the Artemis Accords, which lay out a vision for the sustainable, international development of the Moon, Mars, and asteroids. These are important first steps, but they have yet to be clearly translated into comprehensive treaties that govern the fair use and allocation of scarce space resources among all major spacefaring nations. In addition, governments should continue to fill the financial gaps in the still-maturing space-for-space economic ecosystem by funding basic scientific research in support of sending humans to space, and by providing contracts to space startups. Similarly, while excessive regulation will stifle the industry, some government incentives, such as policies to reduce space debris, can help reduce the costs of operating in space for everyone in ways that would be difficult to coordinate independently. 3. Moving beyond geopolitical rivalries. Finally, the development of the space-for-space economy must not be undermined by earthly geopolitical rivalries, such as that between the United States and China. These conflicts will unavoidably extend into space at least to some extent, and military demand has long been an important source of funding for aerospace companies. But if not kept in check, such rivalries will not only distract attention and resources from borderless commercial pursuits but also create barriers and risks that hamper private investment. On earth, private economic activity has long tied together people whose states are at odds. The growing space-for-space economy offers exceptional potential to be such a force for unity — but **it’s the job of the world’s governments not to get in the way**. A collaborative, international approach to establishing — and enforcing — the rule of law in space will be essential to encouraging a healthy space-for-space economy. Visions of a space-for-space economy have been around since the dawn of the Space Age in the 1960s. Thus far, those hopes have gone largely unmet — but this moment is different. **For the first time in history, the private sector’s capital, risk tolerance, and profit motive are being channeled into putting people in space. If we seize this opportunity, we will look back on 2020 as the year when we started the truly transformational project of building an economy and a society in space, for space.**

#### **Innovation solves every existential threat**

Dylan **Matthews 18**. Co-founder of Vox, citing Nick Beckstead @ Rutgers University. 10-26-2018. "How to help people millions of years from now." Vox. <https://www.vox.com/future-perfect/2018/10/26/18023366/far-future-effective-altruism-existential-risk-doing-good>

If you care about improving human lives, you should overwhelmingly care about those quadrillions of lives rather than the comparatively small number of people alive today. The 7.6 billion people now living, after all, amount to less than 0.003 percent of the population that will live in the **future**. It’s reasonable to suggest that those **quadrillions** of future people have, accordingly, **hundreds of thousands of times** more moral weight than those of us living here **today** do. That’s the basic argument behind Nick Beckstead’s 2013 Rutgers philosophy dissertation, “On the overwhelming importance of shaping the far future.” It’s a glorious mindfuck of a thesis, not least because Beckstead shows very convincingly that this is a conclusion any plausible moral view would reach. It’s not just something that weird utilitarians have to deal with. And Beckstead, to his considerable credit, walks the walk on this. He works at the Open Philanthropy Project on grants relating to the far future and runs a charitable fund for donors who want to prioritize the far future. And arguments from him and others have turned “long-termism” into a very vibrant, important strand of the effective altruism community. But what does prioritizing the far future even mean? The most **literal** thing it could mean is preventing human **extinction**, to ensure that the species persists as long as possible. For the long-term-focused effective altruists I know, that typically means identifying concrete threats to humanity’s continued existence — like unfriendly artificial intelligence, or a pandemic, or global warming/out of control geoengineering — and engaging in activities to prevent that specific eventuality. But in a set of slides he made in 2013, Beckstead makes a compelling case that while that’s certainly **part** of what caring about the far future entails, approaches that address **specific threats** to humanity (which he calls “**targeted**” approaches to the far future) have to **complement** “**broad**” approaches, where instead of trying to **predict** what’s going to kill us all, you just **generally try to keep civilization running as best it can**, so that it is, as a whole, well-equipped to deal with **potential** extinction events in the **future**, not just in 2030 or 2040 but in 3500 or 95000 or even 37 million. In other words, caring about the far future **doesn’t mean just paying attention to low-probability risks of total annihilation**; it also means **acting on pressing needs now**. For example: We’re going to be **better prepared** to prevent extinction from **AI** or a **supervirus** or **global warming** if society as a whole makes **a lot of scientific progress**. And a significant bottleneck there is that the vast majority of humanity doesn’t get high-enough-quality education to engage in scientific research, if they want to, which reduces the odds that we have enough trained scientists to come up with the breakthroughs we need as a civilization to survive and thrive. So maybe one of the **best thing**s we can do for the **far future** is to improve school systems — here and now — to harness the group economist Raj Chetty calls “lost Einsteins” (**potential innovators** who are thwarted by poverty and inequality in rich countries) and, more importantly, the hundreds of millions of kids in developing countries dealing with even worse education systems than those in depressed communities in the rich world. What if living ethically for the far future means living ethically now? Beckstead mentions some other broad, or very broad, ideas (these are all his descriptions): Help make computers faster so that people everywhere can work more efficiently Change intellectual property law so that technological innovation can happen more quickly Advocate for open borders so that people from poorly governed countries can move to better-governed countries and be more productive Meta-research: improve **incentives** and **norms** in **academic work** to better advance human knowledge Improve education Advocate for political party X to make future people have values more like political party X ”If you look at these areas (economic growth and technological progress, access to information, individual capability, social coordination, motives) a lot of everyday good works contribute,” Beckstead writes. “An implication of this is that a lot of everyday good works are good from a broad perspective, even though hardly anyone thinks explicitly in terms of far future standards.” Look at those examples again: It’s just a list of what normal altruistically motivated people, not effective altruism folks, generally do. Charities in the US love talking about the lost opportunities for innovation that poverty creates. Lots of smart people who want to make a difference become scientists, or try to work as teachers or on improving education policy, and lord knows there are plenty of people who become political party operatives out of a conviction that the moral consequences of the party’s platform are good. All of which is to say: Maybe effective altruists aren’t that special, or at least maybe we don’t have access to that many specific and weird conclusions about how best to help the world. If the far future is what matters, and generally trying to make the world work better is among the best ways to help the far future, then effective altruism just becomes plain ol’ do-goodery.\*

## **Satellites DA**

Satellites DA

#### **Private company focus on satellites key for improved internet connection**

**Russon 21** – Technology of Business Reporter, BBC News

[Mary-Ann Russon, “Satellite boom attracts technology giants,” BBC News, 1-29-21, <https://www.bbc.com/news/business-55807150>]

**Sir Richard Branson's rocket company Virgin Orbit has joined a growing list of private companies that can launch satellites into orbit.** Earlier this month, [**10 payloads were lofted**](https://www.bbc.co.uk/news/science-environment-55699262) on the Virgin Orbit rocket, which was launched from under the wing of one of the entrepreneur's old 747 jumbos. Sir Richard is hoping to tap into what is a growing market for small, lower-cost satellites. Space has traditionally had a high barrier to entry. Today, just seven firms make up 75% of the industry, according to Scott Campbell, director at Deloitte Ventures. The space industry is worth $380bn (£285bn), and 60% of that is commercial. But previously, virtually all investment into space was by governments, he says. The first real shift came in 2011 when US President Barack Obama opened up space to businesses, and now more disruption is coming. "The new space race and start-up scene is almost entirely based around space applications: what can I do with data from space?" says Mr Campbell. Traditionally, building and launching a satellite to collect data or enable communications costs hundreds of millions of dollars. The satellites weighed up to six tonnes, were the size of a bus, and would be sent up into geostationary orbit - 35,786km (22,236 miles) above the Earth. But today, you could send up a so-called nanosat weighing just 25-50kg into low-Earth orbit (160-1,000km above Earth) for between $100,000 and $1m. Launch prices are also falling because technology giants are driving demand, says Mark Boggett, chief executive of British venture capital firm Seraphim Capital. "Because tech firms need to launch their own satellites in the thousands [for space internet networks], this further drives down the cost of launch and storage for everyone else," he says. "Whole new industries of businesses can benefit from using this data, essentially democratising space." And of course, if more data is being transmitted back to Earth, someone will need to process it. As a result, Deloitte's Scott Campbell has seen "an explosion of businesses around space". In 2011, there were 234 space-related firms in the UK, rising to 948 companies in 2018. As for satellites, today there are fewer than 9,000 in orbit, according to Seraphim. OneWeb, SpaceX, Planet, Spire and Amazon have put up 10% of these satellites since 2016, but there are 200 smaller firms behind them who are projected to launch 25,000 satellites over the next four years. One smaller firm is nanosat manufacturer NanoAvionics, which announced plans in October to create 400 new jobs in the UK. The firm saw revenues soar 300% in the last year. "In the old days, we launched one satellite that had lots of sensors on it. But today, we've launched hundreds of satellites that have the same one sensor, and that's a much cheaper, repeatable way to do it with more consistent data," says Robin Sampson, head of operations at NanoAvionics UK. PWC UK's space lead Dinesh Patel says the nanosat market is worth only £1.8bn today, but annual growth rates of 20% are projected. Satellites have traditionally been used for communications, TV services and tracking the weather, but new cheaper options are attracting tech giants with **big plans**. Late last year Microsoft announced it was teaming up with Elon Musk's SpaceX. Their partnership, Azure Space, [**plans to combine**](https://news.microsoft.com/transform/azure-space-partners-bring-deep-expertise-to-new-venture/#:~:text=our%20partners%20below.-,SpaceX,via%20SpaceX's%20Starlink%20satellite%20network.) Microsoft's cloud computing services with a global network of satellites. Tom Keane, corporate vice president at Microsoft Azure, tells the BBC that space makes it possible to "move computing to the edge", which means processing data much closer to users' devices than ever before. "The edge could be anywhere - on a device... you're wearing, it could be something you're carrying, it could be in your car," he says. "Space allows you to connect all of that infrastructure together, and then you can use artificial intelligence [like] predictive analytics to gain insights over things that were previously not connected together." Ground stations, which receive data from satellites, are also potential money makers for IT giants. Microsoft Azure's Tom Keane plans to revolutionise ground stations, which are currently "expensive and often monolithic devices" and hook them up to Microsoft's data centres. "Today, in many cases, data [from ground stations] may not be used, or it's certainly not used as broadly as it could be. By connecting that ground station, you take the data from space... to solve problems that you can't solve today." Another opportunity is to connect the **3.8 billion people** in rural areas who **still** do not have an internet connection. SpaceX in particular [**has been launching batches of small satellites**](https://www.bbc.co.uk/news/science-environment-55775977) into orbit since 2018 to form a huge constellation, with the aim of providing **instant broadband anywhere on Earth**. Other businesses will hope to make money by collecting data from nanosats, processing it with artificial intelligence, and using it in innovative ways to solve problems. Firms are looking to collect Earth observation data like weather, heat signatures and atmospheric gas composition to help farmers, for example, and to monitor things like flood defences, traffic and construction sites.

#### **Better connection required for telehealth – access suffers without it**

**Balasubramanian 20** – M.D, J.D

[ Sai Balasubramanian, “Elon Musk’s Starlink May Potentially Revolutionize Healthcare,” Forbes, 11-27-2020, <https://www.forbes.com/sites/saibala/2020/11/27/elon-musks-starlink-may-potentially-revolutionize-healthcare/?sh=37c89b241e03>]

One of Elon Musk’s relatively recent and most successful ventures is [SpaceX](https://www.spacex.com/mission/), an advanced aerospace technology company with a mission of “Making Humanity Multiplanetary.” The company has celebrated some incredible milestones thus far, from its successful transportation of astronauts into space, to its valiant strides in making rocket technology reusable, and therefore, more cost-efficient. One interesting sub-division of SpaceX is Starlink, which is Musk’s venture into increasing global connectivity. Starlink’s [mission](https://www.starlink.com/) is to use a global network of low Earth orbit satellites to eventually “deliver high speed broadband internet to locations where access has been unreliable, expensive, or completely unavailable.” While satellite internet itself is not a novel concept, most of the traditional systems use **dated technology** that have far less capabilities with regards to internet speed, connectivity, and sustainability. Starlink’s goal is to provide high-speed broadband internet, using cutting-edge satellite systems that will also **not add to** the space pollution created by traditional systems. As of now, the company states that it “is targeting service in the Northern U.S. and Canada in 2020, rapidly expanding to near global coverage of the populated world by 2021.” For many, high-speed broadband internet has incredible implications for connectivity.

One of the most important potential benefits of this technology may be its impact on healthcare and access-to-care in **underserved areas**. For decades, it has been a well-recognized fact that [rural sites in America](https://www.npr.org/sections/health-shots/2019/05/21/725118232/the-struggle-to-hire-and-keep-doctors-in-rural-areas-means-patients-go-without-c) have **poor access** to healthcare. This has not been helped by the rising trend of burnout in healthcare professions, in addition to an ever-growing physician shortage. Experts have articulated that the rise of telemedicine may be one possible solution to help with this issue. Digital platforms that can effectively and safely deliver healthcare without regard to distance or location can potentially provide a viable solution to connecting underserved populations with the care they need. The Covid-19 pandemic has been a great test of this technology. As stay-at-home and social distancing orders became the norm this year due to coronavirus, many healthcare systems, and in-turn patients, often had to rely on telehealth for their care needs. Of course, as telehealth services continue to grow, regulators, healthcare professionals, and innovators will need to keep a close eye on many issues that will inevitably emerge, including data-storage concerns, cybersecurity problems, and most importantly, how best to protect patient privacy and information. The latter is especially concerning, given the growing trends in healthcare [cybersecurity breaches](https://www.forbes.com/sites/saibala/2020/10/17/healthcare-cybersecurity-continues-to-be-a-major-concern/) in the past decade. However, if the appropriate oversight bodies can indeed resolve the issues that telemedicine entails, there is significant opportunity for this technology to make an impact. The market has been receptive of this as well, with telehealth companies gaining massive amounts of utilization and market share just this year alone. In fact, [studies indicate](https://www.globenewswire.com/news-release/2020/07/29/2069575/0/en/Telehealth-Market-to-Exhibit-25-2-CAGR-till-2027-Rising-Preference-for-E-visits-Owing-to-Their-Cost-effectiveness-will-Boost-Growth-Fortune-Business-Insights.html) that the telehealth market is poised for a 25.2% CAGR (compound annual growth rate) and a valuation of nearly $559.5 billion by 2027. Nonetheless, one of the most important limiting factors for telemedicine is connectivity. Due to the same degree of distance that causes healthcare shortages in rural areas, these locations often also lack reliable and high-speed internet connections—the kind that is needed to support stable telemedicine applications and platforms.

This is where Starlink could potentially become a game-changer. If the Starlink service can indeed provide high-speed broadband internet services to rural populations, it may **resolve** yet another piece of the puzzle in increasing access-to-care in underserved communities. Furthermore, the applications of this technology are **endless** and go **far beyond** the American paradigm of rural healthcare. Starlink’s concept, if proven to be scalable and effective, may be able to one day provide internet worldwide, providing the opportunity for underserved communities across the globe to receive much needed medical attention.

#### **Telehealth communications solve pandemics**

**Monaghesh and Hajizadeh 20** – Department of Health Information Technology Student Research Committee

[Elham Monaghesh and Slireza Haajizadeh, “ The role of telehealth during COVID-19 outbreak: a systematic review based on current evidence,” BMC Public Health, 08-01/2020, <https://link.springer.com/article/10.1186/s12889-020-09301-4>]

Coronaviruses, a genus of the coronaviridae family, may cause illness in animals or humans [[1](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR1), [2](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR2)]. In humans, several coronaviruses are known to cause infections of respiratory ranging from the common cold to more serious diseases. The most recently discovered coronavirus causes coronavirus disease-19 (COVID-19) [[1](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR1)]. The disease originated in Wuhan, China and has kept spreading widely to other regions of the world [[3](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR3)]. Primitive symptoms of COVID-19 contain fever, dry cough, breathing difficulty, and boredom [[4](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR4), [5](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR5)]. Elderly people and those with underlying medical problems such as hypertension, heart problems, and diabetes are more susceptible to develop the disease in its form of most intensive [[1](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR1)]. This universal event has been announced a pandemic by the World Health Organization (WHO) [[6](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR6)]. A **significant factor** in slowing down the transmission of the virus is the “social gap” or social distancing that is made possible by the reduction of person-to-person contact [[7](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR7), [8](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR8)]. To reduce transmission, travel restrictions have been appointed and enforced around the world, and most cities have been quarantined [[9](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR9)]. However, people who are not infected with the COVID-19, especially those who are at greater risk of developing the disease (e.g. Elderly people and those with underlying diseases), should receive daily care without the risk of exposure to other patients in the hospital [[7](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR7)]. Moreover, under strict infection control, unnecessary personnel such as clinical psychiatrists strongly refuse to enter COVID-19 patient’s ward [[10](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR10), [11](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR11)]. Natural disasters and epidemics pose many challenges in providing health care [[12](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR12)]. As a result, unique and innovative solutions are needed to address both the critical needs of patients with COVID-19 and other people who need healthcare service. In this respect, technological advances provide new options [[13](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR13)]. Although the ultimate solution for COVID-19 will be multifaceted, it is one of the effective ways to use existing technologies to facilitate optimal service delivery while minimizing the hazard of direct person-to-person exposure [[7](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR7), [14](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR14)]. The use of telemedicine at the time of epidemic conditions (COVID-19 pandemic) has the potential to improve research of epidemiological, control of disease and management of clinical case [[7](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR7), [14](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR14), [15](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR15)]. The use of telehealth technology is a twenty-first century approach that is both patient-centered and protects patients, physicians, as well as others [[16](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR16), [17](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR17)]. Telehealth is the delivery of health care services by health care professionals, where distance is a critical factor, through using information and communication technologies (ICT) for the exchange of valid and correct information [[18](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR18)]. Telehealth services are renderdusing real-time or store-and-forward techniques [[19](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR19)]. With the rapid evolution and downsizing of portable electronics, most families have at least one device of digital, such as smartphones [[20](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR20)] and webcams that provide communication between patient and healthcare provider [[21](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR21)]. Video conferencing and similar television systems are also used to provide health care programs for people who are hospitalized or in quarantine to reduce the risk of exposure to others and employees [[7](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR7)]. Physicians who are in quarantine can employ these services to take care of their patients remotely [[8](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR8), [22](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR22)]. In addition, covering multiple sites with a tele-physician can address some of the challenges of the workforce [[8](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR8), [23](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR23)]. There are various benefits in using technology of telehealth, especially in non-emergency / routine care and in cases where services do not require direct patient-provider interaction, such as providing psychological services [[24](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR24)]. Remote care **reduces** the use of resources in health centers, improves access to care, while **minimizing** the risk of direct transmission of the infectious agent from person to person [[25](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR25)]. In addition to being beneficial in keeping people safe, including the general public, patients and health workers, another important advantage is providing widely access to care givers [[12](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR12)].. Therefore, this technology is an attractive, **effectual and affordable option** [[14](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR14), [26](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR26), [27](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR27)].

Patients are eager to use telehealth, but hindrances still exist [[28](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR28), [29](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR29)]. The barriers of implementing these programs also largely depend on accreditation, payments systems, and insurance [[8](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR8)]. Furthermore, some physicians are concerned about technical and clinical quality, safety, privacy, and accountability [[23](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR23), [30](https://link.springer.com/article/10.1186/s12889-020-09301-4#ref-CR30)]. Telehealth can become a basic need for the general population, health care providers, and patients with COVID-19, especially when people are in quarantine, enabling patients in real time through contact with health care provider for advice on their health problems. Thus, the aim of this review was to identify and systematically review the role of telehealth services in preventing, diagnosing, treating, and controlling diseases during COVID-19 outbreak. We recognized eight studies that presented precious data on telehealth regarding the status of people infected with COVID-19. Telehealth has the capability to incorporate several organizations and situations of health care into one virtual network, led by the central clinic. This network can contain physical locations in different region: central and remote clinics, prevention centers, private clinics, and, private offices of physicians, centers of rehab state and all registered patients within their locations. By using virtual care for very regular, essential medical care, and deferring elective procedures or yearly checkups, we can free up medical staff and equipment required for those who become seriously ill from COVID-19.

Additionally, by not congregating in small spaces like waiting rooms, the ability of the coronavirus to transmission from one person to another were thwart. Keeping people discrete is called “social distancing”. Keeping healthcare staffs discrete from patients and other providers is “medical distancing”. In present time the Telehealth is one strategy to help us carry out this. Telehealth can mobilize all aspects of healthcare potentials to decrease transmission of disease, conduct people to the right level of health care, ensure safety for provide health services online, protect patients, clinicians, and the community from exposure to infection, and finally diminish the burden on the healthcare providers and health system. Some of the telehealth usage cases for patients were control and triage during the outbreak of COVID-19 pandemic, self and distance monitoring, treatment, patients after discharge in health centers (follow-ups) and implementation of online health services. These methods have the potential to **reduce morbidity and mortality during pandemic**. For all healthcare workers and clinicians with mild symptoms can still work remotely with patients, facilitate quick access to medical decision making, seek second opinion for severe cases of patients, exchange cross-border experiences, and offer teleradiology and online trainings for health workers. To provide continued access to necessary health services, telehealth should be a **key weapon** in the fight against the COVID-19outbreak.

#### **Next pandemic causes extinction**

**Bhadelia, 21** -- Center for Emerging Infectious Diseases Policy & Research founding director

[Nahid, MD, MALD, "What do we need to build resilience against the next pandemic?," Center for Emerging Infectious Diseases Policy & Research, 5-18-2021, https://www.bu.edu/ceid/2021/05/18/placeholder-blog-post/, accessed 10-18-2021]

What do we need to build **resilience** against the **next pandemic**?

We have lost close to 3.4 million souls to COVID-19 globally over the last year. By some estimates, the real number may be much higher than that because the excess deaths this year are closer to between 7 and 13 million, after accounting for those who died without a diagnosis and those who died because they could not receive timely care for another medical condition. And the pandemic, despite the receding cases in high-resource countries, is nowhere near its end.

Lives lost are the tip of iceberg. We cannot quantify the pain felt by family members remaining behind. Livelihoods and businesses have been devastated. The pandemic’s impact reaches into all recesses of our personal and public lives. It has and will continue to undo decades of work globally on reducing poverty, improving education and health, and empowering women. An IMF study last year showed how, in the five years after major epidemics, incomeinequality continues to increase in affected countries. Similar trends are already being seen in five countries with the heaviest death tolls from COVID-19. As communities around the world deal with the wreckage of their economies, 95 million more people have been pushed into extreme poverty, with another 200 million predicted to be at risk between now and the year 2030. And this does not even cover the multidimensional impact of poverty. How long will it take for us to recover from this pandemic? How do we take stock and pandemic-proof our communities?

More urgently, COVID-19 may not be the last pandemic we face in our lifetimes. The **existential threat** of pandemics doesn’t decrease because we are already facing one. In fact, this pandemic worsens the risk for new threats because our effort and resources are depleted, and our surveillance and healthcare systems are overstretched. And because the risk of new infectious diseases seeping into the human population from **animal reservoirs** is going to continue to grow as we see grow in numbers, require more land, raise more animals, put down more roads, use up more wetlands, and close the gap between us and natural habitats where yet **undiscovered viruses** lurk. How can we ensure that economically devastated communities coming out of this pandemic recover without worsening the tenuous balance we have with the world around us?

Within our own lifetimes, we have seen the impact of climate change, another existential crisis, transition from something we heard about in news reports to something we experience in our personal lives in the form of changing weather patterns, health effects, increased risk of natural disasters, and rising sea levels. Over the next decades, these factors will exponentially increase the incidence of many infections and change the distribution of others.

And as we tackle these complex problems, new challenges are arising: despite becoming ever more globally connected, our perceptions of reality continue to be disparate. In the deluge of digital data, many among us are falling prey to misinformation and disinformation. The urgency of outbreaks, the shifting scientific knowledge base that comes from tackling emerging pathogens, and political interference have all contributed to the signal getting lost in the noise. The role of disinformation is only going to expand in future emergencies. How do we share timely information in crisis? How do we, in government, science, and public health, earn and build the trust of our communities so ours is the voice they listen to during the fray? How do we listen more carefully to them? How do we involve them in making us all safer?

We can no longer ignore infectious threats on the other side of the world, and we can no longer practice isolationist policies. Because COVID-19 painfully instructed us that outbreaks aren’t just something that happen on the news in distant communities, but instead, they can reach into our homes and rip away our loved ones.

There are moments in history when our actions require collective metacognition and urgency. This has to be one of those moments.

The Center for Emerging Infectious Diseases (CEID) Policy & Research was founded because the time is now for collective transdisciplinary research and response. Every step of the way in this pandemic, the questions haven’t been just scientific, they have also been legal, economic, cultural, and ethical. CEID’s mission is to tug at the threads of all the complex systems that leave us vulnerable to new epidemics and help us answer some of the questions posed above. Through research, collaborative action, community engagement, and training, we hope to find ways to secure us against future global threats. I hope you will reach out with ideas, collaborate with us, and check back often to see where our work is taking us.

We are not rudderless as we head into this future. The COVID-19 pandemic, like recent Ebola virus disease outbreaks and other recent emergencies, has shown that investment in sciences, global collaboration, **public health**, and health-systems readiness can decrease our vulnerability. We need not only to invest in diagnostics, vaccines, and therapeutics but also find a new way of approaching the problems. My own experience serving as an outbreak responder in multiple emergencies has underscored for me again and again that epidemics fracture us along lines of existing weakness. Because at the terminus of all international surveillance for outbreaks are many communities that do not have access to care. When families can’t access care, we can’t stop cases from becoming clusters, which then become outbreaks. When communities can’t equitably access vaccines, it makes it harder for them to recover, and we continue to suffer collectively from the global economic impact and through the appearance of new variants. When structural racism keeps parts of our communities from being protected, diagnosed, and cared for, all of us are at risk. When it comes to infectious diseases outbreaks, health inequity is a threat to all our survival.

At the launch of our center, we asked public health experts and scientists, “What do we need to do to build resilience against the next pandemic?” Over the next few months, we will continue asking this question to different disciplines, covering those working on health and economic equity, lawmakers, the business community, artists and musicians, and those in media and journalism. Because the solutions, like the questions, require all of us.

## **DEBRIS ADV**

No spillover- peace in space doesn’t mean peace on earth- economic incentives means the earth doesn't’ get treated as a commons. OCEANS PROVE- we treat the oceans as a commons, but it didn’t spillover- there’s still colonialism on earth.

#### **Debris risks are overestimated**

**Wattles 19**

[ Jackie Wattles – Reporter, “Space junk poses terrifying threats. Here’s what that means for SpaceX’s megaconstellation,”: CNN Business, 05-30-2019,<https://www.cnn.com/2019/05/30/tech/spacex-starlink-space-junk-debris/index.html>]

SpaceX fired [60 small satellites](http://www.cnn.com/2019/05/15/tech/spacex-starlink-internet-satellites-first-launch/index.html) into orbit last week, the first installment of an internet-beaming [megaconstellation](http://www.cnn.com/2019/05/23/business/spacex-starliner-revenue-business-case/index.html) that the company hopes will grow to include thousands of satellitesin just a few years. Elon Musk’s space company is just one of several with its eyes on beaming broadband to Earth from space. Companies including Amazon [(AMZN)](https://money.cnn.com/quote/quote.html?symb=AMZN&source=story_quote_link) and [OneWeb](http://www.cnn.com/2019/03/13/tech/oneweb-space-debris-junk-low-earth-orbit/index.html) also have similar plans. Looking ahead, [a lot could go wrong for them](http://www.cnn.com/2019/05/23/business/spacex-starliner-revenue-business-case/index.html) — financially or technologically. The most nightmarish calamity, however unlikely, wouldn’t just impact their businesses. It could set back all of human civilization. Imagine this scenario: A single satellite loses power and smashes, uncontrolled, into anothersatellite. They explode, sending plumes of junk charging through space at [23 times](https://www.nasa.gov/mission_pages/station/news/orbital_debris.html) the speed of sound. A piece of that debris slams into another satellite, and it sets off a chain reaction that obliterates everything orbiting in nearby altitudes. In low-Earth orbit, that could include multibillion-dollar networks like Starlink, the [International Space Station](https://www.nasa.gov/mission_pages/station/news/orbital_debris.html), spy satellites and [Earth-imaging](https://www.cnn.com/2015/03/12/tech/mci-planet-labs-doves/index.html) technology. Nothing would remain except an impenetrable graveyard of rubbish that could ground rocket launches for years, maybe even [centuries](https://www.nasa.gov/news/debris_faq.html). In the rarest of situations, [all satellite technology](http://www.bbc.com/future/story/20130609-the-day-without-satellites) could be done for. GPS services wouldcut out; weather tracking technology would be lost, potentially grounding commercial flights worldwide; satellite television and phone service would be gone; the loss in bandwidth couldclog ground-based systems and jam up internet and phone services. From there, [economies](https://phys.org/news/2017-05-space-junk-satellites-economies.html) could be crippled. Such a scenario remains **highly, *highly* unlikely**. Space is huge and satellites are still far from “crowded” up there. But the price of space travel is plummeting, meaning loads of new satellites are going up each year, while the risk of collisions climbs exponentially higher, explains Jonathan McDowell, an astronomer at the Harvard-Smithsonian Center for Astrophysics. “If you put up 10 times the [current total] number of satellites, the risk isn’t just ten times as big — it’s 100 times bigger,” McDowell told CNN Business, describing the risk of a collision. While a single crash might not lead to a doomsday scenario, any incident can create problems. Musk, for his part, says SpaceX takes the problem very seriously: “We are taking great pains to make sure there’s not an orbital debris issue,” he told reporters during a recent conference call. Each active Starlink satellite will be able to automatically dodge traceable pieces of debris headed their way, Musk said. The satellites will also save enough fuel at the end of their lives so that they can intentionally plunge back toward Earth to get out of the way of new devices, SpaceX says. Even if a satellite unexpectedly dies, it’ll be in such a low altitude that gravity will naturally pull it out of orbit in one-to-five years, according to the company. The Federal Communications Commission, which approves satellites for launch, approved of SpaceX’s designs and [said](https://docs.fcc.gov/public/attachments/DA-19-342A1.pdf) its Starlink satellites have “**zero, or near zero” risk of collision** while operational. The first 60 Starlink satellites have now been in orbit about a week, and everything seems to be going smoothly. **No** malfunctioning satellites or failed propulsion systems have been reported.

SpaceX’s debris mitigation plan **matches or exceeds** expert guidelines on best practices. SpaceX competitor OneWeb also has [plans](https://www.cnn.com/2019/03/13/tech/oneweb-space-debris-junk-low-earth-orbit/index.html) to ensure its satellites don’t become spaceborne garbage.With spaceflight growing cheaper and more common, however, businesses with all types of [goals](https://www.nbcnews.com/mach/science/startup-wants-put-huge-ads-space-not-everyone-board-idea-ncna960296) (and little stake in whether or not space stays safe) can afford to send something into orbit. Yet no formal international rules or punishments exist to hold satellite operators accountable for debris creation or general carelessness in space. Some countries, [including the United States](https://www.fcc.gov/document/fcc-launches-review-rules-mitigate-orbital-space-debris), are considering stricter regulations. For now, companies and organizations mostly have to take it upon themselves to research and invest in being good patrons of space. “It’s like any kind of environmental stewardship,” Kelso said. There isn’t always a business incentive to do the right thing, but “you don’t want to reach the point where you’re saying, ‘Gee, I wish we did this earlier.’”

#### **No debris cascades—This ev answers all aff warrants**

Fange 2017 (Daniel Von Fange, Web Application Engineer, Founder and Owner of LeanCoder, Full Stack, Polyglot Web Developer, “Kessler Syndrome is Over Hyped”, 5/21/2017, http://braino.org/essays/kessler\_syndrome\_is\_over\_hyped/)

Kessler Syndrome is *overhyped*. A *chorus of online commenters* great any news of upcoming low earth orbit satellites with worry that humanity will to lose access to space. I now think they are *wrong*.

What is Kessler Syndrome?

Here’s the popular view on Kessler Syndrome. Every once in a while, a piece of junk in space hits a satellite. This single impact destroys the satellite, and breaks off several thousand additional pieces. These new pieces now fly around space looking for other satellites to hit, and so exponentially multiply themselves over time, like a nuclear reaction, until a sphere of man-made debris surrounds the earth, and humanity no longer has access to space nor the benefits of satellites.

It is a dark picture.

Is Kessler Syndrome likely to happen?

I had to stop everything and spend an afternoon doing back-of-the-napkin math to know how big the threat is. To estimate, we need to know where the stuff in space is, how much mass is there, and how long it would take to deorbit.

The orbital area around earth can be broken down into four regions.

*Low LEO*

- Up to about 400km. Things that orbit here burn up in the earth’s atmosphere quickly - between a few months to two years. The space station operates at the high end of this range. It loses about a kilometer of altitude a month and if not pushed higher every few months, would soon burn up. For all practical purposes, Low LEO *doesn’t matter* for Kessler Syndrome. If Low LEO was ever full of space junk, we’d just wait a year and a half, and the problem would be over.

*High LEO* - 400km to 2000km. This where most heavy satellites and most space junk orbits. The air is thin enough here that satellites only go down slowly, and they have a much farther distance to fall. It can take 50 years for stuff here to get down. This is where Kessler Syndrome could be an issue.

*Mid Orbit* - *GPS* satellites and other navigation satellites travel here in lonely, long lives. The *volume of space is so huge*, and the *number of satellites so few*, that we *don’t need to worry* about Kessler *here*.

*GEO* - If you put a satellite far enough out from earth, the speed that the satellite travels around the earth will match the speed of the surface of the earth rotating under it. From the ground, the satellite will appear to hang motionless. Usually the geostationary orbit is used by big weather satellites and big TV broadcasting satellites. (This apparent motionlessness is why satellite TV dishes can be mounted pointing in a fixed direction. You can find approximate south just by looking around at the dishes in your northern hemisphere neighborhood.) For Kessler purposes, GEO orbit is roughly a ring 384,400 km around. However, all the satellites here are moving the same direction at the same speed - debris doesn’t get free velocity from the speed of the satellites. Also, it’s quite expensive to get a satellite here, and so there aren’t many, only about *one satellite per 1000km* of the ring. Kessler is *not a problem* here.

How bad could Kessler Syndrome in High LEO be?

Let’s imagine a *worst case* scenario.

An evil alien intelligence chops up everything in High LEO, turning it into 1cm cubes of death orbiting at 1000km, spread as evenly across the surface of this sphere as orbital mechanics would allow. Is humanity cut off from space?

I’m guessing the world has launched about 10,000 tons of satellites total. For guessing purposes, I’ll assume 2,500 tons of satellites and junk currently in High LEO. If satellites are made of aluminum, with a density of 2.70 g/cm3, then that’s *839,985,870 1cm cubes*. A sphere for an orbit of 1,000km has a surface area of 682,752,000 square KM. So there would be one cube of junk per .81 square KM. If a rocket traveled through that, its odds of hitting that cube are *tiny - less than 1 in 10,000*.

So *even in the worst case, we don’t lose access to space*.

Now though you can travel through the debris, you couldn’t keep a satellite alive for long in this orbit of death. Kessler Syndrome at its worst just prevents us from putting satellites in *certain orbits*.

In *real life*, there’s a *lot of factors* that make Kessler syndrome *even less of a problem* than our worst case though experiment.

· Debris would be *spread* over a *volume* of space, not a *single orbital surface*, making collisions *orders of magnitudes less likely*.

· Most impact debris will have a *slower orbital velocity* than either of its original pieces - this makes it deorbit *much sooner*.

· Any collision will create large and small objects. Small objects are much more affected by atmospheric drag and deorbit faster, even in a *few months* from high LEO. Larger objects can be *tracked* by earth based radar and *avoided*.

· The planned big new constellations are *not in High LEO*, but in *Low LEO* for faster communications with the earth. They *aren’t an issue* for Kessler.

· Most importantly, all new satellite launches since the 19*90’s* are required to include a plan to get rid of the satellite at the end of its useful life (usually by deorbiting)

So the realistic worst case is that *insurance premiums on satellites go up a bit*. Given the *current trend* toward *much smaller, cheaper micro satellites*, this wouldn’t even have a huge effect.

I’m removing Kessler Syndrome from my list of things to worry about.

#### **Turn – only new private tech can solve for space debris**

**Giordano 21**

[ David Giordano – Staffer, “Space Debris: Another Frontier in the Commercialization of Space,” Columbia Journal of Transnational Law, 10-31-2021,<https://www.jtl.columbia.edu/bulletin-blog/space-debris-another-frontier-in-the-commercialization-of-space>]

In the Summer of 2021, we got a glimpse of what some hope will be commonplace in the future: space tourism. [While it might be billionaires and their associates for now](https://apnews.com/article/jeff-bezos-space-e0afeaa813ff0bdf23c37fe16fd34265), if this technology is to follow the arc of many other advancements previously reserved for the rich ([cell phones](http://www.cnn.com/2010/TECH/mobile/07/09/cooper.cell.phone.inventor/index.html) and [air travel](https://www.travelandleisure.com/airlines-airports/history-of-flight-costs), for example), eventually there may come a time in the future where space tourism is a realistic financial goal for those of more restricted means. As humanity broaches this great commercial frontier, it will have to clear the great and neglected hurdle of “space junk,” and current trends appear to indicate that industry will shape not only the technology designed to solve the problem, but the policy as well. As satellites and other projectiles blast into orbit, upon collision they can disintegrate into shards, sometimes just centimeters wide, that remain in orbit, risking further collision. Hollywood captured the potential perils of fairly large pieces of space debris in the opening minutes of the 2013 film [*Gravity*](https://www.warnerbros.com/movies/gravity), where space junk threatens the lives of astronauts on a mission.

Outside the realms of fictional space-thrillers, even the smallest pieces of space junk can present real danger. In 2016, a tiny piece of space junk, believed to be a paint chip or a piece of metal no more than a few thousandths of a millimeter across, [cracked the window of the International Space Station](https://www.popsci.com/paint-chip-likely-caused-window-damage-on-space-station/). In May 2021, a piece of space debris [punctured](https://www.nbcnews.com/science/space/space-junk-damages-international-space-stations-robotic-arm-rcna1067) the robotic arm of the International Space Station. This is seriously concerning, as, [according to the European Space Agency](https://www.esa.int/Safety_Security/Clean_Space/How_many_space_debris_objects_are_currently_in_orbit), there are 670,000 pieces of space debris larger than 1cm and 170,000,000 between 1mm and 1cm in width. Unfortunately, public action and policy struggles to keep up with these risks. International law affords little clarity on the problem, as its control is a novel, [emerging field](https://www.technologyreview.com/2021/08/23/1032386/space-traffic-maritime-law-ruth-stilwell/) with many technical [tracking](https://www.space.com/space-situational-awareness-house-hearing-february-2020.html) and [removal](https://www.scientificamerican.com/article/space-junk-removal-is-not-going-smoothly/#:~:text=There%20is%20no%20doubt%20that,antisatellite%20weapon%2C%E2%80%9D%20she%20says.) challenges. **None** of the existing space treaties [directly tackle the issue](https://oxfordre.com/planetaryscience/view/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-70), rendering [responsibility for it](https://scholarship.law.upenn.edu/jil/vol41/iss1/6/) ambiguous. Absent such responsibility, [legal incentives are non-existent](https://www.courthousenews.com/lack-of-space-law-complicates-growing-debris-problem/). [Guidelines are occasionally issued](https://www.unoosa.org/pdf/limited/l/AC105_2014_CRP14E.pdf) by international governing bodies, but provide little legal significance and are [more targeted at the practicalities of tracking and removal](https://scholarship.law.upenn.edu/jil/vol41/iss1/6/). The nation best positioned to notify space actors of collision risks is the United States, and the burden of that task currently falls on the [Department of Defense](https://www.govexec.com/media/d1-mission-space.pdf). However, the Trump administration issued a [directive in 2018](https://www.cnbc.com/2018/06/18/national-space-council-trump-signs-space-debris-directive.html), shifting the responsibility from the DoD to the Department of Commerce, and the [transition has yet to materialize](https://www.govexec.com/media/d1-mission-space.pdf), leaving DoD struggling to keep pace [with increasing commercial activity](https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/look-out-below-what-will-happen-to-the-space-debris-in-orbit). In the face of public paralysis, addressing the problem through industry looks more and more attractive. This has led some to call for a new legal order that still leaves room for government, but reframes who the rules exist to serve. Rather than our current, rudimentary treaty regime designed to [prevent international conflict](https://www.theverge.com/2017/1/27/14398492/outer-space-treaty-50-anniversary-exploration-guidelines), [commentators](https://space.nss.org/wp-content/uploads/NSS-Position-Paper-Space-Debris-Removal-2019.pdf) have called for an additional regime resembling [maritime law](https://www.technologyreview.com/2021/08/23/1032386/space-traffic-maritime-law-ruth-stilwell/) that preserves the interests of a more diverse set of stakeholders, including those in the future that can bring technology and interests to space that may not yet exist. These commentators shun the common conception that space regulation should resemble air-traffic control, which is suited to a narrower set of uses (transport). Under such a “maritime” regime, the light touch of central regulatory bodies, and perhaps their non-existence, is preferred, just as it has been on the seas. This way, individual nations have a degree of flexibility in instituting controls they see fit while leaving room for industry to address problems and introduce new uses for space.

Furthermore, governments seem ready and willing to construct the legal and incentive framework in concert with such private action. [In a joint statement this summer](https://www.gov.uk/government/news/g7-nations-commit-to-the-safe-and-sustainable-use-of-space), G7 members expressed **openness** to resolving the technical aspects of the debris problem with private institutions, and there is some **promising progress**. Apple co-founder [Steve Wozniak](https://www.space.com/apple-cofounder-steve-wozniak-space-junk-company) signaled his plans to address the problem through a new company with a telling name: Privateer Space. Astroscale, a UK-based company, successfully launched a pair of satellites in the Spring of 2021 [that will remove certain space debris from orbit](https://astroscale.com/astroscale-celebrates-successful-launch-of-elsa-d/). Astroscale also [stated their desire](https://astroscale.com/space-sustainability/) to work with governments and international governing bodies to craft policy with private efforts to control the problem top of mind. In light of public policy’s silence on space debris, the initiative of actors like Astroscale involving themselves in policy may be advised, as it could [promote further private investment](https://docs.google.com/document/d/1NCO5Vvjf-kgoZLNfgaOn4bDj_CAfyD1Qhz2oW3TrcHc/edit) in technology for space debris removal. A popular [policy recommendation](https://reason.org/policy-brief/u-s-space-traffic-management-and-orbital-debris-policy/) among experts is the establishment of public-private partnerships, and Astroscale has entered several such agreements including with [Japan](https://www.satellitetoday.com/in-space-services/2021/07/27/space-clean-up-company-astroscale-signs-partnerships-with-mhi-and-japanese-government/) and the [European Space Agency](https://spacenews.com/astroscale-clearspace-aim-to-make-a-bundle-removing-debris/). Other actors include [ClearSpace](https://www.space.com/esa-startup-clearspace-debris-removal-2025), [OneWeb](https://www.hou.usra.edu/meetings/orbitaldebris2019/orbital2019paper/pdf/6077.pdf), and [D-Orbit](https://www.satellitetoday.com/in-space-services/2021/09/10/esa-awards-d-orbit-uk-contract-for-debris-removal-demonstration/). Some may want to push back against further private involvement. The congestion of space is, in part, industry’s fault, and if we conceptualize orbital space as a common resource, it might be right to fear the effects of the [Tragedy of the Commons](https://www.britannica.com/science/tragedy-of-the-commons). Critics may seek to bolster international treaties, give legal teeth to the guidelines occasionally issued by the UN, and preserve the public posture of the heavens. These may be welcome adjustments, but unlike a pond that industry overfishes or a well that industry dries up, here industry is working to add more fish and water. Moreover, governments stand to benefit from this private decluttering, as well, as [they are expected](https://astroscale.com/wp-content/uploads/2020/02/Reg-V-Development-of-Global-Policy-for-Active-Debris-Removal-Services-v2.0.pdf) to be major customers of some of these private actors. As for the public posture, space has long been a commercial place. Telecommunications companies and government contractors historically depend on space. As the number of commercial satellites set to launch skyrockets, it seems natural to craft policies that are responsive to their interests and provide incentives to remedy issues created in the course of spacefaring, such as space debris. In light of the long silence of international law on such issues and the **demonstrated motivation** by private actors, space debris represents the latest frontier in the abdication of space from the public concern to the private.

**No ‘space war’ – Insurmountable barriers and everyone has an interest in keeping space peaceful**

**Dobos 19**

[(Bohumil Doboš, scholar at the Institute of Political Studies, Faculty of Social Sciences, Charles University in Prague, Czech Republic, and a coordinator of the Geopolitical Studies Research Centre) “Geopolitics of the Outer Space, Chapter 3: Outer Space as a Military-Diplomatic Field,” Pgs. 48-49] TDI

Despite the theorized potential for the achievement of the terrestrial dominance throughout the utilization of the ultimate high ground and the ease of destruction of space-based assets by the potential space weaponry, the utilization of space weapons is with current technology and no effective means to protect them far from fulfilling this potential (Steinberg 2012, p. 255). In current global international political and technological setting, the utility of space weapons is very limited, even if we accept that the ultimate high ground presents the potential to get a decisive tangible military advantage (which is unclear). This stands among the reasons for the lack of their utilization so far. Last but not the least, it must be pointed out that the states also develop passive defense systems designed to protect the satellites on orbit or critical capabilities they provide. These further decrease the utility of space weapons. These systems include larger maneuvering capacities, launching of decoys, preparation of spare satellites that are ready for launch in case of ASAT attack on its twin on orbit, or attempts to decrease the visibility of satellites using paint or materials less visible from radars (Moltz 2014, p. 31). Finally, we must look at the main obstacles of connection of the outer space and warfare. The first set of barriers is comprised of **physical obstructions**. As has been presented in the previous chapter, the outer space is very challenging domain to operate in. Environmental factors still present the largest threat to any space military capabilities if compared to any man-made threats (Rendleman 2013, p. 79). A following issue that hinders military operations in the outer space is the predictability of orbital movement. If the reconnaissance satellite's orbit is known, the terrestrial actor might attempt to hide some critical capabilities-an option that is countered by new surveillance techniques (spectrometers, etc.) (Norris 2010, p. 196)-but the hide-and-seek game is on. This same principle is, however, in place for any other space asset-any nation with basic tracking capabilities may quickly detect whether the military asset or weapon is located above its territory or on the other side of the planet and thus mitigate the possible strategic impact of space weapons not aiming at mass destruction. Another possibility is to attempt to destroy the weapon in orbit. Given the level of development for the ASAT technology, it seems that they will prevail over any possible weapon system for the time to come. Next issue, directly connected to the first one, is the utilization of weak physical protection of space objects that need to be as light as possible to reach the orbit and to be able to withstand harsh conditions of the domain. This means that their protection against ASAT weapons is very limited, and, whereas some avoidance techniques are being discussed, they are of limited use in case of ASAT attack. We can thus add to the issue of predictability also the issue of easy destructibility of space weapons and other military hardware (Dolman 2005, p. 40; Anantatmula 2013, p. 137; Steinberg 2012, p. 255). Even if the high ground was effectively achieved and other nations could not attack the space assets directly, there is still a need for communication with those assets from Earth. There are also ground facilities that support and control such weapons located on the surface. Electromagnetic communication with satellites might be jammed or hacked and the ground facilities infiltrated or destroyed thus rendering the possible space weapons useless (Klein 2006, p. 105; Rendleman 2013, p. 81). This issue might be overcome by the establishment of a base controlling these assets outside the Earth-on Moon or lunar orbit, at lunar L-points, etc.-but this perspective remains, for now, unrealistic. Furthermore, **no contemporary actor will risk full space weaponization in the face of possible competition and the possibility of rendering the outer space useless.** No actor is dominant enough to prevent others to challenge any possible attempts to dominate the domain by military means. To quote 2016 Stratfor analysis, "(a) war in space would be devastating to all, and preventing it, rather than finding ways to fight it, will likely remain the goal" (Larnrani 20 16). This stands true unless some space actor finds a utility in disrupting the arena for others.

#### **No space arms race – we would have seen it already with the creation of space force**

**Grego 19**

(Laura Grego –Union of Concerned Scientists, “Creating a Space Force Would Trigger a Space Arms Race and Threaten US Satellite Security, Science Group Says,” Union of Concerned Scientists, 12-09-2019,<https://www.ucsusa.org/about/news/space-force-would-trigger-arms-race>)

A congressional conference committee has agreed to include the creation of a space force in a must-pass defense bill in exchange for paid parental leave benefits for federal workers. What is missing from the debate over the horse trade, according to the Union of Concerned Scientists (UCS), is the fact that a space force is a very bad idea. Below is a statement by Laura Grego, a physicist and senior scientist in the Global Security Program at UCS. “At best a space force is a distraction from what is necessary to ensure space security in the face of rapid technological and geopolitical changes. At worst, it would prompt a space arms race that would threaten U.S. military and civilian satellites, not protect them. Diplomacy, not bureaucratic reorganization is urgently needed. “The Pentagon insists that keeping space predictable and safe is the core purpose of whatever reorganization they do. To be sure, that mission is important and stabilizing, but it doesn’t need a new military service. Creating a new military service focused on space will create bureaucratic incentives to hype the space weapons threat and build new weapons. Pentagon officials emphasize that Russia and China are developing anti-satellite technology, but they leave out the fact that the United States is far ahead in sophistication as well as capacity of such technology. “Testing anti-satellite technology, much less engaging in an actual conflict in space, can have profound ripple effects. “We all would be better off with international agreements that constrain conduct and particularly dangerous technologies in space. The international community has struggled to overcome ideological divisions to reach agreements, but the benefits of continuing to try are obvious.

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## **COLONIALISM ADV**

**Space cooperation doesn’t lead to broader relations.**

**Sterner 15** (Eric Sterner is a fellow at the George C. Marshall Institute. He held senior staff positions for the U.S. House Science and Armed Services committees and served in DoD and as NASA’s associate deputy administrator for policy and planning, “Talk and Cooperation in Space” 8/6/2015<https://spacenews.com/op-ed-china-talk-and-cooperation-in-space/>)

How might cooperation with China benefit the United States? Some hold that cooperation in space helps promote cooperation on Earth. Writing in SpaceNews in 2013, Michael Krepon argued “The more they cooperate in space, the less likely it is that their competition on Earth will result in military confrontation. The reverse is also true.” That sentiment is widespread and flows from the nobility of exploration. **If only it were so.** Unfortunately, a country’s space behavior appears to have little affect on its terrestrial actions. Russia’s multidecadal human spaceflight partnership with the United States did not prevent it from invading and destabilizing Ukraine when it moved toward a closer relationship with the European Union, many of whose members are Russian partners in the International Space Station. Space cooperation **has not, and will not**, prevent the continued worsening of the security environment in Europe, which flows from Russian behavior on Earth, not in space. **Space cooperation with China is similarly unlikely to moderate its behavior**. Tensions in Asia derive from China’s insistence on pressing unlawful territorial claims in the Pacific, most recently by transforming disputed coral reefs into would-be military bases. Ironically, civilian space technology has proved critical in documenting these aggressive moves. To further demonstrate the civil space cooperation does not promote cooperation on Earth, we need look no further than recent history. The NASA administrator’s visit to China in the fall of 2014 nearly coincided with China’s hacking of NOAA, with whom Beijing has a “partnership” in studying climate change. Military confrontation flows from the interaction of hard power in pursuit of competing national interests. Space cooperation falls into the realm of soft power. It has value in strengthening relationships among like-minded states with similar interests. China’s aggressiveness toward its neighbors, its human rights record and its cyberattacks on the United States strongly demonstrate that it and the United States are **not of like minds**. This is not the result of insufficient space cooperation, but of divergent national interests. The United States is a status quo power; China is not.

#### **Debates about oppression should center on consequences.**

Christopher A. Bracey 6, Associate Professor of Law, Associate Professor of African & African American Studies, Washington University in St. Louis, September, Southern California Law Review, 79 S. Cal. L. Rev. 1231, p. 1318

Second, **reducing conversation** on race matters **to an ideological contest allows opponents to elide inquiry into whether the results of a particular** preference **policy are desirable. Policy positions masquerading as** principled **ideological stances create the impression that a racial policy is not simply a choice among available alternatives, but the embodiment of some higher moral principle**. Thus, **the "principle" becomes an end in itself, without reference to outcomes. Consider the prevailing view of colorblindness in constitutional discourse. Colorblindness has come to be understood as the embodiment of what is morally just,** independent of its actual effect upon the lives of racial minorities. This explains Justice Thomas's belief in the "moral and constitutional equivalence" between Jim Crow laws and race preferences, and his tragic assertion that "Government cannot make us equal [but] can only recognize, respect, and protect us as equal before the law." [281](http://web.lexis-nexis.com/universe/document?_m=cd9713b340d60abd42c2b34c36d8ef95&_docnum=9&wchp=dGLbVzz-zSkVA&_md5=9645fa92f5740655bdc1c9ae7c82b328#n281) For Thomas, there is no meaningful difference between laws designed to entrench racial subordination and those designed to alleviate conditions of oppression. **Critics may point out that colorblindness in practice has the effect of entrenching existing racial disparities in** health, wealth, and society. **But in framing the debate in purely ideological terms, opponents are able to avoid the contentious issue of outcomes and make viability determinations based exclusively on whether racially progressive measures exude fidelity to the ideological principle of colorblindness. Meaningful policy debate is replaced by ideological exchange, which further exacerbates hostilities and deepens the cycle of resentment.**

#### **Extinction categorically outweighs all other impacts.**

Seth D. **Baum &** Anthony M. **Barrett 18**. Global Catastrophic Risk Institute. 2018. “Global Catastrophes: The Most Extreme Risks.” Risk in Extreme Environments: Preparing, Avoiding, Mitigating, and Managing, edited by Vicki Bier, Routledge, pp. 174–184.

2. What Is GCR And Why Is It Important? Taken *literally*, a global catastrophe can be any event that is in some way catastrophic across the globe. This suggests a rather low threshold for what counts as a global catastrophe. An event causing just one death on each continent (say, from a jet-setting assassin) could rate as a global catastrophe, because surely these deaths would be catastrophic for the deceased and their loved ones. However, in common usage, a global catastrophe would be *catastrophic* for a significant portion of the globe. Minimum thresholds have variously been set around ten thousand to ten million deaths or $10 billion to $10 trillion in damages (Bostrom and Ćirković 2008), or death of one quarter of the human population (Atkinson 1999; Hempsell 2004). Others have emphasized catastrophes that cause *long-term declines in the trajectory of human civilization* (Beckstead 2013), that human civilization *does not recover from* (Maher and Baum 2013), that drastically reduce humanity’s potential for future achievements (Bostrom 2002, using the term “*existential risk*”), or that result in *human extinction* (Matheny 2007; Posner 2004). A common theme across all these treatments of GCR is that *some catastrophes are vastly more important than others*. Carl Sagan was perhaps the first to recognize this, in his commentary on nuclear winter (Sagan 1983). Without nuclear winter, a global nuclear war might kill several hundred million people. This is obviously a major catastrophe, but humanity would presumably carry on. However, with *nuclear winter*, per Sagan, *humanity could go extinct*. The loss would be not just an additional four billion or so deaths, but the loss of *all future generations*. To paraphrase Sagan, the loss would be billions and billions of lives, or even *more*. Sagan estimated *500 trillion lives*, assuming humanity would continue for ten million more years, which he cited as typical for a successful species. Sagan’s 500 trillion number may even be an *underestimate*. The analysis here takes an adventurous turn, hinging on the evolution of the human species and the long-term fate of the universe. On these long time scales, the descendants of contemporary humans may no longer be recognizably “human”. The issue then is whether the descendants are still worth caring about, whatever they are. If they are, then it begs the question of how many of them there will be. Barring major global catastrophe, Earth will remain habitable for about one billion more years 2 until the Sun gets too warm and large. The rest of the Solar System, Milky Way galaxy, universe, and (if it exists) the multiverse will remain habitable for a lot longer than that (Adams and Laughlin 1997), should our descendants gain the capacity to migrate there. An open question in astronomy is whether it is possible for the descendants of humanity to continue living for an *infinite length of time* or instead merely an *astronomically large but finite* length of time (see e.g. Ćirković 2002; Kaku 2005). Either way, the stakes with global catastrophes *could* be *much larger than the loss of 500 trillion lives.* Debates about the infinite vs. the merely astronomical are of theoretical interest (Ng 1991; Bossert et al. 2007), but they have *limited practical significance*. This can be seen when *evaluating GCRs from a standard risk-equals-probability-times-magnitude framework*. Using Sagan’s 500 trillion lives estimate, it follows that reducing the probability of global catastrophe by a mere one-in-500-trillion chance is of the same significance as saving one human life. Phrased differently, society should *try 500 trillion times harder to prevent a global catastrophe than it should to save a person’s life*. Or, preventing one million deaths is equivalent to a one-in500-million reduction in the probability of global catastrophe. This suggests society should *make extremely large investment in GCR reduction, at the expense of virtually all other objectives.* Judge and legal scholar Richard Posner made a similar point in monetary terms (Posner 2004). Posner used $50,000 as the value of a statistical human life (VSL) and 12 billion humans as the total loss of life (double the 2004 world population); he describes both figures as significant underestimates. Multiplying them gives $600 trillion as an underestimate of the value of preventing global catastrophe. For comparison, the United States government typically uses a VSL of around one to ten million dollars (Robinson 2007). Multiplying a $10 million VSL with 500 trillion lives gives $5x1021 as the value of preventing global catastrophe. But even using “just" $600 trillion, society should be willing to spend at least that much to prevent a global catastrophe, which converts to being willing to spend at least $1 million for a one-in-500-million reduction in the probability of global catastrophe. Thus while reasonable disagreement exists on how large of a VSL to use and how much to count future generations, even low-end positions suggest *vast resource allocations* should be redirected to reducing GCR. This conclusion is only *strengthened* when considering the *astronomical size of the stakes*, but the same point holds either way. The bottom line is that, as long as something along the lines of the standard riskequals-probability-times-magnitude framework is being used, then *even tiny GCR reductions* merit significant effort. This point holds especially strongly for risks of catastrophes that would cause *permanent harm to global human civilization*. The discussion thus far has assumed that all human lives are valued equally. This assumption is *not universally held*. People often value some people more than others, favoring themselves, their family and friends, their compatriots, their generation, or others whom they identify with. Great debates rage on across moral philosophy, economics, and other fields about how much people should value others who are distant in space, time, or social relation, as well as the unborn members of future generations. This debate is crucial for all valuations of risk, including GCR. Indeed, if each of us only cares about our immediate selves, then global catastrophes may not be especially important, and we probably have better things to do with our time than worry about them. While everyone has the right to their *own views and feelings*, we find that the strongest arguments are for the *widely held position* that *all human lives should be valued equally*. This position is succinctly stated in the United States Declaration of Independence, updated in the 1848 Declaration of Sentiments: “We hold these truths to be self-evident: that all men and 3 women are created equal”. Philosophers speak of an agent-neutral, objective “view from nowhere” (Nagel 1986) or a “veil of ignorance” (Rawls 1971) in which each person considers what is best for society *irrespective of which member of society they happen to be*. Such a perspective *suggests valuing everyone equally*, regardless of who they are or where or when they live. This in turn suggests a *very high value for reducing GCR*, or a high degree of priority for GCR reduction efforts.