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#### CP: The appropriation of outer space by private entities except for Large Satellite Constellations in Lower Earth Orbit is unjust.

#### Terrestrial Internet Cables are vulnerable now – risks access.

Griffiths 19 James Griffiths 7-26-2019 "The global internet is powered by vast undersea cables. But they’re vulnerable." <https://www.cnn.com/2019/07/25/asia/internet-undersea-cables-intl-hnk/index.html> (CNN Analyst)//ELmer

Hong Kong (CNN) - On July 29, 1858, two steam-powered battleships met in the middle of the Atlantic Ocean. There, they connected two ends of a 4,000 kilometer (2,500 mile) long, 1.5 centimeter (0.6 inch) wide cable, linking for the first time the European and North American continents by telegraph. Just over two weeks later, the UK’s Queen Victoria sent a congratulatory message to then US President James Buchanan, which was followed by a parade through the streets of New York, featuring a replica of a ship which helped lay the cable and fireworks over City Hall. In their inaugural cables, Queen Victoria hailed the “great international work” by the two countries, the culmination of almost two decades of effort, while Buchanan lauded a “triumph more glorious, because far more useful to mankind, than was ever won by conqueror on the field of battle. The message took over 17 hours to deliver, at 2 minutes and 5 seconds per letter by Morse code, and the cable operated for less than a month due to a variety of technical failures, but a global communications revolution had begun. By 1866, new cables were transmitting 6 to 8 words a minute, which would rise to more than 40 words before the end of the century. In 1956, Transatlantic No. 1 (TAT-1), the first underwater telephone cable, was laid, and by 1988, TAT-8 was transmitting 280 megabytes per second – about 15 times the speed of an average US household internet connection – over fiber optics, which use light to transmit data at breakneck speeds. In 2018, the Marea cable began operating between Bilbao, Spain, and the US state of Virginia, with transmission speeds of up to 160 terabits per second – 16 million times faster than the average home internet connection. Today, there are around 380 underwater cables in operation around the world, spanning a length of over 1.2 million kilometers (745,645 miles). Underwater cables are the invisible force driving the modern internet, with many in recent years being funded by internet giants such as Facebook, Google, Microsoft and Amazon. They carry almost all our communications and yet – in a world of wireless networking and smartphones – we are barely aware that they exist. Yet as the internet has become more mobile and wireless, the amount of data traveling across undersea cables has increased exponentially. “Most people are absolutely amazed” by the degree to which the internet is still cable-based, said Byron Clatterbuck, chief executive of Seacom, a multinational telecommunications firm responsible for laying many of the undersea cables connecting Africa to the rest of the world. “People are so mobile and always looking for Wi-Fi,” he said. “They don’t think about it, they don’t understand the workings of this massive mesh of cables working together. “They only notice when it’s cut.” Network down In 2012, Hurricane Sandy slammed into the US East Coast, causing an estimated $71 billion in damage and knocking out several key exchanges where undersea cables linked North America and Europe. “It was a major disruption,” Frank Rey, director of global network strategy for Microsoft’s Cloud Infrastructure and Operations division, said in a statement. “The entire network between North America and Europe was isolated for a number of hours. For us, the storm brought to light a potential challenge in the consolidation of transatlantic cables that all landed in New York and New Jersey.” For its newest cable, Marea, Microsoft chose to base its US operation further down the coast in Virginia, away from the cluster of cables to minimize disruption should another massive storm hit New York. But most often when a cable goes down nature is not to blame. There are about 200 such failures each year and the vast majority are caused by humans. “Two-thirds of cable failures are caused by accidental human activities, fishing nets and trawling and also ships’ anchors,” said Tim Stronge, vice-president of research at TeleGeography, a telecoms market research firm. “The next largest category is natural disaster, mother nature – sometimes earthquakes but also underwater landslides.” A magnitude-7.0 earthquake off the southwest coast off Taiwan in 2006, along with aftershocks, cut eight submarine cables which caused internet outages and disruption in Taiwan, Hong Kong, China, Japan, Korea and the Philippines. Stronge said the reason most people are not aware of these failures is because the whole industry is designed with it in mind. Companies that rely heavily on undersea cables spread their data across multiple routes, so that if one goes down, customers are not cut off. How a cable gets laid Laying a cable is a years-long process which costs millions of dollars, said Seacom’s Clatterbuck. The process begins by looking at naval charts to plot the best route. Cables are safest in deep water where they can rest on a relatively flat seabed, and won’t rub against rocks or be at risk of other disturbances. “The deeper the better,” Clatterbuck said. “When you can lay the cable down in deep water you rarely have any problems. It goes down on the bottom of the seabed and just stays there.” Things become more difficult the closer you get to shore. A cable that is only a few centimeters thick on the bottom of the ocean must be armored from its environment as reaches the landing station that links it with the country’s internet backbone. “Imagine a long garden hose, inside of which are very small tubes that house a very, very thin fiber pair,” Clatterbuck said. That hose is wrapped in copper, which conducts the direct current that powers the cable and its repeaters, sometimes up to 10,000 volts. “The fibers are wrapped in urethane and wrapped in copper and wrapped again in urethane,” he said. “If we’re going to have to put that cable on a shoreline that is very shallow and has a lot of rocks, you’re now going to have to armor coat that cable so no one can hack through it.” Cables in less hospitable areas can be far thicker than garden hoses, wrapped in extra plastic, kevlar armor plating, and stainless steel to ensure they can’t be broken. Depending on the coast, cable companies might also have to build concrete trenches far out to sea, to tuck the cable in to protect it from being bashed against rocks. “Before the cable-laying vessels go out they send out another specialized ship that maps the sea floor in the area when they want to go,” said TeleGeography’s Stronge. “They want to avoid areas where there’s a lot of undersea currents, certainly want to avoid volcanic areas, and avoid a lot of elevation change on the sea floor.” Once the route is plotted and checked, and the shore connections are secure, huge cable laying ships begin passing out the equipment. “Imagine spools of spools of garden hose along with a lot of these repeaters the size of an old travel trunk,” Clatterbuck said. “Sometimes it can take a month to load the cable onto a ship.” The 6,600 kilometer (4,000 mile) Marea cable weighs over 4.6 million kilograms (10.2 million pounds), or the equivalent of 34 blue whales, according to Microsoft, which co-funded the project with Facebook. It took more than two years to lay the entire thing. Malicious cuts The blackout came without warning. In February 2008, a whole swath of North Africa and the Persian Gulf suddenly went offline, or saw internet speeds slow to a painful crawl. This disruption was eventually traced to damage to three undersea cables off the Egyptian coast. At least one – linking Dubai and Oman – was severed by an abandoned, 5,400 kilogram (6-ton) anchor, the cable’s owner said. But the cause of the other damage was never explained, with suggestions it could have been the work of saboteurs. That raises the issue of another threat to undersea cables: deliberate human attacks. In a 2017 paper for the right-wing think tank Policy Exchange, British lawmaker Rishi Sunak wrote that “security remains a challenge” for undersea cables. “Funneled through exposed choke points (often with minimal protection) and their isolated deep-sea locations entirely public, the arteries upon which the Internet and our modern world depends have been left highly vulnerable,” he said. “The threat of these vulnerabilities being exploited is growing. A successful attack would deal a crippling blow to Britain’s security and prosperity.” However, with more than 50 cables connected to the UK alone, Clatterbuck was skeptical about how useful a deliberate outage could be in a time of war, pointing to the level of coordination and resources required to cut multiple cables at once. “If you wanted to sabotage the global internet or cut off a particular place you’d have to do it simultaneously on multiple cables,” he said. “You’d be focusing on the hardest aspect of disrupting a network.”

#### Mega-constellations provide fast, affordable internet that bridges digital divide – independently, competition lowers prices across the board.

Novo 21 Paula Novo 3-31-2021 "Will Starlink Change the Internet?' <https://www.highspeedoptions.com/resources/insights/will-starlink-change-the-internet> (With over four years of broadband experience, Paula Novo is the Site Editor and Senior Writer for HighSpeedOptions. She has helped develop the criterion by which HighSpeedOptions reviews and recommends internet service providers, striving to simplify and guide the user’s decision toward the best communications services. Paula also leads HighSpeedOptions coverage of the digital divide, ISP reviews, and broadband policy.)//Elmer

While it’s not the first – and won’t be the last – company to test low Earth orbit satellites, Starlink, the satellite internet division of SpaceX, is making waves in the telecommunications industry for its residential beta program launched in 2020. As the first U.S.-based firm to successfully bring LEO internet to market, Starlink shows promise where others have heroically failed. Every satellite company in history to launch a low Earth orbit (LEO) constellation has gone bankrupt, except for Starlink, that is. Said best in a tweet by Elon Musk, founder and CEO of this venture, “Starlink is a staggeringly difficult technical and economic endeavor. However, if we don’t fail, the cost to end-users will improve every year.” In the span of a decade, broadband moved from a “nice-to-have” to a “must-have” – the COVID-19 pandemic simply speeding up the clock on its shift towards a utility. Yet, we’re a far cry away from total connectivity. Due to availability and cost issues (to name a few), millions of Americans don’t have access to reliable internet, which further widens the education and wealth gaps. If successful, Starlink – and LEO satellite internet as a whole – may be the first real solution for billions of people missing out on the benefits of broadband. Current State of the Telecom Industry Despite advances in technology, the telecom industry is lagging behind. And, contrary to what internet service providers and the media report, the United States’ internet options are still very limited. The three biggest hurdles standing in the way of real progress include access, affordability, and lack of competition. Access According to the Federal Communications Commission’s (FCC) 2020 Broadband Deployment Report, roughly 6% of all Americans have zero access to fixed broadband at home. And, of those without access, a majority live in rural areas. That’s about 19 million people who, even if they could afford to subscribe to internet service, are out of luck. The FCC defines broadband speeds as just 25 Mbps down and 3 Mbps up, which may be fast enough to check emails but won’t reliably support your Breaking Bad marathon. You can see how living in an underserved area, then, can severely limit a person’s job prospects, schooling, and social connections. Still, we can’t rate internet access without also looking at affordability. While some 19 million Americans do not have access at all, as many as one in three Americans choose to not subscribe to internet service, citing cost as a leading factor. Affordability FCC data shows that nearly 35% of Americans, or about 114 million people, do not subscribe to broadband service at their homes. Affordability – or lack thereof – is often cited as the main driver for this decision. Despite government intervention via efforts like the FCC Lifeline Program and ISP subsidies to incentivize network expansions, America still seems to lag behind other developed countries when it comes to internet cost. In a 2020 study by New America, it turns out that we pay quite a bit more for internet service than most developed countries in Asia and Europe, regardless of speed. Before factoring in data caps and other ancillary ISP fees, we pay “nearly twice as much as European countries for high-speed internet.” Naturally, the ballooning question pops up – How did we fall behind? Lack of Competition The lack of competition today may be the single greatest obstacle preventing the telecom industry (read: ISPs and consumers) from thriving. A long history of privately-owned infrastructures and government regulations has enabled monopolies to quash competition in the marketplace and ignore the demand for innovation. Unsurprisingly, the Institute of Self-Reliance released a new report finding that two of the largest broadband companies in the U.S. – Comcast and Charter Spectrum – maintain a monopoly over 47+ million American households. It also sheds light on an additional 33 million homes only serviceable by one or two DSL providers. While these are just a few examples of the current market, you can easily see how large segments of the population lack the competitive supply needed to drive down costs and push for more development. What if there was a solution to address these pitfalls with the internet? What if Americans (or, really, anyone in the world) could circumvent some of the physical and political barriers stopping us from connecting from seemingly anywhere? These are questions Starlink is attempting to answer. Ways Starlink May Change the Internet First, what is Starlink and how is it different from other internet providers? It’s an Elon Musk satellite internet company bringing life to the telecom industry. In the last year, Starlink launched over 1,000 satellites into low orbit with the goal of offering a new type of broadband. If successful, this LEO service could not only supersede traditional satellite internet like HughesNet or Viasat but also rival the likes of fiber internet in rural and remote communities. Unlike GEO satellite providers who use a few hundred large satellites orbiting over 35,000 kilometers from Earth, Starlink plans to use up to 42,000 small satellites in low orbit no higher than 1,200 kilometers. Because of these key differences, Starlink is anticipated to offer reliable speeds up to 1 Gbps with lower latency of 20ms to 40ms worldwide. Essentially, it’d combine the performance of grounded internet with the geographical freedom of traditional satellite internet so people can live anywhere on Earth while staying connected. In general, LEO satellite service represents a real chance at solving connectivity issues for anyone outside city limits. Starlink may also pave the way for tangible changes to the industry as a whole, including lower prices, faster speeds, and better economic opportunities. Pricing of Internet As Starlink enters new markets, the added competition has the potential to drive down the cost of internet over time. In a study by the Analysis Group, they calculated that when just one new competitor joins a designated market area (DMA), the price of plans with speeds ranging from 50 Mbps to 1 Gbps sees a monthly decline of $1.50. That’s it? McDonald’s saves me more than that. Not so fast, though. Remember how we said Starlink isn’t the only company testing low orbit satellites? With other ventures like Blue Origin, OneWeb, and Telesat itching to launch their own LEO constellations, it won’t be long before new players enter the market. At which point, the Analysis Group guesstimates an 8% reduction in monthly broadband prices, or about $7.50. For low-income households, that may be the difference needed to break even on bills. And, even though Starlink itself is quite expensive, its presence in the market has the potential to still benefit consumers who could choose a (now) cheaper internet provider. Internet Speeds Similarly, the buzz around LEO internet speeds has industry heads raising their eyebrows as well. While Starlink is only testing speeds of 50 Mbps to 150 Mbps right now, in time it’s expected to offer speeds up to 1 Gbps with low latency. Normally these speeds are reserved for grounded connections like fiber or cable internet. So, if Starlink manages to deliver, we may no longer be limited by our geography. Even further, the Analysis Group reports that the availability of higher internet speeds in a DMA “increases the likelihood that other providers will introduce high-speed plans to match […] their competition.” In particular, they found that broadband providers are 4 to 17 percent more likely to increase their speeds on an annual basis because of competition. This goes to show that a little healthy rivalry in the marketplace first and foremost benefits the consumer. Economic Opportunity If Starlink is successful, we expect to see economic opportunity improve for billions with a B as well. With global availability, more people will have the means to compete for jobs in today’s digital age. To put things into perspective, consider the world population. Of the current 7.8 billion people, a little under half of them (40%) lack regular internet access. That’s nearly one out of every two people. If LEO satellite service can make it to where geography, price, and speeds aren’t roadblocks anymore, what happens? In general, more people with internet access equates to more job access. And, as jobs continue to transition online, it’s safe to assume that people won’t be as limited by obstacles such as disabilities, poor education, and wealth disparities when they compete for openings. In these ways, Starlink has the potential to help offset poverty where many governments have failed.

#### It's comparably faster than current competitors.

Lumanlan 21 August Dominic M Lumanlan 8-14-2021 "How Elon Musk’s Starlink will be the future of the Internet" <https://medium.com/@augustlumanlan2017/how-spacexs-starlink-will-be-the-future-of-the-internet-8f07adb4eb2> (Engineering Author)//Elmer

Internet speeds, satellite equipment, and user feedback Starlink has very high internet speeds, higher than the speed of internet we currently have in our homes. Speeds average around 100 mbps but it could go as far as 200 mbps, or even 300 mbps. It has a latency of 20 milliseconds. Latency just means the time it takes for the satellite to transmit the data packets (YouTube videos, Facebook messages, Google searches, etc.) from the ground station, to the nearest Starlink satellite, which then transmits it to other nearby satellites and whichever one is closest above the user will transmit it downward to the Starlink dish that receives the data packets, which can finally reach your home router and now you’re connected to the internet and received the data packets. The process can repeat vice versa. This means that the internet connection with Starlink is much faster than our current internet connection which has around 60 milliseconds of latency. A lot of beta testers have shared their experiences online and have been picked up by the media to know more about the Starlink internet program’s capabilities and the user’s feedback about them. What they say is true: They are so happy about it, they think it’s worth it. Because its so fast and reliable to many places around the world, you can easily connect to the internet and be able to do multiple things like watch YouTube or Google search, or even work conveniently anywhere you wish, as long as you have a ground Starlink dish with you.

#### Internet solves extinction

**Eagleman 10** [David Eagleman is a neuroscientist at Baylor College of Medicine, where he directs the Laboratory for Perception and Action and the Initiative on Neuroscience and Law and author of Sum (Canongate). Nov. 9, 2010, “ Six ways the internet will save civilization,”  
 http://www.wired.co.uk/magazine/archive/2010/12/start/apocalypse-no]

Many **great civilisations have fallen**, leaving nothing but cracked ruins and scattered genetics. Usually this results **from: natural disasters, resource depletion, economic meltdown, disease, poor information flow and corruption**. But we’re luckier than our predecessors because **we command a technology that no one else possessed: a rapid communication network that finds its highest expression in the internet**. I propose that there are six ways in which **the net has vastly reduced the threat of societal collapse. Epidemics can be deflected by telepresence** One of our more dire prospects for collapse is an infectious-disease epidemic**. Viral and bacterial epidemics precipitated the fall of** the Golden Age of Athens**,** the Roman Empire and most of the empires of the Native Americans. **The internet can be our key to survival because the ability to work telepresently can inhibit microbial transmission by reducing human-to-human contact**. In the face of an otherwise devastating epidemic, businesses can keep supply chains running with the maximum number of employees working from home. This can reduce host density below the tipping point required for an epidemic. **If we are well prepared when an epidemic arrives, we can fluidly shift into a self-quarantined society** in which microbes fail due to host scarcity. Whatever the social ills of isolation, they are worse for the microbes than for us. **The internet will predict natural disasters We are witnessing the downfall of slow central control in the media**: news stories are increasingly becoming user-generated nets of up-to-the-minute information. **During the recent California wildfires,** locals went to the TV stations to learn whether their neighbourhoods were in danger. But the news stations appeared most concerned with the fate of celebrity mansions, so Californians changed their tack: they uploaded geotagged mobile-phone pictures, updated Facebook statuses and tweeted. The balance tipped: **the internet carried news about the fire more quickly and accurately than any news station could.** In this grass-roots, decentralised scheme, there were embedded reporters on every block, and the news shockwave kept ahead of the fire. This head start could provide the extra hours that save us. If the Pompeiians had had the internet in 79AD, they could have easily marched 10km to safety, well ahead of the pyroclastic flow from Mount Vesuvius. **If the Indian Ocean had the Pacific’s networked tsunami-warning system, South-East Asia would look quite different today. Discoveries are retained and shared** Historically, **critical information has required constant rediscovery**. Collections of learning -- from the library at Alexandria to the entire Minoan civilisation -- have fallen to the bonfires of invaders or the wrecking ball of natural disaster. Knowledge is hard won but easily lost. And information that survives often does not spread. **Consider smallpox inoculation**: this was under way in India, China and Africa centuries before it made its way to Europe**. By the time the idea reached North America, native civilisations who needed it had already collapsed. The net solved the problem. New discoveries catch on immediately;** information spreads widely. In this way, societies can optimally ratchet up, using the latest bricks of knowledge in their fortification against risk. **Tyranny is mitigated Censorship of ideas** was a familiar spectre in the last century, with state-approved news outlets ruling the press, airwaves and copying machines **in the USSR**, Romania, Cuba, China, Iraq **and elsewhere**. In many cases, such as Lysenko’s agricultural despotism in the USSR, it **directly contributed to the collapse of the nation**. Historically**, a more successful strategy has been to confront free speech with free speech -- and the internet allows this in a natural way.** It democratises the flow of information by offering access to the newspapers of the world, the photographers of every nation, the bloggers of every political stripe. Some posts are full of doctoring and dishonesty whereas others strive for independence and impartiality -- but all are available to us to sift through. Given the attempts by some governments to build firewalls, it’s clear that this benefit of the net requires constant vigilance. **Human capital is vastly increased Crowdsourcing brings people together to solve problems.** Yet far fewer than one per cent of the world’s population is involved. We need expand human capital. Most of the world not have access to the education afforded a small minority. For every Albert Einstein, Yo-Yo Ma or Barack Obama who has educational opportunities, uncountable others do not. This squandering of talent translates into reduced economic output and a smaller pool of problem solvers. **The net opens the gates education to anyone with a computer**. A motivated teen anywhere on the planet can walk through the world’s knowledge -- from the webs of Wikipedia to the curriculum of MIT’s OpenCourseWare**. The new human capital will serve us well when we confront existential threats we’ve never imagined before. Energy expenditure is reduced** Societal collapse can often be understood in terms of an energy budget: **when energy spend outweighs energy return, collapse ensues**. This has taken the form of deforestation or soil erosion; **currently, the worry involves fossil-fuel depletion. The internet addresses the energy problem with a natural ease**. Consider the massive energy savings inherent in the shift from paper to electrons -- as seen in the transition from the post to email. **Ecommerce reduces the need to drive long distances to purchase products. Delivery trucks are more eco-friendly** than individuals driving around, not least because of tight packaging and optimisation algorithms for driving routes. Of course, there are energy costs to the banks of computers that underpin the internet -- but these costs are less than the wood, coal and oil that would be expended for the same quantity of information flow. **The tangle of events that triggers societal collapse can be complex,** and there are several threats the net does not address. **But vast, networked communication can be an antidote to several of the most deadly diseases threatening civilisation.** The next time your coworker laments internet addiction, the banality of tweeting or the decline of face-to-face conversation, you may want to suggest that the net may just be the technology that saves us.

#### Independently, Starlink bridges the Splinternet – that solves Fake News and Disinformation propagated from censorship – affordable, un-blockable, and accessible internet is key.

Koetsier 20 John Koetsier 1-9-2020 "Elon Musk's 42,000 StarLink Satellites Could Just Save the World" <https://archive.is/K6Lq0#selection-3087.0-3131.123> (I've been a journalist, analyst, and corporate executive, and have chronicled the rise of the mobile economy. I built the VB Insight research team at VentureBeat)//Elmer

Elon Musk’s other company, SpaceX, is building Starlink, a global communications constellation that could approach a staggering 42,000 satellites. And it could be all that stands between us and a fragmented world living in virtually — and actually — different realities. How? World War II can tell us the answer. In the early 1940s a tyrannical power using fake news, hate speech, military might and hegemonic power controlled most of Europe: the Nazis. They controlled public life, news and local economies. Resistance groups dotted the European mainland, with one lifeline for non-official communication from free countries: radio. As such, radios were contraband and confiscated. One of the activities the allies undertook to support resistance fighters was shipping in radios for communication and outside news. Today, radios aren’t at risk of being confiscated. But the internet is. And as a cloud-delivered service, hijacking the internet happens largely out of public sight, in servers and routers that enable services like Netflix and the BBC and Facebook and Google. It’s called splinternet, and it’s the ongoing division of a worldwide interconnected internet into separate and isolatable fiefdoms, each of which can be controlled and managed so that governing powers can control what their populations see. The Great Firewall of China is the most well-known example, but Iran, Syria and Vietnam also control significant portions of the internet for their populations. Russia just completed technology to wall off its internal networks, servers and internet users from the wider internet. And India, in its attempt to control unrest following its anti-Muslim citizenship law, has employed a particularly heavy-handed approach: simply blocking the internet entirely. (One unintended result: contractors in India can’t reach their employers in the U.S.) Another country, United Arab Emirates, took a different approach: outlawing all messengers except one that it built a digital backdoor into: Totok. However it happens, it allows governments to control what people see, read and hear from outside sources — and censor what their own people say. Starlink can change all of that. Elon Musk recently revealed details about how people will access StarLink. It will be incredibly simple, and it will enable access to the relatively free global internet from anywhere on the planet. Starlink Terminal has motors to self-adjust optimal angle to view sky. Instructions are simply: plug in socket, point at sky. These instructions work in either order. No training required. Elon Musk What that means is that anyone can access the internet from anywhere. Chinese citizens will be able to access Google and information about Tiananmen Square. Russian citizens will be able to see external analysis of Putin’s financial dealings if even Russia blocks outside sources. Indian protesters can’t be cut off from the internet. Of course, governments will make the Starlink Terminal illegal. But that in itself will be a victory. Censorship works best when it is invisible: when people don’t even know that there is alternate information, other understandings of reality. (Chinese teenage exchange students at a relative’s house last year, for example, had never heard of Tiananmen Square, and refused to believe stories that, they felt, painted China in a negative light.) But when a device to connect to the outside world becomes contraband, the glass walls become opaque. People realize that walls have been erected to prevent them from seeing other opinions. And that is at least one step to maintaining a free, open and accessible internet globally, which should help combat fake news, propaganda and information deprivation aimed at controlling populations. And it’s a step towards making the splinternet harder to achieve. 1,000 satellites will be enough to enable basic service, Musk has said. SpaceX just launched a third batch of 60 satellites, and is expected to continue launching that many every two weeks through the rest of 2020. (For context, only about 9,000 satellites have been launched in all of space history, about 5,000 of which are still in orbit. And only 2,000 are actually still operational. So even at a quarter or a fifth of total capacity, Starlink is a ridiculously large satellite constellation and unprecedented in human history — and astronomers have legitimate concerns about light pollution.) While Musk has applied for launch permission for up to 42,000 satellites, he’s unlikely to launch them all. But at the current pace, a global and unblockable internet service should be available in less than a year. This doesn’t mean that all will instantly be rosy. Governments, of course, can try to jam satellite signals. That’s unlikely to work — or even be possible — in all places and all times, however. They’re also likely to continue to try to engage in false flag and other misinformation projects. And people seem to be pretty good at fooling themselves these days: locking themselves in reality bubbles that block dissenting narratives. But any gaps in the emerging splinternet are opportunities for different perspectives and, hopefully, true facts to emerge.

#### Fake News is an existential threat – hurts global cooperation on every significant issue and results in geopolitical conflict spirals.

Al-Rodhan 17 Nayef Al-Rodhan 6-7-2017 "Post-Truth Politics, the Fifth Estate and the Securitization of Fake News" <https://www.globalpolicyjournal.com/blog/07/06/2017/post-truth-politics-fifth-estate-and-securitization-fake-news> (Prof Nayef Al-Rodhan is an Honorary Fellow at St Antony’s College, University of Oxford, and Senior Fellow and Head of the Geopolitics and Global Futures Programme at the Geneva Centre for Security Policy)//Elmer

Even so, what we are witnessing today, in the “post-truth” era is more menacing because of the multiplication of channels of communication. Information now can circulate freely and unverified on the Internet, providing possibilities of misinformation and propaganda on a scale that was previously virtually impossible. In effect, it is now possible to share fake news more frequently than verified news, also due to the fact that social media has enabled the proliferation of authentic-looking or misleading fake accounts that help spread lies, most often directed against the liberal public. What is truth anyway? The Oxford Dictionaries dates the first use of the term to a 1992 essay by Steve Tesich, a Serbian-American playwright writing in The Nation following the Iran/Contra scandal. Tesich reflected that after the Watergate revelations and reporting of atrocities from Vietnam, Americans had become contemptuous of uncomfortable truths. He noted: “we came to equate the truth with bad news (…). We looked to our government to protect us from the truth”. Journalist David Roberts also used the term “post-truth” more than two decades ago to refer to the response of some US politicians refuting scientific claims about climate change. In 2004, Ralph Keyes proclaimed we had reached the age of “post-truth”. In his 2004 book, “The Post-Truth Era: Dishonesty and Deception in Contemporary Life”, Keyes expressed the concern that we are losing the stigma attached to lying, meaning that lies can be told with impunity. For Keyes, such times of “post truthfulness” represent an ethical twilight zone. The common theme running across the history of the term is that post-truth is defined by lies spread routinely by politicians, with little or no significant consequences for their legitimacy and reputation. But there are inevitable consequences for the future of democracy and the future of humanity: a future in which scientific facts are repudiated cannot be anything but insecure. Veritas, or truth, and facts are crucial for humanity, and indispensible for effective decision-making and ultimately, for human progress. Moreover, facts-based policies are also important in an existential sense and indispensible to our own survival – the case of the debate on climate change being a prime example. Geopolitics and Fake News Geopolitics in the era of fake-news is also complicated because post-truth disrupts a fundamental element of diplomacy and international politics, namely communication. Unsubstantiated allegations and groundless claims will distort diplomatic relations and lead political and military processes astray. False claims about the money ‘extorted’ from the UK by the European Union helped build the case for Brexit, with its ensuing implications for stability in Europe and elsewhere. The Russian state used social media to spread allegations that the Ukranian government crucified a child – a claim later debunked, yet telling of how fake news can help fuel wars. Similarly, populist rhetoric about NATO’s inadequacy and misinformation about its funding mask ignorance about the real benefits of the alliance for its members’ common security. Although unsubstantiated, such comments are enough to create anxiety in political quarters and prompt some Eastern European nations to see their state security in a wholly different geopolitical light. In the post-truth era, a complete lack of understanding of military strategy and the intricacies of warfare will be less relevant in devising policies, and this comes at the risk of dismantling security communities and the foundations of the liberal order. The possibility of hijacking national elections also has profound geopolitical and security implications. This has been a particularly key topic in the aftermath of the US elections. The stakes are especially high in France, which is a key member of the European Union and NATO, and where the winning candidate can, quite unequivocally, impact the future of the liberal order.

#### Starlink solves internet monopolies

**Krow 21** Krow, A. (2021, February 27). *Will Starlink disrupt spectrum’s internet provider monopoly?* Medium. <https://medium.com/technology-hits/will-starlink-disrupt-spectrums-internet-provider-monopoly-c3b33d20be11> (Teacher. Writer. Future Author. Aspiring Linguist. Progressive Voter. Twitter @ajkrow\_writer.) //Aadit

Throughout college and well into my teaching career, I’ve spent several hundred dollars sitting in coffee shops, drinking a latte or a Frappuccino while I completed work using their Wi-Fi until closing. Once I arrived home, I opened YouTube on my phone and played a video at the lowest resolution, 144p. I waited for several minutes as the video buffered. This became a daily occurrence when living in a rural area. Millions still don’t have access to fast internet at home As of [2019](https://www.digitaltrends.com/web/31-percent-us-households-no-broadband-internet/), a third of households nationwide do not have a reliable internet connection. The only way those families can access the internet is to leave their homes and go to a public library, school, or Starbucks. A week before schools transitioned to virtual learning in 2020, I remember some of my students stared at their phones under their desks. When I caught them and asked them to turn it in, they refused. For many students, the only internet access they had available was at school. [As of September 2020](https://usafacts.org/articles/internet-access-students-at-home/), 3.7 million children still did not have access to an internet connection at home. In August of 2020, teachers were expected to provide live (synchronous) classes to students via Zoom. I panicked. I still did not have access to the internet in my rural home. I immediately went on apartments.com and searched for a decent apartment that would have access to the internet. Once school started, many students could not log in to Google Classroom or Zoom and attend class. Of the seventy or so students I see every other day, less than half log in to Zoom. All the other students have never logged in, nor have they turned in a single assignment since school began. As a result, teachers, schools, and [districts nationwide failed them](https://apnews.com/article/distance-learning-coronavirus-pandemic-oregon-7fde612c3dbfd2e21fab9673ca49ad89). Corporations control who gets access to the internet In the United States, only two companies control a majority of the internet service available in the country. Those are Spectrum (also known as Comcast) and Charter (also known as Xfinity). Both companies decided they wouldn’t compete against each other. Instead, they would each claim one area and be the only internet service provider available. By doing so, they could raise prices and provide data caps. Customers have no choice other than to agree to the terms and conditions. In the U.S., [83.3 million people](https://ilsr.org/report-most-americans-have-no-real-choice-in-internet-providers/) are controlled by an internet monopoly: either Charter or Spectrum. Since both corporations have no other competition, they have no incentive to innovate or expand their services to other areas, namely rural areas. Spectrum and Charter see no benefit in laying out hundreds or thousands of feet of underground cable and spend tens of thousands of dollars to provide internet to a rural home, as the customer would only pay $50-$100 a month. Meanwhile, their “competitors” provide poor services and fail to offer any sort of competition to Charter or Spectrum. ViaSat, for example, offers limited data plans — its most expensive plan offers 150GB for $200 per month. In a family of four or five people, where children are connected to Zoom meetings, that data plan will reach its limit very quickly. This data plan also can’t compare to Spectrum, which offers unlimited internet for a quarter of the price of ViaSat. However, ViaSat and HughesNet are the only internet service providers available to rural areas. Since ViaSat and HughesNet face no competition from Spectrum and Charter, they have no incentive to provide fast speeds for their consumers. The average speed of ViaSat clocks in at [11.7Mbps](https://testmy.net/hoststats/viasat), or 1.4 Megabytes per second. At that speed, a YouTube video has to be played at the lowest resolution and would still buffer. Google Fiber failed to disrupt the market Roughly ten years ago, Google announced it would become an internet service provider. Google planned to disrupt Spectrum and Charter’s current control of the market by offering internet using fiber-cable. This new technology would allow for faster speeds. [As of 2020](https://support.google.com/fiber/answer/6250056?hl=en), it is about five times faster than Spectrum internet. Today, a majority of the U.S. population still does not have access to Google Fiber. According to Google, Fiber is [only available in twelve cities](https://fiber.google.com/) in the country. Rural customers still don’t have a solution, nor do city people have access to more than one or two options. Starlink will do what Google couldn’t A few years ago, Elon Musk announced Starlink, a division of SpaceX. Musk intends on providing internet access to everyone around the world wirelessly through the use of satellites. So far, SpaceX has launched over a thousand satellites into low-Earth orbit, though the FCC has approved SpaceX to launch over 12,000 satellites for Starlink usage. As more satellites are launched into space, internet coverage will expand around the world. Whether you live in an urban, suburban, or rural area, you will have access to high-speed internet. Many YouTubers who have preordered the Starlink service have already received their installation package and are testing it out in remote areas. As of [a few days ago](https://www.cnbc.com/2021/02/22/elon-musk-spacex-will-double-starlink-internet-speed-later-this-year.html), Elon Musk made a few promises. People would have access to 300Mbps speed internet, and coverage will be available worldwide by the end of 2021. This timeline beats Google Fiber, as Google is only providing coverage to a dozen cities in the U.S. For people who lack internet access or want something other than Spectrum or Charter, Starlink will be the answer.

#### Extinction – nuke war fallout creates Ice Age and mass starvation

Steven Starr 15. “Nuclear War: An Unrecognized Mass Extinction Event Waiting To Happen.” Ratical. March 2015. <https://ratical.org/radiation/NuclearExtinction/StevenStarr022815.html> TG

A war fought with 21st century strategic nuclear weapons would be more than just a great catastrophe in human history. If we allow it to happen, such a war would be a mass extinction event that [ends human history](https://ratical.org/radiation/NuclearExtinction/StarrNuclearWinterOct09.pdf). There is a profound difference between extinction and “an unprecedented disaster,” or even “the end of civilization,” because even after such an immense catastrophe, human life would go on.

But extinction, by definition, is an event of utter finality, and a nuclear war that could cause human extinction should really be considered as the ultimate criminal act. It certainly would be the crime to end all crimes.

The world’s leading climatologists now tell us that nuclear war threatens our continued existence as a species. Their studies predict that a large nuclear war, especially one fought with strategic nuclear weapons, would create a post-war environment in which for many years it would be too cold and dark to even grow food. Their findings make it clear that not only humans, but most large animals and many other forms of complex life would likely vanish forever in a nuclear darkness of our own making.

The environmental consequences of nuclear war would attack the ecological support systems of life at every level. Radioactive fallout produced not only by nuclear bombs, but also by the destruction of nuclear power plants and their spent fuel pools, would poison the biosphere. Millions of tons of smoke would act to [destroy Earth’s protective ozone layer](https://www2.ucar.edu/atmosnews/just-published/3995/nuclear-war-and-ultraviolet-radiation) and block most sunlight from reaching Earth’s surface, creating Ice Age weather conditions that would last for decades.

Yet the political and military leaders who control nuclear weapons strictly avoid any direct public discussion of the consequences of nuclear war. They do so by arguing that nuclear weapons are not intended to be used, but only to deter.

Remarkably, the leaders of the Nuclear Weapon States have chosen to ignore the authoritative, long-standing scientific research done by the climatologists, research that predicts virtually any nuclear war, fought with even a fraction of the operational and deployed nuclear arsenals, will leave the Earth essentially uninhabitable.

Pics negate – proves theyre wrong about the moral calculus bc it can be just in some instances

### 2

#### CP: The appropriation of outer space by private entities is unjust except for the appropriation of outer space for asteroid mining by United States private entities. The United States should fund the appropriation of outer space for the mining of rare earth metals from asteroids by private entities.

#### Asteroids have REMs

AP 21 “Mining A $10,000 Quadrillion Asteroid.” AP News, Feb 1, 2021, <https://apnews.com/press-release/accesswire/technology-business-science-utilities-electric-utilities-7bb32ecaac33bebef6e4b97ade588c57> TG

There are several million asteroids. They fall into three main types: carbonaceous asteroids, metallic asteroids, and mixed salicaceous-mineral-metallic asteroids. Many of the metallic asteroids are composed mainly of nickel and iron, but also contain sizeable quantities of important rare earth elements and precious metals including platinum and gold. A metallic asteroid just 25 meters across could contain as much as 30 tons of platinum valued around $1 billion. 16 Psyche is a staggering 226 kilometers (140 miles) wide and the most mineral rich asteroid so far detected. It is speculated that 16 Psyche could be worth about $10,000 quadrillion (or €8,240 quadrillion euros). To explore 16 Psyche in greater detail, NASA has approved the Psyche mission, which is scheduled to launch in August 2022. The spacecraft will orbit around 16 Psyche for 21 months while studying the asteroid using a number of different scientific instruments. Twenty four percent of all asteroids are thought to be composed of metals and rare minerals. While it is quite difficult to analyze asteroid composition from here on the earth’s surface, there are another 10 asteroids have been identified as likely cost-effective mining targets to date.

#### The PIC is key to beat China and protect against Chinese REM gatekeeping

Stavridis 21 [(James, retired US Navy admiral, chief international diplomacy and national security analyst for NBC News, senior fellow at JHU Applied Physics Library, PhD in Law and Diplomacy from Tufts) “U.S. Needs a Strong Defense Against China’s Rare-Earth Weapon,” Bloomberg Opinion, March 4, 2021, <https://www.bloomberg.com/opinion/articles/2021-03-04/u-s-needs-a-strong-defense-against-china-s-rare-earth-weapon>] TDI

You could be forgiven if you are confused about what’s going on with rare-earth elements. On the one hand, news reports indicate that China may increase production quotas of the minerals this quarter as a [goodwill gesture](https://www.scmp.com/news/china/diplomacy/article/3122501/china-raises-rare-earth-quotas-goodwill-trade-signal-us) to the Joe Biden administration. But other sources say that China may ultimately ban the export of the rare earths altogether on “[security concerns](https://www.bloomberg.com/news/articles/2021-02-19/china-may-ban-rare-earth-technology-exports-on-security-concerns?sref=QYxyklwO).” What’s really going on here?

There are 17 elements considered [rare earths](https://www.bloomberg.com/news/articles/2021-02-16/why-rare-earths-are-achilles-heal-for-europe-u-s-quicktake) — lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, scandium and yttrium — and while many aren’t actually rare in terms of global deposits, extracting them is difficult and expensive. They are used across high-tech manufacturing, including smartphones, fighter aircraft and components in virtually all advanced electronics. Of particular note, they are essential to many of the clean-energy technologies expected to come online in this decade.

I began to focus on rare-earth elements when I commanded the North Atlantic Treaty Organization’s presence in Afghanistan, known as the International Security Assistance Force. While Afghans live in an extremely poor country, [studies](https://thediplomat.com/2020/02/afghanistans-mineral-resources-are-a-lost-opportunity-and-a-threat/) have assessed that they sit atop $1 trillion to $3 trillion in a wide variety of minerals, including rare earths. Some [estimates](https://www.fraserinstitute.org/article/afghanistans-rare-earth-element-bonanza) put the rare-earth levels alone at 1.4 million metric tons.

But every time I tried to visit a mining facility, the answer I got from my security team was, “It’s too dangerous right now, admiral.” Unfortunately, despite a great deal of effort by the U.S. and NATO, those security challenges remain, deterring the large foreign-capital investments necessary to harvest the lodes. Which brings us back to Beijing.

China controls roughly 80% of the rare-earths market, between what it mines itself and processes in raw material from elsewhere. If it decided to wield the weapon of restricting the supply — something it has repeatedly [threatened](https://www.wsj.com/articles/china-trade-fight-raises-specter-of-rare-earth-shortage-11559304000) to do — it would create a significant challenge for manufacturers and a geopolitical predicament for the industrialized world.

It could happen. In 2010, Beijing threatened to cut off exports to Japan over the disputed Senkaku Islands. Two years ago, Beijing was reportedly considering restrictions on exports to the U.S. generally, as well as against specific companies (such as defense giant Lockheed Martin Corp.) that it deemed in violation of its policies against selling advanced weapons to Taiwan.

President Donald Trump’s administration issued an executive order to spur the production of rare earths domestically, and created an [Energy Resource Governance Initiative](https://www.state.gov/wp-content/uploads/2019/06/Energy-Resource-Governance-Initiative-ERGI-Fact-Sheet.pdf) to promote international mining. The European Union and Japan, among others, are also aggressively seeking newer sources of rare earths.

Given this tension, it was superficially surprising that China announced it would boost its mining quotas in the first quarter of 2021 by nearly 30%, reflecting a continuation in strong (and rising) demand. But the increase occurs under a shadow of uncertainty, as the Chinese Communist Party is undertaking a “review” of its policies concerning future sales of rare earths. In all probability, the tactics of the increase are temporary, and fit within a larger strategy.

China will go to great lengths to maintain overall control of the global rare-earths supply. This fits neatly within the geo-economic approach of the [One Belt, One Road](https://www.bloomberg.com/opinion/articles/2019-10-30/china-is-determined-to-reshape-the-globe) initiative, which seeks to use a variety of carrots and sticks — economic, trade, diplomatic and security — to create zones of influence globally. In terms of rare earths, the strategy seems to be allowing carefully calibrated access to the elements at a level that makes it economically less attractive for competitors to undertake costly exploration and mining operations. This is similar to the oil-market strategy used by Russia and the Organization of Petroleum Exporting Countries for decades.

Some free-market advocates believe that China will not take aggressive action choking off supply because that could [precipitate retaliation](https://www.bloomberg.com/opinion/articles/2021-02-22/china-weaponizing-rare-earths-technology-will-probably-backfire) or accelerate the search for alternate sources in global markets. What seems more likely is a series of targeted shutdowns directed against specific entities such as U.S. defense companies, Japanese consumer electronics makers, or European industrial concerns that have offended Beijing.

The path to rare-earth independence for the U.S. must include: Ensuring supply chains of rare earths necessary for national security; promoting the exploitation of the elements domestically (and removing barriers to responsibly doing so); mandating that defense contractors and other critical-infrastructure entities wean themselves off Chinese rare earths; sponsoring research and development to find alternative materials, especially for clean energy technology; and creating a substantial stockpile of the elements in case of a Chinese boycott.

This is a bipartisan agenda. The Trump administration’s [strategic assessment](https://www.commerce.gov/news/press-releases/2019/06/department-commerce-releases-report-critical-minerals) of what needs to be done (which goes beyond just 17 rare earths to include a total of 35 critical minerals) is thoughtful, and should serve as a basis for the Biden administration and Congress.

#### REM access key to military primacy and tech advancement – alternatives fail

Trigaux 12 (David, University Honors Program University of South Florida St. Petersburg) “The US, China and Rare Earth Metals: The Future Of Green Technology, Military Tech, and a Potential Achilles‟ Heel to American Hegemony,” USF St. Petersberg, May 2, 2012, <https://digital.stpetersburg.usf.edu/cgi/viewcontent.cgi?article=1132&context=honorstheses>] TDI

* Ok maybe I painted this tm but it’s a great card

The implications of a rare earth shortage aren’t strictly related to the environment, and energy dependence, but have distinct military implications as well that could threaten the position of the United States world’s strongest military. The United States place in the world was assured by powerful and decisive deployments in World War One and World War Two. Our military expansion was built upon a large, powerful industrial base that created more, better weapons of war for our soldiers. During the World Wars, a well-organized draft that sent millions of men into battle in a short amount of time proved decisive, but as the war ended, and soldiers drafted into service returned to civilian life, the U.S. technological superiority over its opponents provided it with sustained dominance over its enemies, even as the numerical size of the army declined. New technologies, such as the use of the airplane in combat, rocket launched missiles, radar systems, and later, GPS, precision guided missiles, missile defense systems, high tech tanks, lasers, and other technologies now make the difference between victory and defeat.

The United States military now serves many important functions, deterring threats across the world. The United States projects its power internationally, through a network of bases and allied nations. Thus, the United States is a powerful player in all regions of the world, and often serves as a buffer against conflict in these regions. US military presence serves as a buffer against Chinese military modernization in Eastern Asia, against an increasingly nationalist Russia in Europe, and smaller regional actors, such as Venezuela in South America and Iran in the Middle East. The U.S. Navy is deployed all over the world, as the guarantor of international maritime trade routes. The US Navy leads action against challenges to its maritime sovereignty on the other side of the globe, such as current action against Somali piracy. Presence in regions across the world prevents escalation of potential crisis. These could result in either a larger power fighting a smaller nation or nations (Russia and Georgia, Taiwan and China), religious opponents (Israel and Iran), or traditional foes (Ethiopia and Eretria, Venezuela and Colombia, India and Pakistan). US projection is also key deterring emerging threats such as terrorism and nuclear proliferation. While not direct challenges to US primacy, both terrorism and nuclear proliferation can kill thousands.

The US Air Force has a commanding lead over the rest of the world, in terms of both numbers and capabilities. American ground forces have few peers, and are unmatched in their ability to deploy to anywhere in the world at an equally unmatched pace.

The only perceived challenge to the United States militarily comes from the People’s Republic of China.76 While the United States outspends all other nations in the world put together in terms of military spending, China follows as a close second, and has begun an extensive modernization program to boot.77 The Chinese military however, is several decades behind the United States in air power and nuclear capabilities.78 To compensate, China has begun the construction of access-denial technology, preventing the US from exercising its dominance in China’s sphere of influence.79 Chinese modernization efforts have a serious long-term advantage over the United States; access to rare earth metals, and a large concentration of rare earth chemists doing research.80 This advantage, coupled with the U.S. losing access to rare earth metals, will even the odds much quicker than policymakers had previously anticipated. 81

The largest example is US airpower. With every successive generation of military aircraft, the U.S. Air Force becomes more and more dependent on Rare Earth Metals.82 As planes get faster and faster, they have to get lighter and lighter, while adding weight from extra computers and other features on board.83 To lighten the weight of the plane, scandium is used to produce lightweight aluminum alloys for the body of the plane. Rare Earth metals are also useful in fighter jet engines, and fuel cells.84 For example, rare earths are required to producing miniaturized fins, and samarium is required to build the motors for the F-35 fighter jet.85 F-35 jets are the next generation fighter jet that works together to form the dual plane combination that cements U.S. dominance in air power over the Russian PAK FA.86

Rare earth shortages don’t just affect air power, also compromising the navigation system of Abrams Tanks, which need samarium cobalt magnets. The Abrams Tank is the primary offensive mechanized vehicle in the U.S. arsenal. The Aegis Spy 1 Radar also uses samarium.87 Many naval ships require neodymium. Hell Fire missiles, satellites, night vision goggles, avionics, and precision guided munitions all require rare earth metals. 88

American military superiority is based on technological advancement that outstrips the rest of the world. Command and control technology allows the U.S. to fight multiple wars at once and maintain readiness for other issues, as well as have overwhelming force against rising challengers. This technology helps the U.S. know who, where, and what is going to attack them, and respond effectively, regardless of the source of the threat.

Rare Earth Elements make this technological superiority possible.

To make matters worse, the defense industrial base is often a single market industry, dependent on government contracts for its business. If China tightens the export quotas further, major US defense contractors will be in trouble.89 Every sector of the defense industrial base is dependent on rare earth metals. Without rare earths, these contractors can’t build anything, which collapses the industry.90

Rare Earth shortages are actually already affecting our military, with shortages of lanthanum, cerium, europium and gadolinium happening in the status quo. This prevents us not only from building the next generation of high tech weaponry, but also from constructing more of the weapons and munitions that are needed in the status quo. As current weapon systems age and they can’t be replaced, the US primacy will be undermined. Of special concern is that U.S. domestic mining doesn’t produce “heavy” rare earth metals that are needed for many advanced components of military technologies. Given the nature of many military applications, substitutions aren’t possible. 91

#### Primacy and allied commitments solve arms races and great power war – unipolarity is sustainable, and prevents power vacuums and global escalation

Brands 18 [Hal, Henry Kissinger Distinguished Professor at Johns Hopkins University's School of Advanced International Studies and a senior fellow at the Center for Strategic and Budgetary Assessments." American Grand Strategy in the Age of Trump." Page 129-133] TDI

Since World War II, the United States has had a military second to none. Since the Cold War, America has committed to having overwhelming military primacy. The idea, as George W. Bush declared in 2002, that America must possess “strengths beyond challenge” has featured in every major U.S. strategy document for a quarter century; it has also been reflected in concrete terms.6

From the early 1990s, for example, the United States consistently accounted for around 35 to 45 percent of world defense spending and maintained peerless global power-projection capabilities.7 Perhaps more important, U.S. primacy was also unrivaled in key overseas strategic regions—Europe, East Asia, the Middle East. From thrashing Saddam Hussein’s million-man Iraqi military during Operation Desert Storm, to deploying—with impunity—two carrier strike groups off Taiwan during the China-Taiwan crisis of 1995– 96, Washington has been able to project military power superior to anything a regional rival could employ even on its own geopolitical doorstep.

This military dominance has constituted the hard-power backbone of an ambitious global strategy. After the Cold War, U.S. policymakers committed to averting a return to the unstable multipolarity of earlier eras, and to perpetuating the more favorable unipolar order. They committed to building on the successes of the postwar era by further advancing liberal political values and an open international economy, and to suppressing international scourges such as rogue states, nuclear proliferation, and catastrophic terrorism. And because they recognized that military force remained the ultima ratio regum, they understood the centrality of military preponderance.

Washington would need the military power necessary to underwrite worldwide alliance commitments. It would have to preserve substantial overmatch versus any potential great-power rival. It must be able to answer the sharpest challenges to the international system, such as Saddam’s invasion of Kuwait in 1990 or jihadist extremism after 9/11. Finally, because prevailing global norms generally reflect hard-power realities, America would need the superiority to assure that its own values remained ascendant. It was impolitic to say that U.S. strategy and the international order required “strengths beyond challenge,” but it was not at all inaccurate.

American primacy, moreover, was eminently affordable. At the height of the Cold War, the United States spent over 12 percent of GDP on defense. Since the mid-1990s, the number has usually been between 3 and 4 percent.8 In a historically favorable international environment, Washington could enjoy primacy—and its geopolitical fruits—on the cheap.

Yet U.S. strategy also heeded, at least until recently, the fact that there was a limit to how cheaply that primacy could be had. The American military did shrink significantly during the 1990s, but U.S. officials understood that if Washington cut back too far, its primacy would erode to a point where it ceased to deliver its geopolitical benefits. Alliances would lose credibility; the stability of key regions would be eroded; rivals would be emboldened; international crises would go unaddressed. American primacy was thus like a reasonably priced insurance policy. It required nontrivial expenditures, but protected against far costlier outcomes.9 Washington paid its insurance premiums for two decades after the Cold War. But more recently American primacy and strategic solvency have been imperiled.

THE DARKENING HORIZON For most of the post–Cold War era, the international system was— by historical standards—remarkably benign. Dangers existed, and as the terrorist attacks of September 11, 2001, demonstrated, they could manifest with horrific effect. But for two decades after the Soviet collapse, the world was characterized by remarkably low levels of great-power competition, high levels of security in key theaters such as Europe and East Asia, and the comparative weakness of those “rogue” actors—Iran, Iraq, North Korea, al-Qaeda—who most aggressively challenged American power. During the 1990s, some observers even spoke of a “strategic pause,” the idea being that the end of the Cold War had afforded the United States a respite from normal levels of geopolitical danger and competition. Now, however, the strategic horizon is darkening, due to four factors.

First, great-power military competition is back. The world’s two leading authoritarian powers—China and Russia—are seeking regional hegemony, contesting global norms such as nonaggression and freedom of navigation, and developing the military punch to underwrite these ambitions. Notwithstanding severe economic and demographic problems, Russia has conducted a major military modernization emphasizing nuclear weapons, high-end conventional capabilities, and rapid-deployment and special operations forces— and utilized many of these capabilities in conflicts in Ukraine and Syria.10 China, meanwhile, has carried out a buildup of historic proportions, with constant-dollar defense outlays rising from US$26 billion in 1995 to US$226 billion in 2016.11 Ominously, these expenditures have funded development of power-projection and antiaccess/area denial (A2/AD) tools necessary to threaten China’s neighbors and complicate U.S. intervention on their behalf. Washington has grown accustomed to having a generational military lead; Russian and Chinese modernization efforts are now creating a far more competitive environment.

#### 1AR theory is skewed towards the aff – a) the 2NR must cover substance and over-cover theory, since they get the collapse and persuasive spin advantage of the 3min 2AR, b) their responses to my counter interp will be new, which means 1AR theory necessitates intervention. Implications – a) reject 1AR theory since it can’t be a legitimate check for abuse, b) drop the arg to minimize the chance the round is decided unfairly, c) use reasonability with a bar of defense or the aff always wins since the 2AR can line by line the whole 2NR without winning real abuse

## Case

### Framing

#### Existential threats outweigh – all life has infinite value and extinction eliminates the possibility for future generations – err negative, because of innate cognitive biases

GPP 17 (Global Priorities Project, Future of Humanity Institute at the University of Oxford, Ministry for Foreign Affairs of Finland, “Existential Risk: Diplomacy and Governance,” Global Priorities Project, 2017, <https://www.fhi.ox.ac.uk/wp-content/uploads/Existential-Risks-2017-01-23.pdf>,

1.2. THE ETHICS OF EXISTENTIAL RISK In his book Reasons and Persons, Oxford philosopher Derek Parfit advanced an influential argument about the importance of avoiding extinction: I believe that if we destroy mankind, as we now can, this outcome will be much worse than most people think. Compare three outcomes: (1) Peace. (2) A nuclear war that kills 99% of the world’s existing population. (3) A nuclear war that kills 100%. (2) would be worse than (1), and (3) would be worse than (2). Which is the greater of these two differences? Most people believe that the greater difference is between (1) and (2). I believe that the difference between (2) and (3) is very much greater. ... The Earth will remain habitable for at least another billion years. Civilization began only a few thousand years ago. If we do not destroy mankind, these few thousand years may be only a tiny fraction of the whole of civilized human history. The difference between (2) and (3) may thus be the difference between this tiny fraction and all of the rest of this history. If we compare this possible history to a day, what has occurred so far is only a fraction of a second.65 In this argument, it seems that Parfit is assuming that the survivors of a nuclear war that kills 99% of the population would eventually be able to recover civilisation without long-term effect. As we have seen, this may not be a safe assumption – but for the purposes of this thought experiment, the point stands. What makes existential catastrophes especially bad is that they would “destroy the future,” as another Oxford philosopher, Nick Bostrom, puts it.66 This future could potentially be extremely long and full of flourishing, and would therefore have extremely large value. In standard risk analysis, when working out how to respond to risk, we work out the expected value of risk reduction, by weighing the probability that an action will prevent an adverse event against the severity of the event. Because the value of preventing existential catastrophe is so vast, even a tiny probability of prevention has huge expected value.67 Of course, there is persisting reasonable disagreement about ethics and there are a number of ways one might resist this conclusion.68 Therefore, it would be unjustified to be overconfident in Parfit and Bostrom’s argument. In some areas, government policy does give significant weight to future generations. For example, in assessing the risks of nuclear waste storage, governments have considered timeframes of thousands, hundreds of thousands, and even a million years.69 Justifications for this policy usually appeal to principles of intergenerational equity according to which future generations ought to get as much protection as current generations.70 Similarly, widely accepted norms of sustainable development require development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs.71 However, when it comes to existential risk, it would seem that we fail to live up to principles of intergenerational equity. Existential catastrophe would not only give future generations less than the current generations; it would give them nothing. Indeed, reducing existential risk plausibly has a quite low cost for us in comparison with the huge expected value it has for future generations. In spite of this, relatively little is done to reduce existential risk. Unless we give up on norms of intergenerational equity, they give us a strong case for significantly increasing our efforts to reduce existential risks. 1.3. WHY EXISTENTIAL RISKS MAY BE SYSTEMATICALLY UNDERINVESTED IN, AND THE ROLE OF THE INTERNATIONAL COMMUNITY In spite of the importance of existential risk reduction, it probably receives less attention than is warranted. As a result, concerted international cooperation is required if we are to receive adequate protection from existential risks. 1.3.1. Why existential risks are likely to be underinvested in There are several reasons why existential risk reduction is likely to be underinvested in. Firstly, it is a global public good. Economic theory predicts that such goods tend to be underprovided. The benefits of existential risk reduction are widely and indivisibly dispersed around the globe from the countries responsible for taking action. Consequently, a country which reduces existential risk gains only a small portion of the benefits but bears the full brunt of the costs. Countries thus have strong incentives to free ride, receiving the benefits of risk reduction without contributing. As a result, too few do what is in the common interest. Secondly, as already suggested above, existential risk reduction is an intergenerational public good: most of the benefits are enjoyed by future generations who have no say in the political process. For these goods, the problem is temporal free riding: the current generation enjoys the benefits of inaction while future generations bear the costs. Thirdly, many existential risks, such as machine superintelligence, engineered pandemics, and solar geoengineering, pose an unprecedented and uncertain future threat. Consequently, it is hard to develop a satisfactory governance regime for them: there are few existing governance instruments which can be applied to these risks, and it is unclear what shape new instruments should take. In this way, our position with regard to these emerging risks is comparable to the one we faced when nuclear weapons first became available. Cognitive biases also lead people to underestimate existential risks. Since there have not been any catastrophes of this magnitude, these risks are not salient to politicians and the public.72 This is an example of the misapplication of the availability heuristic, a mental shortcut which assumes that something is important only if it can be readily recalled. Another cognitive bias affecting perceptions of existential risk is scope neglect. In a seminal 1992 study, three groups were asked how much they would be willing to pay to save 2,000, 20,000 or 200,000 birds from drowning in uncovered oil ponds. The groups answered $80, $78, and $88, respectively.73 In this case, the size of the benefits had little effect on the scale of the preferred response. People become numbed to the effect of saving lives when the numbers get too large. 74 Scope neglect is a particularly acute problem for existential risk because the numbers at stake are so large. Due to scope neglect, decision-makers are prone to treat existential risks in a similar way to problems which are less severe by many orders of magnitude. A wide range of other cognitive biases are likely to affect the evaluation of existential risks.75

### Solvency

#### Growth is sustainable.

Harford, 20—economics columnist for the Financial Times, citing Diane Coyle, Bennett Professor of Public Policy at the University of Cambridge, Vaclav Smil, Distinguished Professor Emeritus in the Faculty of Environment at the University of Manitoba, Chris Goodall, English businessman, author and expert on new energy technologies, alumnus of St Dunstan's College, University of Cambridge, and Harvard Business School, and Jesse Ausubel, Director and Senior Research Associate of the Program for the Human Environment of Rockefeller University (Tim, “Two cheers for the dematerialising economy,” <https://www.ft.com/content/04858216-322e-11ea-9703-eea0cae3f0de>, dml)

If past trends continue, the world’s gross domestic product will be about twice as big by 2040 as it is today. That’s the sort of growth rate that translates to 30-fold growth over a century, or by a factor of a thousand over two centuries.

Is that miraculous, or apocalyptic? In itself, neither. GDP is a synthetic statistic, invented to help us put a measuring rod up against the ordinary business of life. It measures neither the energy and resource consumption that might worry us, nor the things that really lead to human flourishing.

That disconnection from what matters might be a problem if politicians strove to maximise GDP, but they don’t — otherwise they would have hesitated before imposing austerity in the face of a financial crisis, launching trade wars or getting Brexit done. Economic policymaking has flaws, but an obsession with GDP is not one of them.

Nevertheless the exponential expansion of GDP is indirectly important, because GDP growth is correlated with things that do matter, good and bad. Economic growth has long been associated with unsustainable activities such as carbon dioxide emissions and the consumption of metals and minerals.

But GDP growth is also correlated with the good things in life: in the short run, an economy that is creating jobs; in the long run, more important things. GDP per capita is highly correlated with indicators such as the Social Progress Index. The SPI summarises a wide range of indicators from access to food, shelter, health and education to vital freedoms of choice and from discrimination. All the leading countries in the Social Progress database are rich. All the strugglers are desperately poor.

So the prospect of a doubling of world GDP matters, not for its own sake, but for what it implies — an expansion of human flourishing, and the risk of environmental disaster.

So here’s the good news: we might be able to enjoy all the good stuff while avoiding the unsustainable environmental impact. The link between economic activity and the use of material resources is not as obvious as one might think. There are several reasons for this.

The first is that for all our seemingly insatiable desires, sometimes enough is enough. If you live in a cold house for lack of money, a pay rise lets you take off the extra cardigan and turn up the radiators. But if you win the lottery, you are not going to celebrate by roasting yourself alive.

The second is that, while free enterprise may care little for the planet, it is always on the lookout for ways to save money. As long as energy, land and materials remain costly, we’ll develop ways to use less. Aluminium beer cans weighed 85 grammes when introduced in the late 1950s. They now weigh less than 13 grammes.

The third reason is a switch to digital products — a fact highlighted back in 1997 by Diane Coyle in her book The Weightless World. The trend has only continued since then. My music collection used to require a wall full of shelves. It is now on a network drive the size of a large hardback book. My phone contains the equivalent of a rucksack full of equipment.

Dematerialisation is not automatic, of course. As Vaclav Smil calculates in his new book, Growth, US houses are more than twice as large today as in 1950. The US’s bestselling vehicle in 2018, the Ford F-150, weighs almost four times as much as 1908’s bestseller, the Model T. Let’s not even talk about the number of cars; Mr Smil reckons the global mass of automobiles sold has increased 2,500-fold over the past century.

Still, there is reason for hope. Chris Goodall’s research paper “Peak Stuff” concluded that, in the UK, “both the weight of goods entering the economy and the amounts finally ending up as waste probably began to fall from sometime between 2001 and 2003”. That figure includes the impact of imported goods.

In the US, Jesse Ausubel’s article “The Return of Nature” found falling consumption of commodities such as iron ore, aluminium, copper, steel, and paper and many others. Agricultural land has become so productive that some of it is being allowed to return to nature.

In the EU, carbon dioxide emissions fell 22 per cent between 1990 and 2017, despite the economy growing by 58 per cent. Only some of this fall is explained by the offshoring of production. (For a good summary of all this research, try Andrew McAfee’s book More From Less.)

Can we, then, relax? No. To pick a single obvious problem, global carbon dioxide emissions may be rising more slowly than GDP — but they are rising nevertheless, and they need to fall rapidly.

Yet the fact that dematerialisation is occurring is heartening. We all know what the basic policies are that would tilt the playing field in favour of smaller, lighter, lower-emission products and activities. Adopting those policies means we might actually be able to save the planet, preserve human needs, rights and freedoms — and still have plenty of fun into the bargain.

### Space Col

#### The Private Industry is the only avenue for Space Colonization – Governments have no incentive and are bound by I-Law.

Eure 16 (, J., 2016. Space… the final frontier. [online] Campbell Law Observer. Available at: <http://campbelllawobserver.com/space-the-final-frontier/> [Accessed 28 December 2021] Jonathan Eure is a 2017 graduate of Campbell Law School, winner of the 2017 J. Bryan Boyd Award for Excellence in Legal Journalism, and served as a senior staff writer for the Campbell Law Observer. He lived in Morganton, in the foothills of North Carolina, before moving to Raleigh for law school. He earned BA’s in Political Science and History from the University of North Carolina at Chapel Hill, graduating in 2014. The summer after his first year of law school, Jonathan worked as a legislative research intern with Representative Rob Bryan in the North Carolina General Assembly. Jonathan now interns with the Honorable Paul Newby at the North Carolina Supreme Court. Jonathan is the Secretary for the Campbell Public Interest Law Student Association (CPILSA).)-rahulpenu

Space… the final frontier With the recent discovery of a new earth-like planet, many countries are beginning serious talks about inhabiting and colonizing a planet in outer space. We very soon might turn on the news and hear stories of interstellar exploration and colonization. We might even hear about voyages of a starship named Enterprise. This probably sounds like wild speculation, or the contents of a cheesy science fiction novel. However, after a European research team announced the discovery of an earth-like planet circling the inhabitable zone of Proxima Centauri in August, 2016, we may soon see more discussions of the logistics and technology required to reach out into the stars. The part of that discussion we ultimately must address is the legal ramifications of colonization, essentially what are the laws to which nations and private individuals must adhere, when claiming portions of a new planet, moon, or asteroid. Proxima Centauri is the closest star to our own, lying a mere 4.54 light years from the Sun. In interstellar terms, that is a stone’s throw away, though clearly still an impossible journey for a civilization who has yet to visit another planet in our own Solar System. Still, Proxima Centauri’s vicinity to Earth has garnered a fair amount of interest from parties who hope to discover an inhabitable, one day reachable, planet. Guillem Anglada-Escudé led a research team of 31 scientists from eight different countries for months studying Proxima Centauri through the European Southern Observatory’s HARPS spectrograph and 3.6 meter telescope in La Silla, Chile. While investigating a tiny wobble Proxima Centauri experiences, the team discovered that the cause of the wobble is an Earthlike planet, promptly named “Proxima b.” “…overall, Proxima b is the best opportunity we have ever had for an inhabitable planet that may be reachable in the foreseeable future.” To be classified as “Earthlike,” Proxima b was studied based on likely mass, position, and orbit around Proxima Centauri, and the effects of Proxima Centauri on Proxima b. The researchers believe Proxima b has a similar mass to Earth, possibly indicating a similar, rocky makeup. Though Proxima Centauri, as a red dwarf star, releases less energy than our Sun, Proxima b is located in the so-called “goldilocks zone” of Proxima Centauri; in other words, not too hot, not too cold. Therefore, the researchers believe the basic elements for human life, heat, oxygen, and water could exist on Proxima b. There is some concern that the amount of solar radiation expelled by Proxima Centauri could make Proxima b uninhabitable, but overall, Proxima b is the best opportunity we have ever had for an inhabitable planet that may be reachable in the foreseeable future. “A ratified treaty is then given the full force of domestic law in the U.S., and the U.S. government would generally be bound to uphold the tenets of that treaty. Being bound to a treaty in this case means the U.S. could not claim any portion of Proxima b as U.S. property.” Obviously we have to get there first, and at this very moment, some of the most brilliant minds on Earth are attempting to develop interstellar travel. Ideas such as asteroid mining and economic incentives of resources available in space are already pushing us toward the day when we might visit another planet. Once we do, our current legal framework may make colonization difficult, at least on a national level. The best starting place for understanding space law is the “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies,” better known as the “Outer Space Treaty.” Signed in 1967 by the member nations of the UN, including space race powerhouses the U.S. and U.S.S.R., the Outer Space Treaty created a series of broad principles controlling the manner in which nations would explore space. These principles include provisions that exploration is permitted in all states, that no celestial bodies may be appropriated by individual states, that nations take responsibility for the environments of space and celestial bodies, and that non-governmental space activities must be authorized and continually supervised by the states which have jurisdiction over such activities. In order to have ratified such a treaty in the U.S., the President would have sent the treaty to Congress for their “advice and consent,” and the treaty would have to be approved by a two-thirds majority. The treaty would then be sent back to the President to be ratified, as described in Article II, Section 2 of the U.S. Constitution. A ratified treaty is then given the full force of domestic law in the U.S., and the U.S. government would generally be bound to uphold the tenets of that treaty. Being bound to a treaty in this case means the U.S. could not claim any portion of Proxima b as U.S. property. Fortunately, this is also true for Russia and China, the U.S.’s primary competitors in space, and none of these nations can violate the treaty without risking adverse reactions from the others. The Outer Space Treaty is the only one of the U.N.’s treaties on outer space to which the U.S. or any other major space-faring nation belongs, and is therefore the only treaty that really matters, though the U.N. has passed other resolutions on the issue. “**Private** **exploration** of space **becomes** **more** of a **reality** each day, with private corporations such as SpaceX, Blue Origin, and Virgin Galactic testing **new** **platforms** for space travel.” As a policy matter, though the **O**uter **S**pace **T**reaty uses lofty ideals to **bind** **nations** into mutual respect and perhaps even unity of purpose, focusing solely on those ideals discounts a key ingredient of the original space race. Promulgation of national ideology was the original motivator of the space race between the U.S. and the U.S.S.R. Without national ideology, prestige, or power as a motivating factor, there is really **no** **incentive** **for** the **governments** of major spacefaring nations **to** **spend** massive amounts of mon

ey over long periods of time **on** such risky endeavors as space **colonization**. For this reason, the **colonization** of Proxima b would more likely **fall** **to** private **corporations** with much to gain from the resources other worlds might offer. Private exploration of space becomes more of a reality each day, with private corporations such as SpaceX, Blue Origin, and Virgin Galactic testing new platforms for space travel. A **movement** has **grown** **up** **alongside** these private spacefaring **companies** **claiming** planets such as Proxima b might become a **new** **frontier**, where private citizens can stake their own personal claims. This movement has even **proposed** **legislation** in Congress. The “Space Settlement Prize Act,” which would **ultimately** **guarantee** that **any** **settlement** built privately on other planets, moons, asteroids, etc., would be **owned** **by** the private citizens or **corporations** **who** **claim** **them**. This act would likely function similarly to the Homestead Acts, which allowed settlers who worked unclaimed land, to buy that land at very little cost. Furthermore, these groups claim that they are **not** **subject** **to** the **O**uter **S**pace **T**reaty, as the treaty’s provisions only govern nations. “The language of the Outer Space Treaty does not forbid private claims on and settlement of celestial bodies, only national appropriations. Furthermore, nations themselves are answerable in case of any environmental damages.” It is an interesting theory, and these 21st century frontiersmen and women might be correct. The Outer Space Treaty does not only govern nations themselves, but national oversight of non-governmental organizations as well. As all private attempts at space colonization on Proxima b and any other celestial body would be through corporate entities. These corporate entities would certainly fall under the national mandate to authorize and continually supervise the operation of such groups. But just because governments must have some form of oversight in place to manage private space exploration corporations, does not mean there is a mandate to control the legal operation of such corporations. The language of the Outer Space Treaty does not forbid private claims on and settlement of celestial bodies, only national appropriations. Furthermore, nations themselves are answerable in case of any environmental damages. Nations can certainly pass laws regulating the actions of private corporations consistent with the Outer Space Treaty’s mandate, and in fact the U.S. is already considering and attempting to create policies governing private space craft and travel. The problem is that none of this law has become official yet. The reality behind this entire discussion is that it will not become truly important until either nations or private corporations prove they can travel to another planet. Until then, the laws of space colonization are nothing more than an academic exercise. However, they have been proven important in one sense: protection of our moon. Prohibitions on national appropriation, military use, or exploitation have certainly been effective in keeping the moon unmolested (though technological and financial constraints also played a major role). So perhaps there is a reasonable groundwork for the future laws of space colonization. Proxima b may not be the first place they are exercised, but the discovery of a relatively nearby Earthlike planet is sure to hasten the need for such laws to be in place before we land. The law now needs to boldly go where no law has gone before.

#### Space colonization solves extinction

Filling Space 19, 4-19, "Deflecting Existential Risk with Space Colonization," Filling Space, https://filling-space.com/2019/04/19/deflecting-existential-risk-with-space-colonization/

The first living organism on Earth emerged approximately three and a half billion years ago. Since then, life has evolved into countless forms and colonized the planet. But the story of life is not a rosy one. At least five mass extinctions have occurred, and nearly all species that have ever existed on our planet are now dead. One of the most well-understood mass extinctions occurred when the Alvarez asteroid impacted Earth and, likely combined with other factors, killed many dinosaurs and other species. Life then had no tools to detect the coming asteroid or to be able to plan proactively to ensure its survival.

In order to avoid sharing the same fate as the dinosaurs, scholars argue that humans should become a multi-planetary species. We spoke with Professor Gonzalo Munevar, Emeritus Professor at Lawrence Technical University, to hear his thoughts on the existential risks we face and how colonization of the cosmos can help us address them. He has written extensively about the philosophy of space exploration and human consciousness.

Why do you argue that “failure to move into the cosmos would condemn us to oblivion”?

By having a significant presence in the solar system in the next few thousands of years and beyond, we will be in a better position to deflect asteroids and comets that might bring the end of humanity, and much other Earth life, in a horrible collision. And if perchance one such catastrophe proves inevitable (e.g. a rogue planet passing through the solar system), humanity would still survive by having colonized Mars and other bodies, as well as by having built artificial space colonies of the type advocated by Gerard O’Neill.

Once the sun begins to turn into a red giant in a few billion years, we must have long moved into the outer solar system. In the very long run, we have to move into other solar systems. Relativistic-speed starships would be nice, but they are not necessary for the task of moving humanity to the stars. We can reach them, slowly but surely, by propelling some of our space colonies away from the sun, carrying perhaps millions of human beings. They would take advantage of the many resources to be found in the Oort Cloud, and then of equivalent clouds in other solar systems. Even interstellar space has resources to offer. Nuclear energy, probably fusion, would likely be required. It may take us tens of thousands of years, but in the cosmic time scale, that is but a blink in the eye.

What are these catastrophic threats? Are there any records of catastrophic events happening before humans appeared on Earth?

I have already mentioned collisions with asteroids and comets. Although the active geology of our planet tends to erase the record of many collisions, we can find a well-preserved record on the Moon and Venus, the two closest bodies to Earth. On the 600-million-years-old Venusian surface, the spacecraft Magellan discovered about one thousand impact craters at least twice the diameter of meteor craters on Earth. This impact record makes it reasonable to estimate a catastrophic impact on Earth every half a million years or so. Collisions with bodies of 5 km across would happen, on the average, every 20 million years. Apart from the Alvarez asteroid (crater near Yucatan) that led to the extinction of the dinosaurs and the majority of species on Earth 65 million years ago, there have been at least two more impacts by asteroids 10 km or larger in the last 300 million years.

How could human colonization of outer space save other terrestrial life?

On both O’Neill types of colonies as well as on colonies on other planets, and particularly on terraformed planets, we would need all sorts of organisms like bacteria and plants for food, medicine, and ornamentation, as well as many animals for food and other purposes. We cannot have a proper colony without an Earthly environment to surround and nourish us. So, we have to take much other terrestrial life with us in order to survive and flourish. And given the value of biodiversity we would make it a point to take a great variety of organisms that contribute to our biosphere. Of course, we should heed Mark Twain and be sure not to include mosquitoes in our future space arks. I myself would keep out tarantulas and some other obnoxious viruses, bacteria, plants, and animals.