# 1AC vs SatMat ZS HWL R3

### Plan

#### Resolved: States ought to prohibit the private appropriation of Low Earth Orbit.

#### The plan clarifies customary law to ban private satellite mega-constellations that appropriate Low Earth Orbit and solves otherwise detrimental space debris.

Johnson 20 [Chris, Space Law Advisor for Secure World Foundation, 9 years of professional experience in international space law and policy. J.D. from New York Law School; 2020; “The Legal Status of MegaLEO Constellations and Concerns About Appropriation of Large Swaths of Earth Orbit,” <https://swfound.org/media/206951/johnson2020_referenceworkentry_thelegalstatusofmegaleoconstel.pdf>] brett

Yes, This Is Impermissible Appropriation

Article II of the Outer Space Treaty, discussed above, is clear on the point that the appropriation of outer space, including the appropriation of either void space or of celestial bodies, is an impermissible and prohibited action under international law. No means or methods of possession of outer space will legitimize the appropriation or ownership of outer space, or subsections thereof.

Excludes Others

The constellations above, because they seem to so overwhelmingly possess particular orbits through the use of multiple satellites to occupy orbital planes, and in a manner that precludes other actors from using those exact planes, constitute an appropriation of those orbits. While the access to outer space is nonrivalrous – in the sense that anyone with the technological capacity to launch space objects can therefore explore space – it is also true that orbits closer to Earth are unique, and when any actor utilizes that orbit to such an extent to these proposed constellations will, it means that other actors simply cannot go there.

To allow SpaceX, for example, to so overwhelmingly occupy a number of altitudes with so many of their spacecraft, essentially means that SpaceX will henceforth be the sole owner and user of that orbit (at least until their satellites are removed). No other actors can realistically expect to operate there until that time. No other operator would dare run the risk of possible collision with so many other spacecraft in that orbit. Consequently, the sole occupant will be SpaceX, and if “possession is 9/10th of the law,” then SpaceX appears to be the owner of that orbit.

Done Without Coordination

Additionally, SpaceX and other operators of megaconstellations are doing so without any real international conversation or agreement, which is especially egregious and transgressive of the norms of outer space. Compared to the regime for GSO, as administered by the ITU and national frequency administrators, Low Earth Orbit is essentially ungoverned, and SpaceX and others are attempting to seize this lack of authority to claim entire portions of LEO for itself; and before any international agreement, consensus, or even discussion is had. They are operating on a purely “first come, first served” basis that smacks of unilateralism, if not colonialism.

Governments Are Ultimately Implicated

As we know, under international space law, what a nongovernmental entity does, a State is responsible for. Article VI of the Outer Space Treaty requires that at least one State authorize and supervise its nongovernmental entities and assure their continuing compliance with international law. As such, the prohibition on nonappropriation imposed upon States under Article II of the Outer Space Treaty applies equally to nongovernmental private entities such as SpaceX.

Nevertheless, through the launching and bringing into use of the Starlink constellation, SpaceX will be the sole occupant, and thereby, possessor, both fact and in law, of 550 km, 1100 km, 1130 km, 1275 km, and 1325 km above our planet (or whatever orbits they finally come to occupy). The same is true for the other operators of these large constellations which will be solely occupying entire orbits.

Long-Term Occupation Constitutes Appropriation

These altitudes are additionally significant, as nonfunctional spacecraft in orbits lower than around 500 km will re-enter the Earth’s atmosphere in months or a few years, but the altitudes selected for the Starlink constellation, while technologically desirable for their purposes, also mean that any spacecraft which are not de-orbited from these regions may be there for decades, or possibly even hundreds of years. By comparison, the granting of rights for orbital slots at GSO is in 15-year increments, a length of time much less than what the altitudes of the megaconstellations threaten. Such long spans of time at these altitudes by these megaconstellations further bolster the contention that this occupation rises to the level of appropriation of these orbits.

Prevents Others from Using Space

Article I of the Outer Space Treaty establishes that the exploration and use of outer space is “the province of all mankind.” It further requires that this exploration and use shall be by all States “without discrimination of any kind, on a basis of equality and in accordance with international law...” However, when one private corporation so overwhelmingly possesses entire portions of outer space, their use is discriminatory to other potential users and interferes with their freedom to access, explore, and use outer space. So long as these actors are so dominantly possessing and occupying those orbits, their actions exclude others from using them. What other operator would dare use orbits where there are already hundreds of satellites operating as part of a constellation? It would be an extremely unwise and risky decision to try to share these orbits with a mega constellation, so they will likely choose other altitudes and orbits. This massive occupation of particular orbits effectively defeats others from enjoying the use of outer space. While a State can issue permits for one of its corporations allowing them to launch and operate satellites to this extent, that does not automatically mean that their activities in outer space, an area beyond national sovereignty, are therefore in perfect accordance with the strictures of international law. Indeed, national permissions offer no such guarantee.

No Due Regard for Others

That these megaconstellations violate the prohibition on appropriation in Article II is additionally supported by Article IX of the Outer Space Treaty. Article IX requires that in the exploration and use of outer space, States “shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space... with due regard to the corresponding interests of other States...” There is hardly any way to view this deployment of megaconstellations as showing any type of due regard to the corresponding interests of others. This lack of regard further supports the notion of their unilateral transgressive violations of the purposes of space law norms.

Harmful Contamination

The impacts of the spacecraft on the pressing issue of space debris need not be gone into detail here. Suffice it to say, megaconstellations threaten mega-debris. The failure rate of these comparatively cheap satellites should give pause, because if 5% of a constellation of 100 satellites fails, this is 5 guaranteed new pieces of debris intentionally introduced to the fragile space domain. Article IX of the Outer Space Treaty warns of harmful contamination of the space environment and requires States to take appropriate measures to prevent this harmful contamination. A responsible government could not, in all seriousness, permit the intentional release of such amounts of space debris, especially in the already fraught orbits that many megaconstellations are headed towards. While the threat of space debris is not directly relevant to the accusation of appropriation of outer space, it goes towards the argument that these actors are conducting activities in a manner lacking in regard to others, and in fact, amounts to excluding others from using the space domain. By excluding others, this has the effect of taking orbits for themselves, which IS occupation.

If This Isn’t Appropriation, Then What Is?

Arguing in the alternative, if these megaconstellations — in their dominant occupation of entire orbits in orbital planes with numerous satellites — could be considered (merely for the sake of argument) to not be appropriation, we must therefore ask: what would be appropriation? What use of void space, including orbits of the Earth, would constitute actual appropriation? What further, additional fact of these uses of space, if added to the scenario, would cause that constellation to cross over the line into clearly prohibited appropriation? Perhaps the exact same scenario, but supplemented with an actual, formal claim of sovereignty, issued by a government, is the only element which could be added to megaconstellations which would then cross the threshold into appropriation. However, a formal claim of sovereignty would be merely an act occurring on Earth and would not change any actual facts in the space domain. Consequently, the lack of a formal claim of sovereignty should not be the deciding criteria in arriving at the conclusion that megaconstellations constitute appropriation of orbits.

Conclusion

In conclusion, these megaconstellations effectively occupy entire orbital regions with their vast fleet of spacecraft and in so doing effectively preclude other actors from sharing those domains. They have done so, or are attempting to do so, without any international consensus or discussion, which is most egregious for a domain outside of State sovereignty and which no State can own. Governments will ultimately be responsible for this appropriation, and both are prohibited from appropriating space. In distinction to GSO, their permission to go there means that they could occupy these regions for incredibly long periods — which again shows their appropriation. These constellations significantly prevent others from using those regions, which therefore interferes with others’ right to explore and use space. And ultimately, this reckless ambition shows absolutely no due regard (as per Article IX) for the corresponding rights of others. As such, these megaconstellations constitute an impermissible appropriation of particular regions of outer space, regardless of any formal, official claim of such by a responsible, authorizing government.

### Advantage

#### Incoming mega-constellations of cheap satellites ensure unmanageable space debris, triggering the Kessler Syndrome.

Boley & Byers 21 [Aaron C., Department of Physics and Astronomy @ The University of British Columbia\*, and Michael, Department of Political Science @ The University of British Columbia; Published: 20 May 2021; Scientific Reports; “Satellite mega-constellations create risks in Low Earth Orbit, the atmosphere and on Earth,” <https://www.nature.com/articles/s41598-021-89909-7>] brett

Companies are placing satellites into orbit at an unprecedented frequency to build ‘mega-constellations’ of communications satellites in Low Earth Orbit (LEO). In two years, the number of active and defunct satellites in LEO has increased by over 50%, to about 5000 (as of 30 March 2021). SpaceX alone is on track to add 11,000 more as it builds its Starlink mega-constellation and has already filed for permission for another 30,000 satellites with the Federal Communications Commission (FCC)1. Others have similar plans, including OneWeb, Amazon, Telesat, and GW, which is a Chinese state-owned company2. The current governance system for LEO, while slowly changing, is ill-equipped to handle large satellite systems. Here, we outline how applying the consumer electronic model to satellites could lead to multiple tragedies of the commons. Some of these are well known, such as impediments to astronomy and an increased risk of space debris, while others have received insufficient attention, including changes to the chemistry of Earth’s upper atmosphere and increased dangers on Earth’s surface from re-entered debris. The heavy use of certain orbital regions might also result in a de facto exclusion of other actors from them, violating the 1967 Outer Space Treaty. All of these challenges could be addressed in a coordinated manner through multilateral law-making, whether in the United Nations, the Inter-Agency Debris Committee (IADC), or an ad hoc process, rather than in an uncoordinated manner through different national laws. Regardless of the law-making forum, mega-constellations require a shift in perspectives and policies: from looking at single satellites, to evaluating systems of thousands of satellites, and doing so within an understanding of the limitations of Earth’s environment, including its orbits.

Thousands of satellites and 1500 rocket bodies provide considerable mass in LEO, which can break into debris upon collisions, explosions, or degradation in the harsh space environment. Fragmentations increase the cross-section of orbiting material, and with it, the collision probability per time. Eventually, collisions could dominate on-orbit evolution, a situation called the Kessler Syndrome3. There are already over 12,000 trackable debris pieces in LEO, with these being typically 10 cm in diameter or larger. Including sizes down to 1 cm, there are about a million inferred debris pieces, all of which threaten satellites, spacecraft and astronauts due to their orbits crisscrossing at high relative speeds. Simulations of the long-term evolution of debris suggest that LEO is already in the protracted initial stages of the Kessler Syndrome, but that this could be managed through active debris removal4. The addition of satellite mega-constellations and the general proliferation of low-cost satellites in LEO stresses the environment further5,6,7,8.

Results

The overall setting

The rapid development of the space environment through mega-constellations, predominately by the ongoing construction of Starlink, is shown by the cumulative payload distribution function (Fig. 1). From an environmental perspective, the slope change in the distribution function defines NewSpace, an era of dominance by commercial actors. Before 2015, changes in the total on-orbit objects came principally from fragmentations, with effects of the 2007 Chinese anti-satellite test and the 2009 Kosmos-2251/Iridium-33 collisions being evident on the graph.

Figure 1

[Figure 1 omitted]

Cumulative on-orbit distribution functions (all orbits). Deorbited objects are not included. The 2007 and 2009 spikes are a Chinese anti-satellite test and the Iridium 33-Kosmos 2251 collision, respectively. The recent, rapid rise of the orange curve represents NewSpace (see "Methods").

Full size image

Although the volume of space is large, individual satellites and satellite systems have specific functions, with associated altitudes and inclinations (Fig. 2). This increases congestion and requires active management for station keeping and collision avoidance9, with automatic collision-avoidance technology still under development. Improved space situational awareness is required, with data from operators as well as ground- and space-based sensors being widely and freely shared10. Improved communications between satellite operators are also necessary: in 2019, the European Space Agency moved an Earth observation satellite to avoid colliding with a Starlink satellite, after failing to reach SpaceX by e-mail. Internationally adopted ‘right of way’ rules are needed10 to prevent games of ‘chicken’, as companies seek to preserve thruster fuel and avoid service interruptions. SpaceX and NASA recently announced11 a cooperative agreement to help reduce the risk of collisions, but this is only one operator and one agency.

Figure 2

[Figure 2 omitted]

Orbital distribution and density information for objects in Low Earth Orbit (LEO). (Left) Distribution of payloads (active and defunct satellites), binned to the nearest 1 km in altitude and 1° in orbital inclination. The centre of each circle represents the position on the diagram, and the size of the circle is proportional to the number of satellites within the given parameter space. (Right) Number density of different space resident objects (SROs) based on 1 km radial bins, averaged over the entire sky. Because SRO objects are on elliptical orbits, the contribution of a given object to an orbital shell is weighted by the time that object spends in the shell. Despite significant parameter space, satellites are clustered in their orbits due to mission requirements. The emerging Starlink cluster at 550 km and 55° inclination is already evident in both plots (Left and Right).

Full size image

When completed, Starlink will include about as many satellites as there are trackable debris pieces today, while its total mass will equal all the mass currently in LEO—over 3000 tonnes. The satellites will be placed in narrow orbital shells, creating unprecedented congestion, with 1258 already in orbit (as of 30 March 2021). OneWeb has already placed an initial 146 satellites, and Amazon, Telesat, GW and other companies, operating under different national regulatory regimes, are soon likely to follow.

Enhanced collision risk

Mega-constellations are composed of mass-produced satellites with few backup systems. This consumer electronic model allows for short upgrade cycles and rapid expansions of capabilities, but also considerable discarded equipment. SpaceX will actively de-orbit its satellites at the end of their 5–6-year operational lives. However, this process takes 6 months, so roughly 10% will be de-orbiting at any time. If other companies do likewise, thousands of de-orbiting satellites will be slowly passing through the same congested space, posing collision risks. Failures will increase these numbers, although the long-term failure rate is difficult to project. Figure 3 is similar to the righthand portion of Fig. 2 but includes the Starlink and OneWeb mega-constellations as filed (and amended) with the FCC (see “Methods”). The large density spikes show that some shells will have satellite number densities in excess of n=10−6 km−3.

Figure 3

[Figure 3 omitted]

Satellite density distribution in LEO with the Starlink and OneWeb mega-constellations as filed (and amended) with the FCC. Provided that the orbits are nearly circular, the number densities in those shells will exceed 10–6 km−3. Because the collisional cross-section in those shells is also high, they represent regions that have a high collision risk whenever debris is too small to be tracked or collision avoidance manoeuvres are impossible for other reasons.

Full size image

Deorbiting satellites will be tracked and operational satellites can manoeuvre to avoid close conjunctions. However, this depends on ongoing communication and cooperation between operators, which at present is ad hoc and voluntary. A recent letter12 to the FCC from SpaceX suggests that some companies might be less-than-fully transparent about events13 in LEO.

Despite the congestion and traffic management challenges, FCC filings by SpaceX suggest that collision avoidance manoeuvres can in fact maintain collision-free operations in orbital shells and that the probability of a collision between a non-responsive satellite and tracked debris is negligible. However, the filings do not account for untracked debris6, including untracked debris decaying through the shells used by Starlink. Using simple estimates (see “Methods”), the probability that a single piece of untracked debris will hit any satellite in the Starlink 550 km shell is about 0.003 after one year. Thus, if at any time there are 230 pieces of untracked debris decaying through the 550 km orbital shell, there is a 50% chance that there will be one or more collisions between satellites in the shell and the debris. As discussed further in “Methods”, such a situation is plausible. Depending on the balance between the de-orbit and the collision rates, if subsequent fragmentation events lead to similar amounts of debris within that orbital shell, a runaway cascade of collisions could occur.

Fragmentation events are not confined to their local orbits, either. The India 2019 ASAT test was conducted at an altitude below 300 km in an effort to minimize long-lived debris. Nevertheless, debris was placed on orbits with apogees in excess of 1000 km. As of 30 March 2021, three tracked debris pieces remain in orbit14. Such long-lived debris has high eccentricities, and thus can cross multiple orbital shells twice per orbit. A major fragmentation event from a single satellite could affect all operators in LEO.

Even if debris collisions were avoidable, meteoroids are always a threat. The cumulative meteoroid flux15 for masses m > 10–2 g is about 1.2 × 10–4 meteoroids m−2 year−1 (see “Methods”). Such masses could cause non-negligible damage to satellites16. Assuming a Starlink constellation of 12,000 satellites (i.e. the initial phase), there is about a 50% chance of 15 or more meteoroid impacts per year at m > 10–2 g. Satellites will have shielding, but events that might be rare to a single satellite could become common across the constellation.

One partial response to these congestion and collision concerns is for operators to construct mega-constellations out of a smaller number of satellites. But this does not, individually or collectively, eliminate the need for an all-of-LEO approach to evaluating the effects of the construction and maintenance of any one constellation.

#### Debris cascade collapses satellites.

Kessler et al., 18 [Donald J. Kessler\* American astrophysicist and former NASA scientist known for his studies regarding space debris. Kessler has received numerous awards for his pioneering work, the most recent being the 2010 Dirk Brower Award for his half-century career in astrodynamics. Dr. Holder Krag\*\* Head of the Space Debris Office at the European Space Agency and has been a Space Debris Analyst in the Space Debris Office since 2006. Asher Isbrucker\*\*\*, Writer & Video Producer; 11-2-2018; "Kessler Syndrome: What Happens When Satellites Collide," Medium, <https://asherkaye.medium.com/kessler-syndrome-what-happens-when-satellites-collide-1b571ca3c47e>] brett

Donald Kessler: The worst case scenario is that you end up creating enough debris that it’s not cost-effective to depend on space. Now, that may take a long time, but because it’s a non-reversible process, once you’ve reached a certain threshold where you’re generating debris from these collisions faster than it can be cleaned out, it’ll just continually get worse unless you can do something drastic. Holger Krag: If we continue operating the way we do today, we will have a disaster in 50 years, in 100 years. It compares quite nicely to the CO2 issue, and the climate on ground, so it’s not our generation suffering from all the CO2 released into the atmosphere, it is future generations, but it is our generation that has to take the action. And the space debris problem is quite similar. DK: My name’s Don Kessler, I worked for NASA till 1996 as the senior researcher for orbital debris. I started the program back in 1979, and the program is still very active today. In the 1960s my main job was to define the interplanetary meteoroid environment. At the time, the only space debris NASA had to be concerned about were meteoroids, many of which are generated from collisions in the asteroid belt. These asteroid collisions are a cascading phenomenon, meaning every collision creates more ammunition for future collisions. It’s a positive feedback loop. Don was studying this phenomenon when he started to consider an interesting question: DK: When will the same phenomenon start happening in the Earth’s orbit? When will this same kind of cascading occur with satellites? And it was just a matter of curiosity as to what that number may be, and actually when I did the calculations, I was really shocked at the answer that it would happen so soon. Don published a paper in 1978 proposing this scenario, predicting that we’d start to see satellite collisions in Earth orbit by the year 2000. Just like in the asteroid belt, these satellite collisions would trigger a domino effect: creating a whole bunch of debris which causes more collisions, creating more debris, and so on. His main point: once the process starts, it’ll be nearly impossible to stop. This self-perpetuating phenomenon, this domino effect, became known as Kessler Syndrome. The first accidental collision occurred in 1996, when a French satellite was struck by a piece of a rocket thruster that had exploded ten years earlier, severing its stabilization boom and, for the first time, demonstrating how entangled the orbital environment has become. HK: In 2009 a collision happened that was by far more dramatic. The event he’s referring to was the first collision between two intact satellites: the Russian satellite Kosmos and an American Iridium. And that was the first catastrophic accidental collision that got everybody’s attention because not only did they realize how much debris is generated when something like that occurs but that we are now entering this phase of what we’re calling the Kessler Syndrome. Just two years earlier the Chinese military conducted a controversial anti-satellite test, intercepting one of their own defunct weather satellites with a kinetic kill vehicle — a non-explosive missile which relies on sheer speed of impact to destroy its target. It blew the satellite to smithereens and created just a huge mess, it was really bad. DK: And unfortunately it was something they should have known not to do. Yeah, that’s because the US did the same thing back in 1985 — the first anti-satellite test, with more or less the same results. DK: We at NASA tried to delay that or stop that because, we said it’s going to create enough debris that we’ll have to add more shielding to the space station which was planned to be launched a few years later. And nobody believed it would make that much debris, but it did. All of these collisions, accidental or otherwise, make a big mess of junk zipping around the Earth called space debris. It accounts for 95% of the objects in Low Earth orbit, and comes in all shapes and sizes. It’s technically defined as any nonfunctional object in orbit, so there’s big stuff like rocket thrusters and defunct satellites, but the vast majority are little bits and pieces called fragmentation debris. Many of these fragments come from explosions caused by residual fuel and other explosive energy sources self-igniting under the extreme conditions of space. These explosions happen more often than you might think, and as catastrophic and messy as these explosions are, collisions are even worse due to the incredible amount of kinetic energy involved. At the velocities objects travel in Lower Earth Orbit (speeds known as hypervelocity) even an object as tiny as a screw can deliver an incapacitating strike to a satellite. In fact, NASA has repeatedly had to replace shuttle windows due to hypervelocity impacts by flecks of paint. HK: These are velocities, we have no example nor anything that compares to that on ground. So the energy involved in these collisions is extremely high. A 1 cm object that size like a cherry hitting a satellite with 10 km/s, the energy released by this corresponds roughly to an exploding grenade. You can imagine what the satellite looks like after that. DK: Yes, let me know show you something. This is something that was shot in the lab, it’s a projectile about the size of a BB, and it makes a crater into, this is solid aluminum, and this was only going about 5 km/s, about half the speed of what you would expect in space. Most of this is happening in Low Earth Orbit, the 2000 km strip of space above our heads where we’ve packed the vast majority of our satellites, including the International Space Station and the Hubble Space Telescope. The most crowded section is between 500 and 1000 km up. It’s the densest region, it’s the Highway 401 of space. DK: And that’s what’s creating the problem because we’ve crowded so much stuff in that small region. And the probability of collision goes as the square of the spatial density. So you double the number of satellites, you get four times as many collisions. Now, the space station usually flies around 300 km but the debris that’s generated at that higher altitude is being thrown down and drifting down to the lower altitudes. HK: If you look at the space station surface you will find craters everywhere, impact craters caused by debris everywhere. Whenever you bring hardware down and inspect it on ground you find craters of all sizes. What do we do with this? How do you protect the life of the astronauts? The only thing you can do is shielding. And to protect against a hypervelocity impact you need a special type of lightweight shielding, called Whipple shielding. DK: Let me show you something else. The same particle that caused this kind of damage [image below, left] only caused this kind of damage [image below, right]on a surface with a very minor amount of shielding on it. And that’s, it’s almost a liquid splattered onto that. Most spacecraft utilize this type of shielding, which can withstand impacts from objects up to about one centimeter. Objects larger than a softball are catalogued and tracked by the US Space Surveillance Network. Tracking is imprecise, but allows spacecraft to dodge some of the debris that comes too close. This only works for objects larger than 10 cm or so. Anything smaller can’t be reliably tracked. For that reason, the most concerning objects are those between 1 and 10 cm; too large for shielding to withstand and too small to be tracked. These objects could incapacitate any spacecraft in their path, or worse. And with every future explosion and collision there will be more and more of these invisible projectiles going around. The problem gets worse when you consider how long objects can remain in orbit. Depending on altitude, debris in Low Earth Orbit may remain there for years, decades, or centuries before their orbit naturally decays enough to re-enter the Earth’s atmosphere. For example, look no further than ENVISAT; a defunct 8-tonne satellite operated by the European Space Agency until it lost contact in 2012, becoming a massive piece of space junk in the densest region of Earth orbit. ENVISAT will remain in orbit for 200 years if not removed. Experts hope to avoid an encore of ENVISAT and to mitigate Kessler Syndrome through the international adoption of two clean space policies. The first will prevent explosions by requiring so-called passivation of onboard energy sources. HK: Meaning, residual fuel must be either depleted, burned, released through a valve, whatever. That’s number one: no more explosions. DK: And the other is what we call a 25 year rule. Once you put something in orbit, after you finish using it you have 25 years to get it out. Either by moving up to a designated “graveyard orbit” where it will pose minimal risk to active spacecraft or more ideally, lowering its altitude so it will burn up in the atmosphere sooner. These policies aren’t difficult to follow and are beginning to be adopted internationally. HK: When we do these two things that would already make space flight pretty safe for the future. It would mean, if we do this systematically, the risk in the future would be almost the same as it is today. The mitigation measures they help to dampen the effect of the Kessler Syndrome, we are not talking about stopping it, we are talking about maintaining it on an acceptable level, the growth. But it will grow, even if we implement these two measures strictly. If we want to even prevent this growth, then we need to do active removal. DK: We’ve already concluded that it’s going to take something like removing 500 intact objects over the next 100 years in order to stabilize the Low Earth Orbit environment again. That works out to five objects per year for the next century, which at least seems achievable, right? The challenge though is that there’s no easy way to remove space debris. HK: We need to approach the object that are not under control anymore, and attach to them, dock with them, rendezvous them, capture them somehow, and then get rid of them in a controlled way. You can imagine this is not so easy. Experts are working on ways to remove debris, and there are several promising ideas in early development. There are reusable concepts like tethers and space tugs which can grab multiple objects per launch, which saves money. There are ground- or space-based lasers which can deorbit objects by kind of shooting them down, but these face political challenges. There are actually active satellites in space right now, the University of Surrey is controlling a spacecraft called RemoveDEBRIS which will use a harpoon to grab on to debris, that’s promising. And there’s another single-use option like ESA’s e.Deorbit, currently planned to retrieve and deorbit ENVISAT in 2023. Many of these ideas aren’t scalable, though, that’s the problem, they’re expensive and complicated, and missions like these are almost completely unprecedented. The pressure is on, though, because Kessler Syndrome isn’t waiting, and the consequences for space infrastructure are dire. HK: Today only half of the satellites actually disappear from space within the 25 years that are recommended as the maximum on orbit time. We still have five explosions every year. If we continue and not improve the way we do spaceflight, then in a few decades some regions of space might not be useable anymore for spaceflight, or it might be much too risky to go there. And that might mean that we either lose services from space that we rely on today, or they get more expensive. AI: Do you think something like Kessler Syndrome is inevitable? Are you optimistic that this can be managed properly, or do you think this is an inevitable issue for a spacefaring society? HK: I think it can be managed, it can be managed. I do believe it’s time for young people to take charge and there’s a lot of work to be done, and there’s enough people involved today that I’m confident that it’s going to be done. Much like other environmental and generational problems, Kessler Syndrome is invisible to us. When you look up at the night sky, you don’t see collisions and explosions and fragments of debris. If you’re lucky and the conditions are right, you might see one white speck drifting across the sky, a tiny testament to humankind’s highest collective ambitions. But that speck is at risk, along with all it represents, if we don’t address this invisible problem — because Kessler Syndrome isn’t waiting.

#### Kessler syndrome ensures extinction---satellites solve every impact. It’s specifically key to military readiness.

George Dvorsky 15. Senior Staff reporter at Gizmodo. "What Would Happen If All Our Satellites Were Suddenly Destroyed?" <https://io9.gizmodo.com/what-would-happen-if-all-our-satellites-were-suddenly-d-1709006681>.

Lastly, there’s the [Kessler Syndrome](http://www.spacesafetymagazine.com/space-debris/kessler-syndrome/) to consider. This scenario was portrayed in the 2013 film Gravity. In the movie, a Russian missile strike on a defunct satellite inadvertently causes a cascading chain reaction that formed an ever-growing cloud of orbiting space debris. Anything in the cloud’s wake — including satellites, space stations, and astronauts — gets annihilated. Disturbingly, the Kessler Syndrome is a very real possibility, and the likelihood of it happening [is steadily increasing as more stuff gets thrown into space](http://io9.com/how-to-clean-up-deadly-space-junk-before-disaster-strik-1443463338). Given these grim prospects, it’s fair to ask what might happen to our civilization if any of these things happened. At the risk of gross understatement, the complete loss of our satellite fleet would instigate a tremendous disruption to our current mode of technological existence — disruptions that would be experienced in the short, medium, and long term, and across multiple [domains](https://io9.gizmodo.com/what-would-happen-if-all-our-satellites-were-suddenly-d-1709006681). Compromised Communications Almost immediately we’d notice a dramatic reduction in our ability to communicate, share information, and conduct transactions. “If our communications satellites are lost, then bandwidth is also lost,” [Jonathan McDowell](http://planet4589.org/) tells io9. He’s an astrophysicists and Chandra Observatory scientist who works out of the [Harvard-Smithsonian Center for Astrophysics](http://planet4589.org/jcm/cfa-www.harvard.edu). McDowell says that, with telecommunication satellites wiped out, the burden of telecommunications would fall upon undersea cables and ground-based communication systems. But while many forms of communication would disappear in an [instant](https://io9.gizmodo.com/what-would-happen-if-all-our-satellites-were-suddenly-d-1709006681), others would remain. All international calls and data traffic would have to be re-routed, placing tremendous pressure on terrestrial and undersea lines. Oversaturation would stretch the capacity of these systems to the limit, preventing many calls from going through. Hundreds of millions of Internet connections would vanish, or be severely overloaded. A similar number of cell phones would be rendered useless. In remote areas, people dependent on satellite for television, Internet, and radio would practically lose all service. “Indeed, a lot of television would suddenly disappear,” says McDowell. “A sizable portion of TV comes from cable whose companies relay programming from satellites to their hubs.” It’s important to note that we actually have a precedent for a dramatic — albeit brief — disruption in com-sat capability. Back in 1998, [there was a day in which a single satellite failed and all the world’s pagers stopped working](http://articles.latimes.com/1998/may/21/news/mn-52190). Get Out Your Paper Maps We would also lose the Global Positioning System. In the years since its inception, GPS has become ubiquitous, and a surprising number of systems have become reliant on it. “Apart from the fact that everyone has forgotten to navigate without GPS in their cars, many airplanes use GPS as well,” says McDowell. Though backup systems exist, airlines use GPS to chart the most fuel-efficient and expeditious routes. Without GPS and telecomm-sats, aircraft controllers would have tremendous difficulty communicating with and routing airplanes. Airlines would have to fall back to legacy systems and procedures. Given the sheer volume of airline traffic today, accidents would be all but guaranteed. Other affected navigation systems would include those aboard cargo vessels, supply-chain management systems, and transportation hubs driven by GPS. But GPS does more than just provide positioning — it also provides for timing. Ground-based atomic clocks can perform the same function, but GPS is increasingly being used to distribute the universal time standard via satellites. Within hours of a terminated service, any distributing networks requiring tight synchronization would start to suffer from “clock drift,” leading to serious performance issues and outright service outages. Such disruptions could affect everything from the power grid through to the financial sector. In the report, “[A Day Without Space: Economic and National Security Ramifications](http://marshall.org/wp-content/uploads/2013/08/Day-without-Space-Oct-16-2008.pdf),” Ed Morris, the Executive Director of the Office of Space Commerce at the Department of Commerce, writes: If you think it is hard to get work done when your internet connection goes out at the office, imagine losing that plus your cell [phone](https://io9.gizmodo.com/what-would-happen-if-all-our-satellites-were-suddenly-d-1709006681), TV, radio, ATM access, [credit cards](https://io9.gizmodo.com/what-would-happen-if-all-our-satellites-were-suddenly-d-1709006681), and possibly even your electricity. [...] Wireless services, especially those built to [CDMA standard](http://www.protocols.com/pbook/cellular.htm), would fail to hand off calls from one cell to the next, leading to dropped connections. Computer networks would experience slowdowns as data is pushed through finite pipelines at reduced bit rates. The same would be true for major networks for communication and entertainment, since they are all IP-based today and require ultra-precise timing to ensure digital traffic reaches its destination. The lack of effective synch would hit especially hard in banking, where the timing of transactions needs to be recorded. Credit card payments and bank accounts would likely freeze, as billions of dollars could be sucked away from businesses. A financial crash is not out of the question. The Loss of Military Capability The sudden loss of satellite capability would have a profound effect on the military. The Marshall Institute puts it this way: “Space is a critical enabler to all U.S. warfare domains,” including intelligence, navigation, communications, weather prediction, and warfare. McDowell describes satellite capability as as the “backbone” of the U.S. military. And as 21st century warfare expert [Peter W. Singer](http://www.pwsinger.com/biography.html) from [New America Foundation](https://www.newamerica.org/) tells io9, “He who controls the heavens will control what happens in the battles of Earth.” Singer summarized the military consequences of losing satellites in an email to us: Today there are some 1,100 active satellites which act as the nervous system of not just our economy, but also our military. Everything from communications to GPS to intelligence all depend on it. Potential foes have noticed, which is why Russia and China have recently begun testing a new generation of anti-satellite weapons, which in turn has sparked the U.S. military to recently budget $5 billion for various space warfare systems. What would happen if we lost access to space? Well, the battles would, as one U.S. military officer put it, take us back to the “pre digital age.” Our drones, our missiles, even our ground units wouldn’t be able to operate the way we plan. It would force a rewrite of all our assumptions of 21st century high tech war. We might have a new generation of stealthy battleships...but the loss of space would mean naval battles would in many ways be like the game of Battleship, where the two sides would struggle to even find each other. Moreover, and as McDowell explains to io9, the loss of satellite capability would have a profound effect on arms control capabilities. Space systems can monitor compliance; without them, we’d be running ~~blind~~. “The overarching consideration is that you wouldn’t really know what’s going on,” says McDowell. “Satellites provide for both global and local views of what’s happening. We would be less connected, less informed — and with considerably degraded situational awareness.” Compromised Weather Prediction and Climate Science One great thing satellites have done for us is improve our ability to forecast weather. Predicting a slight chance of cloudiness is all well and good, but some areas, like India, Pakistan, and Bangladesh, are dependent on such systems to predict potentially hazardous monsoons. And in the U.S., the NOAA has estimated that, during a typical hurricane season, weather satellites save as much as $3 billion in lives and property damage. There’s also the effect on science to consider. Much of what we know about climate change comes from satellites. As McDowell explains, the first couple of weeks without satellites wouldn’t make much of a difference. But over a ten-year span, the lack of satellites would preclude our ability to understand and monitor such things as the ozone layer, carbon dioxide levels, and the distribution of polar ice. Ground-based and balloon-driven systems would help, but much of the data we’re currently tracking would suddenly become much spottier. “We’re quite dependent on satellites for a global view of what’s happening on our planet — and at a time when we really, really need to know what’s happening,” says McDowell. It’s also worth pointing out that, without satellites, we also wouldn’t be able to monitor space weather, such as incoming space storms. Time to Recover With all the satellites gone, both governmental and private interests would work feverishly to restore space-based capabilities. Depending on the nature of the satellite-destroying event, it could take decades or more to get ourselves back to current operational standards. It would take a particularly long time to recover from a Carrington Event, which would zap many ground-based electronic systems as well. The U.S. military is already thinking along these lines, which is why it’s working on the ability to quickly send up emergency assets, such as small satellites parked in Low Earth Orbit (LEO). Cube satellites are increasingly favored, as an easy-to-launch, affordable, and effective solution — albeit a short-term one. The U.S. Operationally Responsive State Office is currently working on the concept of emergency replenishment and the ability to “rapidly deploy capabilities that are good enough to satisfy warfighter needs across the entire spectrum of operations, from peacetime through conflict.” As for getting full-sized, geostationary satellites back into orbit, that would prove to be a greater challenge. It can take years to built a new satellite, which typically requires a big, costly rocket to get it into space. Lastly, if a Kessler Syndrome wipes out the satellites, that would present an entirely different recovery scenario. According to McDowell, it would take a minimum of 11 years for LEO to clear itself of the debris cloud; any objects below 500 km (310 miles) would eventually fall back to Earth. Thus, we would only be able to start re-seeding LEO in a little over a decade following a Kessler event. Unfortunately, the area above 600 km (372 miles) would remain out of touch for a practically indefinite period of time; objects orbiting at that height tend to stay there for a long, long time. We’d probably lose this band for good — unless we manually removed the debris field, using clean-up satellites or other techniques. It’s worth noting that a single Kessler event could hit the LEO zone or the GEO zone (geosynchronous orbit) but realistically not both; LEO debris could never reach GEO, and vice versa — though a spent rocket in GTO (geosynchronous transfer orbit) or SSTO (supersynchronous transfer orbit) passes through or near both zones and could potentially affect either of them. The spent rockets in GTO do not stay too close to the GEO arc for long due to orbital perturbations, so a GEO Kessler event is very unlikely to be triggered by one of them. Suffice to say, we should probably take the prospect of a Kessler Syndrome more seriously, and be aware of what could happen if we’re no longer able to use these spaces.

#### The best studies confirm our impact – err on the side of a consensus of empirical research – our evidence assumes every skeptic.

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Consistency with influential relevant theories lends credence to the expectation that US security commitments actually can shape the strategic environment as deep engagement presupposes. But it is far from conclusive. Not all analysts endorse the theories we discussed in chapter 5. These theories make strong assumptions that states generally act rationally and focus primarily on security. Allowing misperceptions, emotions, domestic politics, desire for status, or concern for honor into the picture might alter the verdict on the strategy’s net expected effects. And to model the strategy’s expected effects we had to simplify things by selecting two mechanisms— assurance and deterrence— and examining their effects independently, thus missing potentially powerful positive interactions between them.

This chapter moves beyond theory to examine patterns of evidence. If the theoretical arguments about the security effects of deep engagement are right, what sort of evidence should we see? Two major bodies of evidence are most important: general empirical findings concerning the strategy’s key mechanisms and regionally focused research.

General Patterns of Evidence Three key questions about US security provision have received the most extensive analysis. First, do alliances such as those sustained by the United States actually deter war and increase security? Second, does such security provision actually hinder nuclear proliferation? And third, does limiting proliferation actually increase security?

Deterrence Effectiveness The determinants of deterrence success and failure have attracted scores of quantitative and case study tests. Much of the case study work yields a cautionary finding: that deterrence is much harder in practice than in theory, because standard models assume away the complexities of human psychology and domestic politics that tend to make some states hard to deter and might cause deterrence policies to backfire. 1 Many quantitative findings, mean- while, are mutually contradictory or are clearly not relevant to extended deterrence. But some relevant results receive broad support:

* Alliances generally do have a deterrent effect. In a study spanning nearly two centuries, Johnson and Leeds found “support for the hypothesis that defensive alliances deter the initiation of disputes.” They conclude that “defensive alliances lower the probability of international conflict and are thus a good policy option for states seeking to maintain peace in the world.” Sechser and Fuhrmann similarly find that formal defense pacts with nuclear states have significant deterrence benefits. 2 3
* The overall balance of military forces (including nuclear) between states does not appear to influence deterrence; the local balance of military forces in the specific theater in which deterrence is actually practiced, however, is key. 4
* Forward- deployed troops enhance the deterrent effect of alliances with overseas allies. 5
* Strong mutual interests and ties enhance deterrence. 6
* Case studies strongly ratify the theoretical expectation that it is easier to defend a given status quo than to challenge it forcefully: compellence (sometimes termed “coercion” or “coercive diplomacy”) is extremely hard.

The most important finding to emerge from this voluminous research is that alliances— especially with nuclear- armed allies like the United States— actually work in deterring conflict. This is all the more striking in view of the fact that what scholars call “selection bias” probably works against it. The United States is more inclined to offer— and protégés to seek— alliance rela- tionships in settings where the probability of military conflicts is higher than average. The fact that alliances work to deter conflict in precisely the situations where deterrence is likely to be especially hard is noteworthy.

More specifically, these findings buttress the key theoretical implication that if the United States is interested in deterring military challenges to the status quo in key regions, relying only on latent military capabilities in the US homeland is likely to be far less effective than having an overseas military posture. Similarly, they lend support to the general proposition that a forward deterrence posture is strongly appealing to a status quo power, because defending a given status quo is far cheaper than overturning it, and, once a favorable status quo is successfully overturned, restoring the status quo ante can be expected to be fearsomely costly. Recognizing the significance of these findings clearly casts doubt on the “wait on the sidelines and decide whether to intervene later” approach that is so strongly favored by retrenchment proponents.

The Causes of Nuclear Proliferation Matthew Kroenig highlights a number of reasons why US policymakers seek to limit the spread of nuclear weapons: “Fear that nuclear proliferation might deter [US leaders] from using military intervention to pursue their interests, reduce the effectiveness of their coercive diplomacy, trigger regional instability, undermine their alliance structures, dissipate their strategic attention, and set off further nuclear proliferation within their sphere of influence.” These are not the only reasons for concern about nuclear proliferation; also notable are the enhanced prospects of nuclear accidents and the greater risk of leakage of nuclear material to terrorists. 9 8

Do deep engagement’s security ties serve to contain the spread of nuclear weapons? The literature on the causes of proliferation is massive and faces challenges as great as any in international relations. With few cases to study, severe challenges in gathering evidence about inevitably secretive nuclear programs, and a large number of factors in play on both the demand and the supply sides, findings are decidedly mixed. Alliance relationships are just one piece of this complex puzzle, one that is hard to isolate from all the other factors in play. And empirical studies face the same selection bias problem just discussed: Nuclear powers are more likely to offer security guarantees to states confronting a serious threat and thus facing above- average incentives to acquire nuclear weapons. Indeed, alliance guarantees might be offered to states actively considering the nuclear option precisely in order to try to forestall that decision. Like a strong drug given only to very sick patients, alliances thus may have a powerful effect even if they sometimes fail to work as hoped. 10

Bearing these challenges in mind, the most relevant findings that emerge from this literature are:

* The most recent statistical analysis of the precise question at issue concludes that “security guarantees significantly reduce proliferation proclivity among their recipients.” In addition, states with such guarantees are less likely to export sensitive nuclear material and technology to other nonnuclear states. 12 11
* Case study research underscores that the complexity of motivations for acquiring nuclear weapons cannot be reduced to security: domestic politics, economic interests, and prestige all matter. 13
* Multiple independently conceived and executed recent case studies nonetheless reveal that security alliances help explain numerous allied decisions not to proliferate even when security is not always the main driver of leaders’ interest in a nuclear program. As Nuno Monteiro and Alexandre Debs stress, “States whose security goals are subsumed by their sponsors’ own aims have never acquired the bomb. … This finding highlights the role of U.S. security commitments in stymieing nuclear proliferation: U.S. protégés will only seek the bomb if they doubt U.S. protection of their core security goals.” 15 14
* Multiple independently conceived and executed recent case research projects further unpack the conditions that decrease the likelihood of allied proliferation, centering on the credibility of the alliance commitment. In addition, in some cases of prevention failure, the alliances allow the patron to influence the ally’s nuclear program subsequently, decreasing further proliferation risks. 17
* Security alliances lower the likelihood of proliferation cascades. To be sure, many predicted cascades did not occur. But security provision, mainly by the United States, is a key reason why. The most comprehensive statistical analysis finds that states are more likely to proliferate in response to neighbors when three conditions are met: (1) there is an intense security rivalry between the two countries; (2) the prospective proliferating state does not have a security guarantee from a nuclear- armed patron; and (3) the potential proliferator has the industrial and technical capacity to launch an indigenous nuclear program. 18 19 16

In sum, as Monteiro and Debs note, “Despite grave concerns that more states would seek a nuclear deterrent to counter U.S. power preponderance,” in fact “the spread of nuclear weapons decelerated with the end of the Cold War in 1989.” Their research, as well as that of scores of scholars using multiple methods and representing many contrasting theoretical perspectives, shows that US security guarantees and the counter- proliferation policy deep engagement allows are a big part of the reason why. 20

The Costs of Nuclear Proliferation General empirical findings thus lend support to the proposition that security alliances impede nuclear proliferation. But is this a net contributor to global security? Most practitioners and policy analysts would probably not even bring this up as a question and would automatically answer yes if it were raised. Yet a small but very prominent group of theorists within the academy reach a different answer: some of the same realist precepts that generate the theoretical prediction that retrenchment would increase demand for nuclear weapons also suggest that proliferation might increase security such that the net effect of retrenchment could be neutral. Most notably, “nuclear optimists” like Kenneth Waltz contend that deterrence essentially solves the security problem for all nuclear- armed states, largely eliminating the direct use of force among them. It follows that US retrenchment might generate an initial decrease in security followed by an increase as insecure states acquire nuclear capabilities, ultimately leaving no net effect on international security. 21

This perspective is countered by “nuclear pessimists” such as Scott Sagan. Reaching outside realism to organization theory and other bodies of social science research, they see major security downsides from new nuclear states. Copious research produced by Sagan and others casts doubt on the expectation that governments can be relied upon to create secure and controlled nuclear forces. The more nuclear states there are, the higher the probability that the organizational, psychological, and civil- military pathologies Sagan identifies will turn an episode like one of the numerous “near misses” he uncovers into actual nuclear use. As Campbell Craig warns, “One day a warning system will fail, or an official will panic, or a terrorist attack will be misconstrued, and the missiles will fly.” 22 23

Looking beyond these kinds of factors, it is notable that powerful reasons to question the assessment of proliferation optimists also emerge even if one assumes, as they do, that states are rational and seek only to maximize their security. First, nuclear deterrence can only work by raising the risk of nuclear war. For deterrence to be credible, there has to be a nonzero chance of nuclear use. If nuclear use is impossible, deterrence cannot be credible. It follows that every nuclear deterrence relationship depends on some probability of 24 nuclear use. The more such relationships there are, the greater the risk of nuclear war. Proliferation therefore increases the chances of nuclear war even in a perfectly rationalist world. Proliferation optimists cannot logically deny that nuclear spread increases the risk of nuclear war. Their argument must be that the security gains of nuclear spread outweigh this enhanced risk.

Estimating that risk is not simply a matter of pondering the conditions under which leaders will choose to unleash nuclear war. Rather, as Schelling established, the question is whether states will run the risk of using nuclear weapons. Nuclear crisis bargaining is about a “competition in risk taking.” Kroenig counts some twenty cases in which states—including prominently the United States—ran real risks of nuclear war in order to prevail in crises. As Kroenig notes, “By asking whether states can be deterred or not … proliferation optimists are asking the wrong question. The right question to ask is: what risk of nuclear war is a specific state willing to run against a particular opponent in a given crisis?” The more nuclear- armed states there are, the more the opportunities for such risk- taking and the greater the probability of nuclear use. 27 26 25

#### Pursuit inevitable – decline causes global war.

Michael Beckley 15. Michael Beckley is a research fellow in the International Security Program at Harvard Kennedy School’s Belfer Center for Science and International Affairs., “The Myth of Entangling Alliances Michael Beckley Reassessing the Security Risks of U.S. Defense Pacts”, <http://live.belfercenter.org/files/IS3904_pp007-048.pdf>

The finding that U.S. entanglement is rare has important implications for international relations scholarship and U.S. foreign policy. For scholars, it casts doubt on classic theories of imperial overstretch in which great powers exhaust their resources by accumulating allies that free ride on their protection and embroil them in military quagmires.22 The U.S. experience instead suggests that great powers can dictate the terms of their security commitments and that allies often help their great power protectors avoid strategic overextension.

For policy, the rarity of U.S. entanglement suggests that the United States’ current grand strategy of deep engagement, which is centered on a network of standing alliances, does not preclude, and may even facilitate, U.S. military restraint. Since 1945 the United States has been, by some measures, the most militarily active state in the world. The most egregious cases of U.S. overreach, however, have stemmed not from entangling alliances, but from the penchant of American leaders to define national interests expansively, to overestimate the magnitude of foreign threats, and to underestimate the costs of military intervention. Scrapping alliances will not correct these bad habits. In fact, disengaging from alliances may unleash the United States to intervene recklessly abroad while leaving it without partners to share the burden when those interventions go awry.

#### For them to win an impact turn, they need to defend and robustly define their alternative to US primacy—the LIO is the best possible system

Kagan 18 - Stephen & Barbara Friedman Senior Fellow with the Project on International Order and Strategy in the Foreign Policy program at Brookings

Robert Kagan, “The World America Made—and Trump Wants to Unmake,” POLITICO Magazine, September 28, 2018, <https://politi.co/2zB3qCg>.

So, yes, the liberal order has been flawed, with its share of failure and hypocrisy. Liberal goals have sometimes been pursued by illiberal means. Power, coercion and violence have played a big part. The order has been the product of American hegemony and it has also served to reinforce that hegemony. But to note these facts is hardly to condemn the order. No order of any kind can exist without some element of hegemony. The Roman order was based on the hegemony of Rome; the British order of the 18th and 19th centuries was based on the hegemony of the Royal Navy; such order as existed briefly in Europe after the defeat of Napoleon—the so-called Concert of Europe—rested on the collective hegemony of the four victorious great powers. The idea of a peaceful, stable multipolar world where no power or powers enjoy predominance is a dream that exists only in the minds of one-world idealists and international relations theorists.

The same is true of those who would condemn the liberal world order because of the persistence of violence, coercion, hypocrisy, selfishness, stupidity and all the other evils and foibles endemic to human nature. Perhaps in the confines of academia it is possible to imagine a system of international relations where our deeply flawed humanness is removed from the equation. But in the real world, even the best and most moral of international arrangements are going to have their dark, immoral aspects.

The question is, as always, compared to what? Patrick Porter, the author of a widely discussed critique of the liberal world order, acknowledges that “if there was to be a superpower emerging from the rubble of world war in midcentury, we should be grateful it was the United States, given the totalitarian alternatives on offer. Under America’s aegis, there were islands of liberty where prosperous markets and democracies grew.” Indeed, that would seem to be the key point. At any given time there are only so many alternatives, and usually the choice is between the bad and the worse.

Are the alternatives on offer so much better now? Graham Allison, dismissing any return to the “imagined past” when the United States shaped an international liberal order, proposes that we instead make the world “safe for diversity” and accommodate ourselves to “the reality that other countries have contrary views about governance and seek to establish their own international orders governed by their own rules.” Others, such as Peter Beinart, similarly argue that we should accommodate Russian and Chinese demands for their own spheres of interest, even if that entails the sacrifice of sovereign peoples such as Ukrainians and Taiwanese. This wonderfully diverse world would presumably be run partly by Xi Jinping, partly by Vladimir Putin, and partly, too, by the Ayatollah Khamenei and by Kim Jong Un, who would also like to establish orders governed by their own rules. We have not enjoyed such diversity since the world was run partly by Hitler, Stalin and Mussolini.

The idea that this is the solution to our problems is laughable. Porter points out American policy has led to “multiplying foreign conflicts” and put the United States “on a collision course with rivals.” Setting aside the fact that multiplying foreign conflicts and collisions between rivals is the natural state of international relations in any era, it is hard for any student of history to imagine that these problems would lessen if only we returned to the competitive multipolar world of the 19th and early 20th centuries. To suggest that there could be a world with no collisions and no foreign conflicts, if only the United States would pursue an intelligent policy, is the very opposite of realism.

Strikingly absent from all these critiques of the liberal world order, too, is any suggestion of an alternative approach. The critiques end with lists of questions that need to be answered. Allison calls for a “surge of strategic thinking.” Others call for “new thinking” about “difficult trade-offs.” Some critics even complain that so long as people continue to talk about a U.S.-dominated liberal order, it will be “impossible for us to construct a reasonable alternative for the future.”

The most the critiques will offer are suggestions that sound more like attitudes than policies. They throw around words like “realism,” “restraint” and “retrenchment.” Allison proposes that the United States “limit its efforts to ensuring sufficient order abroad.” Beinart comes closest to offering an alternative, but he clearly has not yet thought it through fully. He wants to grant other powers their spheres of interest, for instance, but he mentions only Russia and China. Does this mean Russia should be granted full sway in, say, Ukraine, the Balkans, the Baltics and the Caucuses? Should China be able to impose its will on the Philippines and Vietnam?

And what of the other great powers? Does Japan get its own sphere of interest? Does India? Do Germany, France and Britain? They all had their spheres a century ago, and of course it was the clashes over those inevitably overlapping spheres that led to all the great wars. Is Beinart suggesting we should return to that past?

Of course, we may be moving toward that world, anyway. That is the implication of Trump’s “America First” foreign policy philosophy, his attacks on “globalism” and his recent suggestion that all nations look out strictly for themselves. Trump’s speech at the U.N. was an invitation to global anarchy, a struggle of all against all. His boasting about American power put the world on notice that the United States was turning from supporter of a liberal order to rogue superpower. This breakdown may be our future, but it seems odd to choose that course as a deliberate strategy, as Allison and others seem to do. Little wonder that they don’t wish to spell out the details of their alternative but prefer to carp at the inevitable failures and imperfections of the liberal world we have. As John Hay once remarked, “Our good friends are wiser when they abuse us for what we do, than when they try to say what ought to be done.”

No honest person would deny that the liberal world order has been flawed and will continue to be flawed in the future. The League of Nations was also flawed, as was Woodrow Wilson’s vision of collective security. Yet the world would have been better had the United States joined in upholding it, given the genuine alternative. The enduring truth about the liberal world order is that, like Churchill’s comment about democracy, it is the worst system—except for all the others.

#### No offense - the era of liberalist interventionism is over in favor of realism

Posner 9/3 [Eric, professor at the University of Chicago Law School. “America's Return to Realism”. 9/3/21. https://www.project-syndicate.org/commentary/america-return-to-foreign-policy-realism-by-eric-posner-2021-09]

CHICAGO – US President Joe Biden’s speech defending the withdrawal from Afghanistan announced a decisive break with a tradition of foreign-policy idealism that began with Woodrow Wilson and reached its apex in the 1990s. While that tradition has often been called “liberal internationalism,” it also was the dominant view on the right by the end of the Cold War. The United States, according to liberal internationalists, should use military force as well as its economic power to compel other countries to embrace liberal democracy and uphold human rights.

Both in conception and in practice, American idealism rejected the Westphalian international system, in which states are forbidden to intervene in others’ internal affairs, and peace results from maintaining a balance of power. Wilson sought to replace this system with universal principles of justice, administered by international institutions. During World War II, Franklin D. Roosevelt revived these ideals in the Atlantic Charter of 1941, which declared self-determination, democracy, and human rights to be war goals.

But during the Cold War, the US pursued a resolutely “realist” foreign policy that focused on national interest and propped up or tolerated dictatorships as long as they opposed the Soviet Union. The two rivals had little use for international institutions or universal ideals except for propaganda purposes, instead using regional arrangements to knit together their allies. It was Europe that, in the 1970s, tried to advance human rights and assume a position of moral leadership to distinguish itself from the goliaths to its east and west.

America’s commitment to human rights began at a moment of weakness. In the wake of the military and moral disaster of Vietnam, President Jimmy Carter and the US Congress sought to infuse American foreign policy with a moral center and reached for the language of human rights. President Ronald Reagan saw human rights as a convenient rhetorical cudgel for clobbering the Soviet Union. But both presidents continued to support dictatorships that served US security interests, and neither used military force to advance humanitarian ideals. The era of US-led humanitarian intervention would have to await the end of the Cold War.

The rhetoric outstripped the reality, but reality did change. As the sole global hegemon, the US embarked on a large number of wars, big and small, involving a confusing mélange of hard-nosed security interests and idealistic rhetoric. In Panama, Somalia, Yugoslavia (twice), Iraq (twice), Libya, Afghanistan, and elsewhere, the US launched military interventions on both national-security and humanitarian grounds.

The nonintervention in the Rwandan genocide of 1994 may have been the most consequential (non)event of this period, because it was reinterpreted with the benefit of hindsight as a missed opportunity to use military force to save hundreds of thousands of lives. The debacle was used to justify the wars in Afghanistan and Iraq, and to urge US military intervention in Sudan in the early 2000s, which President George W. Bush’s administration wisely resisted, despite mass killings that amounted to another genocide.

All of this led to an extraordinary burst of interest in international law and legal institutions. Multiple international tribunals were created, leading to the establishment of a permanent International Criminal Court. Human rights treaties and institutions were revived and strengthened. Principles of humanitarian intervention were advanced, including the now-forgotten “responsibility to protect.” Every Western university nowadays has a human rights center of some sort that is a testament to the idealism of that era.

It was already clear that President Donald Trump repudiated this tradition of humanitarian or quasi-humanitarian military intervention, but Biden’s forceful renunciation of it is somewhat surprising. In his speech, he repeatedly emphasized the importance of identifying and defending America’s “vital national interest.” The word “national” is key, and Biden wasn’t subtle:

“If we had been attacked on September 11, 2001, from Yemen instead of Afghanistan, would we have ever gone to war in Afghanistan? Even though the Taliban controlled Afghanistan in the year 2001? I believe the honest answer is no. That’s because we had no vital interest in Afghanistan other than to prevent an attack on America’s homeland and our friends. And that’s true today.”

America had no vital interest in introducing democracy to Afghanistan, in helping women escape a medieval theological regime, in educating children, or in helping to prevent another civil war. His decision to withdraw from Afghanistan was

“about ending an era of major military operations to remake other countries. We saw a mission of counterterrorism in Afghanistan, getting the terrorists to stop the attacks, morph into a counterinsurgency, nation-building, trying to create a democratic, cohesive, and united Afghanistan. Something that has never been done over many centuries of Afghan’s [sic] history. Moving on from that mindset and those kind of large-scale troop deployments will make us stronger and more effective and safer at home.”

Biden also did say that human rights will remain “the center of our foreign policy,” and that economic tools and moral suasion can be used to advance them. This claim is in tension with his declaration that “vital national interests” should determine military intervention. Why wouldn’t vital national interests determine nonmilitary forms of intervention as well? Clearly, the role of human rights and other moral ideals in US foreign policy has been downgraded. The only question is whether the rhetoric will be toned town to match the new reality.

Of course, it was never very clear that US governments were actually motivated by humanitarian considerations. Critics often found more nefarious motives. Future historians may well argue that US foreign policy in the 1990s and 2000s was simply advancing a very ambitious vision of the national interest: America required all countries to adopt American ideals and institutions so that none would want to act against America. Or they might say that, like any empire, the US lacked the patience and wisdom to maintain a consistent stance in its treatment of its peripheries.

In any case, idealism is not actually so idealistic when a country has enough power, and the only thing that is clear now is that America doesn’t. Resistance to its post-Cold War nation-building goals took the form of international terrorism. China and Russia did not obediently embrace democracy. And much of the rest of the world has reverted to various forms of nationalism and authoritarianism.

### Framing

#### The standard is maximizing expected well-being:

#### Extinction must outweigh – moral uncertainty demands we preserve the conditions for life, even a tiny risk outweighs, and future gains in quality of life ensure it’s a prior question

Todd 17 [Ben has a 1st from Oxford in Physics and Philosophy, has published in Climate Physics, once kick-boxed for Oxford, and speaks Chinese, badly. "The case for reducing extinction risk." <https://80000hours.org/articles/extinction-risk/>] brett

In this new age, what should be our biggest priority as a civilisation? Improving technology? Helping the poor? Changing the political system? Here’s a suggestion that’s not so often discussed: our first priority should be to survive. So long as civilisation continues to exist, we’ll have the chance to solve all our other problems, and have a far better future. But if we go extinct, that’s it. Why isn’t this priority more discussed? Here’s one reason: many people don’t yet appreciate the change in situation, and so don’t think our future is at risk. Social science researcher Spencer Greenberg surveyed Americans on their estimate of the chances of human extinction within 50 years. The results found that many think the chances are extremely low, with over 30% guessing they’re under one in ten million.3 We used to think the risks were extremely low as well, but when we looked into it, we changed our minds. As we’ll see, researchers who study these issues think the risks are over one thousand times higher, and are probably increasing. These concerns have started a new movement working to safeguard civilisation, which has been joined by Stephen Hawking, Max Tegmark, and new institutes founded by researchers at Cambridge, MIT, Oxford, and elsewhere. In the rest of this article, we cover the greatest risks to civilisation, including some that might be bigger than nuclear war and climate change. We then make the case that reducing these risks could be the most important thing you do with your life, and explain exactly what you can do to help. If you would like to use your career to work on these issues, we can also give one-on-one support. Reading time: 25 minutes How likely are you to be killed by an asteroid? An overview of naturally occurring existential risks A one in ten million chance of extinction in the next 50 years — what many people think the risk is — must be an underestimate. Naturally occurring existential risks can be estimated pretty accurately from history, and are much higher. If Earth was hit by a 1km-wide asteroid, there’s a chance that civilisation would be destroyed. By looking at the historical record, and tracking the objects in the sky, astronomers can estimate the risk of an asteroid this size hitting Earth as about 1 in 5000 per century.4 That’s higher than most people’s chances of being in a plane crash (about one in five million per flight), and already about 1000-times higher than the one in ten million risk that some people estimated.5 Some argue that although a 1km-sized object would be a disaster, it wouldn’t be enough to cause extinction, so this is a high estimate of the risk. But on the other hand, there are other naturally occurring risks, such as supervolcanoes.6 All this said, natural risks are still quite small in absolute terms. An upcoming paper by Dr. Toby Ord estimated that if we sum all the natural risks together, they’re very unlikely to add up to more than a 1 in 300 chance of extinction per century.7 Unfortunately, as we’ll now show, the natural risks are dwarfed by the human-caused ones. And this is why the risk of extinction has become an especially urgent issue. A history of progress, leading to the start of the most dangerous epoch in human history If you look at history over millennia, the basic message is that for a long-time almost everyone was poor, and then in the 18th century, that changed.8 Large economic growth created the conditions in which now face anthropogenic existential risks This was caused by the industrial revolution — perhaps the most important event in history. It wasn’t just wealth that grew. The following chart shows that over the long-term, life expectancy, energy use and democracy have all grown rapidly, while the percentage living in poverty has dramatically decreased.9 Chart prepared by Luke Muehlhauser in 2017. Literacy and education levels have also dramatically increased: Image source. People also seem to become happier as they get wealthier. In The Better Angels of Our Nature, Steven Pinker argues that violence is going down.10 Individual freedom has increased, while racism, sexism and homophobia have decreased. Many people think the world is getting worse,11 and it’s true that modern civilisation does some terrible things, such as factory farming. But as you can see in the data, many important measures of progress have improved dramatically. More to the point, no matter what you think has happened in the past, if we look forward, improving technology, political organisation and freedom gives our descendants the potential to solve our current problems, and have vastly better lives.12 It is possible to end poverty, prevent climate change, alleviate suffering, and more. But also notice the purple line on the second chart: war-making capacity. It’s based on estimates of global military power by the historian Ian Morris, and it has also increased dramatically. Here’s the issue: improving technology holds the possibility of enormous gains, but also enormous risks. Each time we discover a new technology, most of the time it yields huge benefits. But there’s also a chance we discover a technology with more destructive power than we have the ability to wisely use. And so, although the present generation lives in the most prosperous period in human history, it’s plausibly also the most dangerous. The first destructive technology of this kind was nuclear weapons. Nuclear weapons: a history of near-misses Today we all have North Korea’s nuclear programme on our minds, but current events are just one chapter in a long saga of near misses. We came near to nuclear war several times during the Cuban Missile crisis alone.13 In one incident, the Americans resolved that if one of their spy planes were shot down, they would immediately invade Cuba without a further War Council meeting. The next day, a spy plane was shot down. JFK called the council anyway, and decided against invading. An invasion of Cuba might well have triggered nuclear war; it later emerged that Castro was in favour of nuclear retaliation even if “it would’ve led to the complete annihilation of Cuba”. Some of the launch commanders in Cuba also had independent authority to target American forces with tactical nuclear weapons in the event of an invasion. In another incident, a Russian nuclear submarine was trying to smuggle materials into Cuba when they were discovered by the American fleet. The fleet began to drop dummy depth charges to force the submarine to surface. The Russian captain thought they were real depth charges and that, while out of radio communication, the third world war had started. He ordered a nuclear strike on the American fleet with one of their nuclear torpedoes. Fortunately, he needed the approval of other senior officers. One, Vasili Arkhipov, disagreed, preventing war. Thanks to Vasili Arkhipov, we narrowly averted a global catastrophic risk from nuclear weapons Thank you Vasili Arkhipov. Putting all these events together, JFK later estimated that the chances of nuclear war were “between one in three and even”.14 There have been plenty of other close calls with Russia, even after the Cold War, as listed on this nice Wikipedia page. And those are just the ones we know about. Nuclear experts today are just as concerned about tensions between India and Pakistan, which both possess nuclear weapons, as North Korea.15 The key problem is that several countries maintain large nuclear arsenals that are ready to be deployed in minutes. This means that a false alarm or accident can rapidly escalate into a full-blown nuclear war, especially in times of tense foreign relations. Would a nuclear war end civilisation? It was initially thought that a nuclear blast might be so hot that it would ignite the atmosphere and make the Earth uninhabitable. Scientists estimated this was sufficiently unlikely that the weapons could be “safely” tested, and we now know this won’t happen. In the 1980s, the concern was that ash from burning buildings would plunge the Earth into a long-term winter that would make it impossible to grow crops for decades.16 Modern climate models suggest that a nuclear winter severe enough to kill everyone is very unlikely, though it’s hard to be confident due to model uncertainty.17 Even a “mild” nuclear winter, however, could still cause mass starvation.18 For this and other reasons, a nuclear war would be extremely destabilising, and it’s unclear whether civilisation could recover. How likely is a nuclear war to permanently end civilisation? It’s very hard to estimate, but it seems hard to conclude that the chance of a civilisation-ending nuclear war in the next century isn’t over 0.3%. That would mean the risks from nuclear weapons are greater than all the natural risks put together. (Read more about nuclear risks.) This is why the 1950s marked the start of a new age for humanity. For the first time in history, it became possible for a small number of decision-makers to wreak havoc on the whole world. We now pose the greatest threat to our own survival — that makes today the most dangerous point in human history. And nuclear weapons aren’t the only way we could end civilisation. How big is the risk of run-away climate change? In 2015, President Obama said in his State of the Union address that:19 “No challenge  poses a greater threat to future generations than climate change” Climate change is certainly a major risk to civilisation. The graph below shows estimates of climate sensitivity. Climate sensitivity is how much warming to expect in the long-term if CO2 concentrations double, which is roughly what’s expected within the century. Does climate change pose an existential risk? Wagner and Weitzman predict a greater than 10% chance of greater than 6 degrees celsius of warming. Image source The most likely outcome is 2-4 degrees of warming, which would be bad, but survivable. However, these estimates give a 10% chance of warming over 6 degrees, and perhaps a 1% chance of warming of 9 degrees. That would render large fractions of the Earth functionally uninhabitable, requiring at least a massive reorganisation of society. It would also probably increase conflict, and make us more vulnerable to other risks. (If you’re sceptical of climate models, then you should increase your uncertainty, which makes the situation more worrying.) So, it seems like the chance of a massive climate disaster created by CO2 is perhaps similar to the chance of a nuclear war. Researchers who study these issues think nuclear war seems more likely to result in outright extinction, due to the possibility of nuclear winter, which is why we think nuclear weapons pose an even greater risk than climate change. That said, climate change is certainly a major problem, which should raise our estimate of the risks even higher. (Read more about run-away climate change.) What new technologies might be as dangerous as nuclear weapons? The invention of nuclear weapons led to the anti-nuclear movement just a decade later in the 1960s, and the environmentalist movement soon adopted the cause of fighting climate change. What’s less appreciated is that new technologies will present further catastrophic risks. This is why we need a movement that is concerned with safeguarding civilisation in general. Predicting the future of technology is difficult, but because we only have one civilisation, we need to try our best. Here are some candidates for the next technology that’s as dangerous as nuclear weapons. In 1918-1919, over 3% of the world’s population died of the Spanish Flu.20 If such a pandemic arose today, it might be even harder to contain due to rapid global transport. What’s more concerning, though, is that it may soon be possible to genetically engineer a virus that’s as contagious as the Spanish Flu, but also deadlier, and which could spread for years undetected. That would be a weapon with the destructive power of nuclear weapons, but far harder to prevent from being used. Nuclear weapons require huge factories and rare materials to make, which makes them relatively easy to control. Designer viruses might be possible to create in a lab with a couple of biology PhDs. In fact, in 2006, The Guardian was able to receive segments of the extinct smallpox virus by mail order.21 Some terrorist groups have expressed interest in using indiscriminate weapons like these. (Read more about pandemic risks.) In fact, in 2006, The Guardian was able to receive segments of the extinct smallpox virus by mail order. Relevant experts suggest synthetic pathogens could potentially pose a global catastrophic risk. Who ordered the smallpox? Credit: The Guardian Another new technology with huge potential power is artificial intelligence. The reason that humans are in charge and not chimps is purely a matter of intelligence. Our large and powerful brains give us incredible control of the world, despite the fact that we are so much physically weaker than chimpanzees. So then what would happen if one day we created something much more intelligent than ourselves? In 2017, 350 researchers who have published peer-reviewed research into artificial intelligence at top conferences were polled about when they believe that we will develop computers with human-level intelligence: that is, a machine that is capable of carrying out all work tasks better than humans. The median estimate was that there is a 50% chance we will develop high-level machine intelligence in 45 years, and 75% by the end of the century.22 Graph of expert prediction from Grace et al: The median estimate was that there is a 50% chance we will develop high-level machine intelligence in 45 years These probabilities are hard to estimate, and the researchers gave very different figures depending on precisely how you ask the question.23 Nevertheless, it seems there is at least a reasonable chance that some kind of transformative machine intelligence is invented in the next century. Moreover, greater uncertainty means that it might come sooner than people think rather than later. What risks might this development pose? The original pioneers in computing, like Alan Turing and Marvin Minsky, raised concerns about the risks of powerful computer systems,24 and these risks are still around today. We’re not talking about computers “turning evil”. Rather, one concern is that a powerful AI system could be used by one group to gain control of the world, or otherwise be mis-used. If the USSR had developed nuclear weapons 10 years before the USA, the USSR might have become the dominant global power. Powerful computer technology might pose similar risks. Another concern is that deploying the system could have unintended consequences, since it would be difficult to predict what something smarter than us would do. A sufficiently powerful system might also be difficult to control, and so be hard to reverse once implemented. These concerns have been documented by Oxford Professor Nick Bostrom in Superintelligence and by AI pioneer Stuart Russell. Most experts think that better AI will be a hugely positive development, but they also agree there are risks. In the survey we just mentioned, AI experts estimated that the development of high-level machine intelligence has a 10% chance of a “bad outcome” and a 5% chance of an “extremely bad” outcome, such as human extinction.22 And we should probably expect this group to be positively biased, since, after all, they make their living from the technology. Putting the estimates together, if there’s a 75% chance that high-level machine intelligence is developed in the next century, then this means that the chance of a major AI disaster is 5% of 75%, which is about 4%. (Read more about risks from artificial intelligence.) People have raised concern about other new technologies, such as other forms of geo-engineering and atomic manufacturing, but they seem significantly less imminent, so are widely seen as less dangerous than the other technologies we’ve covered. You can see a longer list of existential risks here. What’s probably more concerning is the risks we haven’t thought of yet. If you had asked people in 1900 what the greatest risks to civilisation were, they probably wouldn’t have suggested nuclear weapons, genetic engineering or artificial intelligence, since none of these were yet invented. It’s possible we’re in the same situation looking forward to the next century. Future “unknown unknowns” might pose a greater risk than the risks we know today. Each time we discover a new technology, it’s a little like betting against a single number on a roulette wheel. Most of the time we win, and the technology is overall good. But each time there’s also a small chance the technology gives us more destructive power than we can handle, and we lose everything. Each new technology we develop has both unprecedented potential and perils. Image source. What’s the total risk of human extinction if we add everything together? Many experts who study these issues estimate that the total chance of human extinction in the next century is between 1 and 20%. For instance, an informal poll in 2008 at a conference on catastrophic risks found they believe it’s pretty likely we’ll face a catastrophe that kills over a billion people, and estimate a 19% chance of extinction before 2100.25 Risk At least 1 billion dead Human extinction Number killed by molecular nanotech weapons. 10% 5% Total killed by superintelligent AI. 5% 5% Total killed in all wars (including civil wars). 30% 4% Number killed in the single biggest engineered pandemic. 10% 2% Total killed in all nuclear wars. 10% 1% Number killed in the single biggest nanotech accident. 1% 0.5% Number killed in the single biggest natural pandemic. 5% 0.05% Total killed in all acts of nuclear terrorism. 1% 0.03% Overall risk of extinction prior to 2100 n/a 19% These figures are about one million times higher than what people normally think. In our podcast episode with Will MacAskill we discuss why he puts the risk of extinction this century at around 1%. In his his book The Precipice: Existential Risk and the Future of Humanity, Dr Toby Ord gives his guess at our total existential risk this century as 1 in 6 — a roll of the dice. Listen to our episode with Toby. What should we make of these estimates? Presumably, the researchers only work on these issues because they think they’re so important, so we should expect their estimates to be high (“selection bias”). But does that mean we can dismiss their concerns entirely? Given this, what’s our personal best guess? It’s very hard to say, but we find it hard to confidently ignore the risks. Overall, we guess the risk is likely over 3%. Why helping to safeguard the future could be the most important thing you can do with your life How much should we prioritise working to reduce these risks compared to other issues, like global poverty, ending cancer or political change? At 80,000 Hours, we do research to help people find careers with positive social impact. As part of this, we try to find the most urgent problems in the world to work on. We evaluate different global problems using our problem framework, which compares problems in terms of: Scale – how many are affected by the problem Neglectedness -how many people are working on it already Solvability – how easy it is to make progress If you apply this framework, we think that safeguarding the future comes out as the world’s biggest priority. And so, if you want to have a big positive impact with your career, this is the top area to focus on. In the next few sections, we’ll evaluate this issue on scale, neglectedness and solvability, drawing heavily on Existential Risk Prevention as a Global Priority by Nick Bostrom and unpublished work by Toby Ord, as well as our own research. First, let’s start with the scale of the issue. We’ve argued there’s likely over a 3% chance of extinction in the next century. How big an issue is this? One figure we can look at is how many people might die in such a catastrophe. The population of the Earth in the middle of the century will be about 10 billion, so a 3% chance of everyone dying means the expected number of deaths is about 300 million. This is probably more deaths than we can expect over the next century due to the diseases of poverty, like malaria.26 Many of the risks we’ve covered could also cause a “medium” catastrophe rather than one that ends civilisation, and this is presumably significantly more likely. The survey we covered earlier suggested over a 10% chance of a catastrophe that kills over 1 billion people in the next century, which would be at least another 100 million deaths in expectation, along with far more suffering among those who survive. So, even if we only focus on the impact on the present generation, these catastrophic risks are one of the most serious issues facing humanity. But this is a huge underestimate of the scale of the problem, because if civilisation ends, then we give up our entire future too. Most people want to leave a better world for their grandchildren, and most also think we should have some concern for future generations more broadly. There could be many more people having great lives in the future than there are people alive today, and we should have some concern for their interests. There’s a possibility that human civilization could last for millions of years, so when we consider the impact of the risks on future generations, the stakes are millions of times higher — for good or evil. As Carl Sagan wrote on the costs of nuclear war in Foreign Affairs: A nuclear war imperils all of our descendants, for as long as there will be humans. Even if the population remains static, with an average lifetime of the order of 100 years, over a typical time period for the biological evolution of a successful species (roughly ten million years), we are talking about some 500 trillion people yet to come. By this criterion, the stakes are one million times greater for extinction than for the more modest nuclear wars that kill “only” hundreds of millions of people. There are many other possible measures of the potential loss–including culture and science, the evolutionary history of the planet, and the significance of the lives of all of our ancestors who contributed to the future of their descendants. Extinction is the undoing of the human enterprise. We’re glad the Romans didn’t let humanity go extinct, since it means that all of modern civilisation has been able to exist. We think we owe a similar responsibility to the people who will come after us, assuming (as we believe) that they are likely to lead fulfilling lives. It would be reckless and unjust to endanger their existence just to make ourselves better off in the short-term. It’s not just that there might be more people in the future. As Sagan also pointed out, no matter what you think is of value, there is potentially a lot more of it in the future. Future civilisation could create a world without need or want, and make mindblowing intellectual and artistic achievements. We could build a far more just and virtuous society. And there’s no in-principle reason why civilisation couldn’t reach other planets, of which there are some 100 billion in our galaxy.27 If we let civilisation end, then none of this can ever happen. We’re unsure whether this great future will really happen, but that’s all the more reason to keep civilisation going so we have a chance to find out. Failing to pass on the torch to the next generation might be the worst thing we could ever do. So, a couple of percent risk that civilisation ends seems likely to be the biggest issue facing the world today. What’s also striking is just how neglected these risks are. Why these risks are some of the most neglected global issues Here is how much money per year goes into some important causes:28 Cause Annual targeted spending from all sources (highly approximate) Global R&D $1.5 trillion Luxury goods $1.3 trillion US social welfare $900 billion Climate change >$300 billion To the global poor >$250 billion Nuclear security $1-10 billion Extreme pandemic prevention $1 billion AI safety research $10 million As you can see, we spend a vast amount of resources on R&D to develop even more powerful technology. We also expend a lot in a (possibly misguided) attempt to improve our lives by buying luxury goods. Far less is spent mitigating catastrophic risks from climate change. Welfare spending in the US alone dwarfs global spending on climate change. But climate change still receives enormous amounts of money compared to some of these other risks we’ve covered. We roughly estimate that the prevention of extreme global pandemics receives under 300 times less, even though the size of the risk seems about the same. Research to avoid accidents from AI systems is the most neglected of all, perhaps receiving 100-times fewer resources again, at around only $10m per year. You’d find a similar picture if you looked at the number of people working on these risks rather than money spent, but it’s easier to get figures for money. If we look at scientific attention instead, we see a similar picture of neglect (though, some of the individual risks receive significant attention, such as climate change): Existential risk research receives less funding than dung beetle research. Credit: Nick Bostrom Our impression is that if you look at political attention, you’d find a similar picture to the funding figures. An overwhelming amount of political attention goes on concrete issues that help the present generation in the short-term, since that’s what gets votes. Catastrophic risks are far more neglected. Then, among the catastrophic risks, climate change gets the most attention, while issues like pandemics and AI are the most neglected. This neglect in resources, scientific study and political attention is exactly what you’d expect to happen from the underlying economics, and are why the area presents an opportunity for people who want to make the world a better place. First, these risks aren’t the responsibility of any single nation. Suppose the US invested heavily to prevent climate change. This benefits everyone in the world, but only about 5% of the world’s population lives in the US, so US citizens would only receive 5% of the benefits of this spending. This means the US will dramatically underinvest in these efforts compared to how much they’re worth to the world. And the same is true of every other country. This could be solved if we could all coordinate — if every nation agreed to contribute its fair share to reducing climate change, then all nations would benefit by avoiding its worst effects. Unfortunately, from the perspective of each individual nation, it’s better if every other country reduces their emissions, while leaving their own economy unhampered. So, there’s an incentive for each nation to defect from climate agreements, and this is why so little progress gets made (it’s a prisoner’s dilemma). And in fact, this dramatically understates the problem. The greatest beneficiaries of efforts to reduce catastrophic risks are future generations. They have no way to stand up for their interests, whether economically or politically. If future generations could vote in our elections, then they’d vote overwhelmingly in favour of safer policies. Likewise, if future generations could send money back in time, they’d be willing to pay us huge amounts of money to reduce these risks. (Technically, reducing these risks creates a trans-generational, global public good, which should make them among the most neglected ways to do good.) Our current system does a poor job of protecting future generations. We know people who have spoken to top government officials in the UK, and many want to do something about these risks, but they say the pressures of the news and election cycle make it hard to focus on them. In most countries, there is no government agency that naturally has mitigation of these risks in its remit. This is a depressing situation, but it’s also an opportunity. For people who do want to make the world a better place, this lack of attention means there are lots high-impact ways to help. What can be done about these risks? We’ve covered the scale and neglectedness of these issues, but what about the third element of our framework, solvability? It’s less certain that we can make progress on these issues than more conventional areas like global health. It’s much easier to measure our impact on health (at least in the short-run) and we have decades of evidence on what works. This means working to reduce catastrophic risks looks worse on solvability. However, there is still much we can do, and given the huge scale and neglectedness of these risks, they still seem like the most urgent issues. We’ll sketch out some ways to reduce these risks, divided into three broad categories: 1. Targeted efforts to reduce specific risks One approach is to address each risk directly. There are many concrete proposals for dealing with each, such as the following: Many experts agree that better disease surveillance would reduce the risk of pandemics. This could involve improved technology or better collection and aggregation of existing data, to help us spot new pandemics faster. And the faster you can spot a new pandemic, the easier it is to manage. There are many ways to reduce climate change, such as helping to develop better solar panels, or introducing a carbon tax. With AI, we can do research into the “control problem” within computer science, to reduce the chance of unintended damage from powerful AI systems. A recent paper, Concrete problems in AI safety, outlines some specific topics, but only about 20 people work full-time on similar research today. In nuclear security, many experts think that the deterrence benefits of nuclear weapons could be maintained with far smaller stockpiles. But, lower stockpiles would also reduce the risks of accidents, as well as the chance that a nuclear war, if it occurred, would end civilisation. We go into more depth on what you can do to tackle each risk within our problem profiles: AI safety Pandemic prevention Nuclear security Run-away climate change We don’t focus on naturally caused risks in this section, because they’re much less likely and we’re already doing a lot to deal with some of them. Improved wealth and technology makes us more resilient to natural risks, and a huge amount of effort already goes into getting more of these. 2. Broad efforts to reduce risks Rather than try to reduce each risk individually, we can try to make civilisation generally better at managing them. The “broad” efforts help to reduce all the threats at once, even those we haven’t thought of yet. For instance, there are key decision-makers, often in government, who will need to manage these risks as they arise. If we could improve the decision-making ability of these people and institutions, then it would help to make society in general more resilient, and solve many other problems. Recent research has uncovered lots of ways to improve decision-making, but most of it hasn’t yet been implemented. At the same time, few people are working on the issue. We go into more depth in our write-up of improving institutional decision-making. Another example is that we could try to make it easier for civilisation to rebound from a catastrophe. The Global Seed Vault is a frozen vault in the Arctic, which contains the seeds of many important crop varieties, reducing the chance we lose an important species. Melting water recently entered the tunnel leading to the vault due, ironically, to climate change, so could probably use more funding. There are lots of other projects like this we could do to preserve knowledge. Similarly, we could create better disaster shelters, which would reduce the chance of extinction from pandemics, nuclear winter and asteroids (though not AI), while also increasing the chance of a recovery after a disaster. Right now, these measures don’t seem as effective as reducing the risks in the first place, but they still help. A more neglected, and perhaps much cheaper option is to create alternative food sources, such as those that be produced without light, and could be quickly scaled up in a prolonged winter. Since broad efforts help even if we’re not sure about the details of the risks, they’re more attractive the more uncertain you are. As you get closer to the risks, you should gradually reallocate resources from broad to targeted efforts (read more). We expect there are many more promising broad interventions, but it’s an area where little research has been done. For instance, another approach could involve improving international coordination. Since these risks are caused by humanity, they can be prevented by humanity, but what stops us is the difficulty of coordination. For instance, Russia doesn’t want to disarm because it would put it at a disadvantage compared to the US, and vice versa, even though both countries would be better off if there were no possibility of nuclear war. However, it might be possible to improve our ability to coordinate as a civilisation, such as by improving foreign relations or developing better international institutions. We’re keen to see more research into these kinds of proposals. Mainstream efforts to do good like improving education and international development can also help to make society more resilient and wise, and so also contribute to reducing catastrophic risks. For instance, a better educated population would probably elect more enlightened leaders (cough), and richer countries are, all else equal, better able to prevent pandemics — it’s no accident that Ebola took hold in some of the poorest parts of West Africa. But, we don’t see education and health as the best areas to focus on for two reasons. First, these areas are far less neglected than the more unconventional approaches we’ve covered. In fact, improving education is perhaps the most popular cause for people who want to do good, and in the US alone, receives 800 billion dollars of government funding, and another trillion dollars of private funding. Second, these approaches have much more diffuse effects on reducing these risks — you’d have to improve education on a very large scale to have any noticeable effect. We prefer to focus on more targeted and neglected solutions.

#### Anticipating nuclear extinction breeds empathy and entangled care. Distancing ourselves from considering extinction reifies detached elitism.

Offord, 17—Faculty of Humanities, School of Humanities Research and Graduate Studies, Bentley Campus (Baden, “BEYOND OUR NUCLEAR ENTANGLEMENT,” Angelaki, 22:3, 17-25, dml) [ableist language modifications denoted by brackets]

You are steered towards overwhelming and inexplicable pain when you consider the nuclear entanglement that the species Homo sapiens finds itself in. This is because the fact of living in the nuclear age presents an existential, aesthetic, ethical and psychological challenge that defines human consciousness. Although an immanent threat and ever-present danger to the very existence of the human species, living with the possibility of nuclear war has infiltrated the matrix of modernity so profoundly as to paralyse [shut down] our mind-set to respond adequately. We have chosen to ignore the facts at the heart of the nuclear program with its dangerous algorithm; we have chosen to live with the capacity and possibility of a collective, pervasive and even planetary-scale suicide; and the techno-industrial-national powers that claim there is “no immediate danger” ad infinitum.8

This has led to one of the key logics of modernity's insanity. As Harari writes: “Nuclear weapons have turned war between superpowers into a mad act of collective suicide, and therefore forced the most powerful nations on earth to find alternative and peaceful ways to resolve conflicts.”9 This is the nuclear algorithm at work, a methodology of madness. In revisiting Jacques Derrida in “No Apocalypse, Not Now (Full Speed Ahead, Seven Missiles, Seven Missives),”10 who described nuclear war as a “non-event,” it is clear that the pathology of the “non-event” remains as active as ever even in the time of Donald Trump and Kim Jong-un with their stichomythic nuclear posturing.

The question of our times is whether we have an equal or more compelling capacity and willingness to end this impoverished but ever-present logic of pain and uncertainty. How not simply to bring about disarmament, but to go beyond this politically charged, as well as mythological and psychological nuclear algorithm? How to find love amidst the nuclear entanglement; the antidote to this entanglement? Is it possible to end the pathology of power that exists with nuclear capacity? Sadly, the last lines of Nitin Sawhney's “Broken Skin” underscore this entanglement:

Just 5 miles from India's nuclear test site

Children play in the shade of the village water tank

Here in the Rajasthan desert people say

They're proud their country showed their nuclear capability.11

As an activist scholar working in the fields of human rights and cultural studies, responding to the nuclear algorithm is an imperative. Your politics, ethics and scholarship are indivisible in this cause. An acute sense of care for the world, informed by pacifist and non-violent, de-colonialist approaches to knowledge and practice, pervades your concern. You are aware that there are other ways of knowing than those you are familiar and credentialed with. You are aware that you are complicit in the prisons that you choose to live inside,12 and that there is no such thing as an innocent bystander. You use your scholarship to shake up the world from its paralysis, abjection and amnesia; to unsettle the epistemic and structural violence that is ubiquitous to neoliberalism and its machinery; to create dialogic and learning spaces for the work of critical human rights and critical justice to take place. All this, and to enable an ethics of intervention through understanding what is at the very heart of the critical human rights impulse, creating a “dialogue for being, because I am not without the other.”13

Furthermore, as a critical human rights advocate living in a nuclear armed world, your challenge is to reconceptualise the human community as Ashis Nandy has argued, to see how we can learn to co-exist with others in conviviality and also learn to co-survive with the non-human, even to flourish. A dialogue for being requires a leap into a human rights frame that includes a deep ecological dimension, where the planet itself is inherently involved as a participant in its future. This requires scholarship that “thinks like a mountain.”14 A critical human rights approach understands that it cannot be simply human-centric. It requires a nuanced and arresting clarity to present perspectives on co-existence and co-survival that are from human and non-human viewpoints.15

Ultimately, you realise that your struggle is not confined to declarations, treaties, legislation, and law, though they have their role. It must go further to produce “creative intellectual exchange that might release new ethical energies for mutually assured survival.”16 Taking an anti-nuclear stance and enabling a post-nuclear activism demands a revolution within the field of human rights work. Recognising the entanglement of nuclearism with the Anthropocene, for one thing, requires a profound shift in focus from the human-centric to a more-than-human co-survival. It also requires a fundamental shift in understanding our human culture, in which the very epistemic and rational acts of sundering from co-survival with the planet and environment takes place. In the end, you realise, as Raimon Panikkar has articulated, “it is not realistic to toil for peace if we do not proceed to a disarmament of the bellicose culture in which we live.”17 Or, as Geshe Lhakdor suggests, there must be “inner disarmament for external disarmament.”18 In this sense, it is within the cultural arena, our human society, where the entanglement of subjective meaning making, nature and politics occurs, that we need to disarm.

It is 1982, and you are reading Jonathan Schell's The Fate of the Earth on a Sydney bus. Sleeping has not been easy over the past few nights as you reluctantly but compulsively read about the consequences of nuclear war. For some critics, Schell's account is high polemic, but for you it is more like Rabindranath Tagore: it expresses the suffering we make for ourselves. What you find noteworthy is that although Schell's scenario of widespread destruction of the planet through nuclear weaponry, of immeasurable harm to the bio-sphere through radiation, is powerfully laid out, the horror and scale of nuclear obliteration also seems surreal and far away as the bus makes its way through the suburban streets.

A few years later, you read a statement from an interview with Paul Tibbets, the pilot of “Enola Gay,” the plane that bombed Hiroshima. He says, “The morality of dropping that bomb was not my business.”19 This abstraction from moral responsibility – the denial of the implications on human life and the consequences of engagement through the machinery of war – together with the sweeping amnesia that came afterwards from thinking about the bombing of Hiroshima, are what make you become an environmental and human rights activist. You realise that what makes the nuclear algorithm work involves a politically engineered and deeply embedded insecurity-based recipe to elide the nuclear threat from everyday life. The spectre of nuclear obliteration, like the idea of human rights, can appear abstract and distant, not our everyday business. You realise that within this recipe is the creation of a moral tyranny of distance, an abnegation of myself with the other. One of modernity's greatest and earliest achievements was the mediation of the self with the world. How this became a project assisted and shaped through the military-industrial-technological-capitalist complex is fraught and hard to untangle. But as a critical human rights scholar you have come to see through that complex, and you put energies into challenging that tyranny of distance, to activate a politics, ethics and scholarship that recognises the other as integral to yourself. Ultimately, even, to see that the other is also within.20

#### Foreign policy experts are good – take in more information and clash to create self-correcting outcomes

**Brands** et. al **20** [HAL BRANDS, the Henry A. Kissinger Distinguished Professor of Global Affairs at the Johns Hopkins School of Advanced International Studies and a scholar at the American Enterprise Institute, served as Special Assistant to the Secretary of Defense in 2015-2016. PETER FEAVER, Professor of Political Science and Public Policy at Duke University, served as special adviser for strategic planning and institutional reform at the National Security Council staff in 2005-2007 and as director for defense policy and arms control in 1993-1994. WILLIAM INBODEN, William Powers, Jr., Executive Director of the Clements Center for National Security and an Associate Professor at the LBJ School of Public Affairs at the University of Texas at Austin, served at the State Department in 2002-2005 and as senior director for strategic planning on the National Security Council staff in 2005-2007, “In Defense of the Blob”, April 29th, <https://www.foreignaffairs.com/articles/united-states/2020-04-29/defense-blob>]

* Any offense they win is solved by doubling down and committing to status quo foreign policy – rejecting foreign policy expertise makes everything worse so any offense they win against primacy is offense against the alt because expertise solves and rejection makes it worse
* Turns interventions – they’re politically toxic which discourages them, but lack of expertise makes them more common
* Answers general foreign policy Ks --- american foreign policy is not monolithic or closed off to alternative perspectives --- your perspective is just wrong
* Assume the K is wrong because a century of foreign policy expertise has concluded the LIO is best

Blob theorists view the establishment as a club of like-minded elite insiders who control everything, take care of one another, and brush off challenges to conventional wisdom. In reality, the United States actually has a healthy marketplace of foreign policy ideas. Discussion over American foreign policy is loud, contentious, diverse, and generally pragmatic—and as a result, the nation gets the opportunity to learn from its mistakes, build on its successes, and improve its performance over time.

In both absolute and relative terms, the expert community dealing with foreign policy and national security in the United States is remarkably large and heterogeneous. Inside government, cadres of professionals make vast amounts of technocratic knowledge and institutional memory available to policymakers. Every department and agency with an international role has distinctive regional or functional expertise it can bring to bear. This in-house knowledge is complemented by an even larger and more diverse network of experts in the many hundreds of think tanks and contract research institutions that surround the government and offer views ranging from right to left, hawk to dove, free trader to protectionist, technocratic to ideological. Pick any policy issue and you can put together a lively debate with ease. Should the United States engage with China or contain it? Negotiate with Iran or squeeze it? Withdraw from the Middle East or redouble its efforts? Reasoned arguments on all sides are widely available, in any form you want—all supplied from within the supposedly monolithic establishment.

Moreover, unlike such communities in other leading powers, the American foreign policy establishment is connected to society rather than cut off from it, because the top several layers of U.S. national security bureaucracies are staffed by political appointees rather than civil servants. The Blob comprises government officials, outside experts, and many people who go back and forth between the two. Insiders know how government works and what is practical. Outsiders think independently. And in-and-outers bridge the gaps. Other countries simply do not have comparably large, diverse, permeable, expert communities that encourage vigorous debate over national policy—which is why, say, the caliber of U.S. debate about nuclear policy is more nuanced and better informed than in other nuclear powers, and which is why other countries would love to have such a Blob of their own.

The American foreign policy establishment, finally, is generally more pragmatic than ideological. It values prudence and security over novelty and creativity. It knows that thinking outside the box may be useful in testing policy assumptions, but the box is usually there for a reason, and so reflexively embracing the far-out option is dangerous. Its members have made many mistakes, individually and collectively, but several features of the system enforce accountability over time. Foreign policy failures, for example, are politically toxic and often spur positive change. The monumental intelligence failures that allowed the September 11 attacks to happen were followed by policy and institutional reforms that have helped prevent other mass-casualty terrorist attacks on U.S. targets for almost two decades. Early misjudgments in the Iraq war led to the adoption of a new counterinsurgency strategy that restored stability, at least for a while. The international economic imbalances and financial procedures that led to the 2008 global financial crisis were addressed by policies that contributed to a decade-long recovery.

Taken together, these virtues reinforce one another and help the United States tackle the countless national and global challenges that confront a superpower. Blob critics claim there are no meaningful arguments over U.S. foreign policy. But this is just not true. Intense disputes over the Korean War, the Vietnam War, détente and arms control, the opening to China, and policies in Central America and the Middle East were followed by battles over the Gulf War, NATO expansion, military interventions in Haiti, Somalia, and the Balkans, and the wars in Afghanistan and Iraq—not to mention heated arguments over positions toward China, Iran, North Korea, Russia, and other issues today. It is true that beneath all this controversy lies a relatively stable consensus on the value of power, alliances, and constructive global engagement. Most members of the establishment believe that global problems usually improve when the United States engages responsibly and worsen when the United States retreats. Yet that reflects not some nefarious groupthink but the wisdom of professional crowds, arrived at through painful trial and error over more than a century.

WHAT MIGHT HAVE BEEN

If the Blob is not a cabal, neither is its record one of dismal failure. Critics argue that the United States entered the 1990s in a position of great power and prestige and squandered that legacy through misguided wars and interventions, geopolitical hubris, and the aggressive pursuit of a global liberal order at the expense of the nation’s economic and security interests. But the story they tell doesn’t match what actually happened. American grand strategy did not change radically after the Cold War, because it was developed not just as a response to the Soviet challenge but to the foreign policy disasters of the 1930s and 1940s. After World War II, U.S. officials decided to maintain the nation’s primacy, thwart dangerous aggressors, and build a secure, prosperous international order in which the United States could thrive. After the Cold War, they decided to keep this strategy going, even in the absence of an immediate peer competitor.

From George H. W. Bush to Barack Obama, post–Cold War presidents worked hard to further the efforts their predecessors started, shaping an environment conducive to American interests and ideas. They promoted free trade and globalization, maintained and even expanded the country’s global network of alliances and military bases, policed the global commons, and tried to stabilize regional conflicts and promote human rights. Unchecked by great-power rivals, Washington did become more willing to use military force in the periphery on behalf of national ideals. But even then, it hardly ran amok in search of monsters to destroy, abstaining from interventions in Rwanda, the African Great Lakes, Sudan, the Caucasus, Ukraine, Myanmar, and other potential cases. The basic outlines of recent American strategy would be recognizable to officials stretching back generations, because its goal has remained constant: fostering a world guided by American leadership, rooted in American values, and protected by American power.

#### Only constructive policy debates nurture information literacy necessary for every model of politics – the process of sifting through evidence and subjecting positions to researched scrutiny is essential to managing emerging crises and information overload

Leek 16 [Danielle R. Leek, professor of communications at Grand Valley State University, “Policy debate pedagogy: a complementary strategy for civic and political engagement through service-learning,” Communication Education, 65:4, 399-405]

Through policy debate, students can develop information literacy and learn how to make critical arguments of fact. This experience is politically empowering for students who will also build confidence for political engagement. Information literacy While there are many definitions of information literacy, the term generally is understood to mean that a student is “able to recognize when information is needed , and have the ability to locate, evaluate, and use effectively the information needed” for problem- solving and decision-making (Spitzer, Eisenberg, & Lowe, 1998, p. 19). Information exists in a variety of forms, in visual data, computer graphics, sound-recordings, film, and photographs. Information is also constructed and disseminated through a wide range of sources and mediums. Therefore, “information literacy” functions as a blanket term which covers a wide range of more specific literacies. Critiques of service-learning’s knowl- edge-building power, such as those articulated by Eby (1998) and Colby (2008), are chal- lenging both the emphasis the pedagogy places on information gained through experience and the limited scope of political information students are exposed to in the process. Policy debate can augment a student’s civic and political learning by fostering extended information literacies. Snider and Schnurer (2002) identify policy debate as an especially research intensive form of oral discussion which requires extensive time and commitment to learn the dimensions of a topic. Understanding policy issues calls for contemplating a range of materials, from traditional news media publications to court proceedings, research data, and institutional propaganda. Moreover, the nature of policy debate, which involves public presentation of arguments on two competing sides of a question, motivates students to go beyond basic information to achieve a more advanced level of expertise and credibility on a topic (Dybvig & Iverson, n.d.). This type of work differs from traditional research projects where students gather only the materials needed to support their argument while neglecting contrary evidence. Instead, the “debate research process encourages a kind of holistic approach, where students need to pay attention to the critics of their argument because they will have to respond to those attacks” (Snider & Schnurer, 2002, p. 32). In today’s attention economy, cultivating a sensibility for well- rounded information gathering can also aid students in recognizing when and how the knowledge produced in their social environments can be effectively translated to specific contexts. The “cultural shift in the production of data” which has followed the emergence of Web 2.0 technologies means that all students are likely “prosumers”—that is, they consume, produce, and coproduce information online all at the same time (Scoble, 2011). Coupling service- learning with policy debate calls on students to apply information across registers of public engagement, including their own service efforts and their own public argumentation, in and outside of their debates. Information is used in the service experience, which in turn, informs the use of information in debates, where students then produce new information through their argumentation. The process is what Bruce (2008) refers to “informed learning,” or “using information in order to learn.” When individuals move from learning how to gather materials for a task to a cognitive awareness and understanding of how the information-seeking process shapes their learning, they are engaged in informed learning. Through this process, students can come to recognize that information management and credibility is deeply disciplinary and historically con- textual (Bruce & Hughes, 2010). This understanding, combined with practical experience in locating information, is a critical missing element in contemporary political engage- ment. Over 20 years ago, Graber (1994) argued that one of the biggest obstacles to political engagement was not apathy, but a gap between the way news media presents information during elections, and the type of information voters need and will listen to during electoral campaigns. The challenge extends beyond elections into policy-making, especially as younger generations continue to revise their notions of citizenship away from institutional politics towards more social forms of activism (Bennett, Wells, & Freelon, 2011). For stu- dents to effectively practice more expressive forms of citizenship they need experience managing the breadth of information available about issues they care about. As past research indicates a strong correlation between service-learning experience and the motiv- ation and desire for post-graduation service, it seems likely that students who debate about policy issues related to service areas will continue their informed learning practices after they have left the classroom (Soria & Thomas-Card, 2014). Arguing facts In addition to building information literacies, students who combine policy debate with service-learning can practice “politically relevant skills,” which will help them have confidence for political engagement in the future. As Colby (2008) explains, this confidence should be tempered by tolerance for difference and differing opinions. On the surface, debating about institutional politics might seem counterintuitive to this goal. Politicians and the press have a credibility problem among college-aged students, and this leaves younger generations less inclined to feel obligated to the state or to look to traditional modes of policy- making for social change (Bennett et al., 2011; Manning & Edwards, 2014). This lack of faith in government and media outlets also makes political argument more difficult (Klumpp, 2006). Whereas these institutions once served as authoritative and trustworthy sources of information, the credibility of legislators and journalists has decreased over the last 40 years or so. Today, politicians and pundits are viewed as political actors interested in spectacle, power, and profit rather than truth-seeking or the common good. While some political controversies are rooted in competing values, Klumpp (2006) explains that arguments about policy are more often based in fact. Indeed, when engaged in public arguments over questions of policy, people tend to “invoke the authority of facts to support their positions.” Likewise, “the governmental sphere has developed elaborate legal and deliberative processes in recognition of the power of facts as the basis for a decision.” Yet, while shared values are often quickly agreed upon, differences over fact are more difficult to resolve. Without credible institutions of authority that can disseminate facts, public deliberation requires more time, information-gathering, evaluation, and reasoning. The Bush administration’s decision to take military action in Iraq, for example, was presumably based on the “fact” that Saddam Hussein had acquired weapons of mass destruction. This has now become a classic example of poor policy-making grounded in faulty factual evidence. This shortcoming is precisely why policy debate is a valuable complement to service- learning activities. Not only can students use their developing literacies to better understand social problems, they can also learn to access a broader range of knowledge sources, thereby mitigating the absence of fact-finding from traditional institutions. Fur- thermore, policy advocacy gives students experience testing the reasoning underlying claims of fact. Issues of source credibility, analogic comparisons, and data analysis are three examples of the type of critical thinking skills that students may need to apply in order to engage a question of policy (Allen, Berkowitz, Hunt, & Louden, 1999). While the effect may be to undermine government action in some instances, in others students will gain a better understanding of when and where institutional activities can work to make change. As students gain knowledge about the relationship between institutional structures and the communities they serve, they grow confidence in their ability to engage in future conversations about policy issues. Zwarensteyn’s (2012) research high- lights these sorts of effects in high school students who engage in competitive policy debate. Zwarensteyn theorizes that even minimal increases in technical knowledge about politics can translate to significant increases in a student’s sense of self-efficacy. Many students start off feeling very insecure when it comes to their mastery of insti- tutional politics; policy debate helps overcome that insecurity. Moreover, because training in policy debate encourages students to address issues as arguments rather than partisan positions, it encourages them to engage policy-making without the hostility and incivility that often characterizes today’s political scene. Indeed, it is precisely that perceived hostility and incivility that prompts many young people to avoid politics in the first place. I do not mean to imply that students who debate about their service-learning experi- ences will draw homogenous conclusions about policies. Quite the contrary. Students who engage in service-learning still bring their personal visions and history to bear on their debates. As a result, students will often have very different opinions after engaging in a shared debate experience. More importantly, the practice of debating should operate to particularize students’ knowledge of community partners and clients, working against the destructive generalizations and power dynamics that can result when students feel privileged to serve less fortunate “others.” For civic and political engagement through service-learning to be meaningful and productive, it must do more to challenge students’ concepts of the homogenous “we” who helps “them.” Seligman (2013) argues that this civic spirit can be cultivated through the core pedagogical principle of a “shared practice,” which emphasizes the application of knowledge to purpose (p. 60). Policy debate achieves this outcome by calling on students to consider and reconsider their understanding of themselves, institutions, community, and policy every time the question “should” may arise. As Seligman writes: ... the orientation of thought to purpose (having an explanation rest at a place, a purpose) is of extreme importance. We must recognize that the orientation of thought to purpose is to recognize moving from providing a knowledge of, to providing a knowledge for. This means that in the context of encountering difference it is not sufficient to learn about (have an idea of) the other, rather it means to have ideas for certain joint purposes—for a set of “to-does.” A purpose becomes the goal towards which our explanations should be oriented. (p. 61) Put another way, policy debate challenges students “to maintain a sense of doubt and to carry on a systematic and protracted inquiry” in the process of service-learning itself (Seligman, 2013, p. 60). This is precisely the type of complex, ongoing, reflective inquiry that John Dewey had in mind. Political engagement through policy debate This essay began with a discussion of the growing attention to civic engagement programs in higher education. The national trend is to accomplish higher levels of student civic responsibility during and after their time in college through service-learning experiences tied to curricular learning objectives. A challenge for service-learning scholars and teachers is to recognize a distinction between civic activities that are accomplished by helping others and political activities that require engagement with the collective institutional structures and processes that govern social life. Both are necessary for democracy to thrive. Policy debate pedagogy can help service-learning educators accomplish these dual objectives. To call policy debate a pedagogy rather than just a style of debate is purposeful. A pedagogy is a praxis for cultivating learning in others. The pedagogy of service-learning helps students to know and engage social conditions through physical engagement with their environments and communities. Policy debate pedagogy leads students to know and engage these same social conditions while also challenging them to apply their knowledge for the purpose of political advocacy. These pedagogies are natural compliments for cul- tivating student learning. Therefore, future studies should explore how well service-learn- ing combined with policy debate can resolve concerns that policy debate alone does not go far enough to invest students with political agency (Mitchell, 1998). The present analysis suggests the potential for such an outcome is likely. Moreover, research is clear that the civic effects of service-learning as an instructional method are improved simply by increasing the amount of time spent on in-class discus- sion about the service work students do (Levesque-Bristol, Knapp, & Fisher, 2010). Policy debates related to students’ service can accomplish this goal and more. Policy debates can also facilitate the political learning students need to build their political efficacy and capacity for political engagement. Through informed learning about the political process—especially in the context of service practice—students develop literacies that will extend beyond the classroom. Using this knowledge in reasoned public argument about policy challenges invites students to move beyond cynical disengagement towards a productive recognition of their own potential voice in the political world. Policy debate pedagogy brings unique elements to the process of political learning. By emphasizing the conditional and dynamic nature of political arguments and processes, debates can work to relieve students of the misconception that there is a single “right answer” for questions about policy-making and politics, especially during election time. The communication perspective on policy debates also highlights students’ collective involvement in the ever-changing field of political terms, symbols, and meanings that constitute interpretations of our social world. In fact, the historical roots of the term “communication” seem to demand that speech and debate educators call for such emphasis on political learning. “To make common,” the Latin interpretation of communicare, situ- ates our discipline as the heart of public political affairs (Peters, 1999). Connecting policy debate to service-learning helps highlight the common purpose of these approaches in efforts to promote civic engagement in higher education.

#### Megaconstellations of satellites and frequent re-entry causes Ozone Hole 2.0

Tereza 21 [Tereza; June 07, 2021; Bachelor's in Journalism and Master's in Cultural Anthropology from Prague's Charles University, Master's in Science from the International Space University. Space.com, “Air pollution from reentering megaconstellation satellites could cause ozone hole 2.0,” <https://www.space.com/starlink-satellite-reentry-ozone-depletion-atmosphere>] brett

Chemicals released as defunct satellites burn in the atmosphere could damage Earth’s protective ozone layer if plans to build megaconstellations of tens of thousands of satellites, such as SpaceX's Starlink, go ahead as foreseen, scientists warn.

Researchers also caution that the poorly understood atmospheric processes triggered by those chemicals could lead to an uncontrolled geoengineering experiment, the consequences of which are unknown.

For years, the space community was content with the fact that the amount of material that burns in the atmosphere as a result of Earth's encounters with meteoroids far exceeds the mass of defunct satellites meeting the same fate. Even the rise of megaconstellations won't change that. The problem, however, is in the different chemical composition of natural meteoroids compared to artificial satellites, according to Aaron Boley, an associate professor of astronomy and astrophysics at the University of British Columbia, Canada.

"We have 54 tonnes (60 tons) of meteoroid material coming in every day," Boley, one of the authors of a paper published May 20 in the journal Scientific Reports, told Space.com. "With the first generation of Starlink, we can expect about 2 tonnes (2.2 tons) of dead satellites reentering Earth's atmosphere daily. But meteoroids are mostly rock, which is made of oxygen, magnesium and silicon. These satellites are mostly aluminum, which the meteoroids contain only in a very small amount, about 1%."

Related: SpaceX's Starlink satellite megaconstellation launches in photos

Uncontrolled geoengineering

The scientists realised that megaconstellations have a significant potential to change the chemistry of the upper atmosphere compared to its natural state. But not only that. The burning of aluminum is known to produce aluminum oxide, also known as alumina, which can trigger further unexplored side effects.

"Alumina reflects light at certain wavelengths and if you dump enough alumina into the atmosphere, you are going to create scattering and eventually change the albedo of the planet," Boley said.

Albedo is the measure of the amount of light that is reflected by a material. In fact, increasing Earth's albedo by pumping certain types of chemicals into the higher layers of the atmosphere has been proposed as a possible geoengineering solution that could slow down global warming. However, Boley said, the scientific community has rejected such experiments because not enough is known about their possible side effects.

"Now it looks like we are going to run this experiment without any oversight or regulation," Boley said. "We don't know what the thresholds are, and how that will change the upper atmosphere."

The Cygnus re-supply vehicle, which delivers cargo to the International Space Station, burning up in the atmosphere during its reentry. (Image credit: ESA/Alexander Gerst)

Ozone hole 2.0

The aluminum from re-entering satellites also has a potential to damage the ozone layer, a problem well known to humanity, which has been successfully solved by widespread bans on the use of chlorofluorocarbons, chemicals used in the past in aerosol sprays and refrigerators.

In their paper, Boley and his colleague Michael Byers cite research by their counterparts from the Aerospace Corporation, a U.S. non-profit research organization, which identified local damage to the planet's ozone layer triggered by the passage of polluting rockets through the atmosphere.

"We know that alumina does deplete ozone just from rocket launches themselves because a lot of solid-fuel rockets use, or have, alumina as a byproduct," Boley said. "That creates these little temporary holes in the stratospheric ozone layer. That's one of the biggest concerns about compositional changes to the atmosphere that spaceflight can cause."

The ozone layer protects life on Earth from harmful UV radiation. The depletion of ozone in the stratosphere, the second lowest layer of the atmosphere extending between altitudes of approximately 7 to 40 miles (10 to 60 kilometers), led to an increased risk of cancer and eye damage for humans on Earth.

Gerhard Drolshagen, of the University of Oldenburg, Germany, who has published papers about the effects of meteoroid material on Earth, told Space.com that reentering satellites usually evaporate at altitudes between 55 and 30 miles (90 and 50 km), just above the ozone-rich stratosphere. However, he added, the particles created as a result of the satellites' burning will eventually sink to the lower layers.

Boley said that as the alumina sinks into the stratosphere, it will cause chemical reactions, which, based on existing knowledge, will likely trigger ozone destruction.

Drolshagen, who wasn't involved in the recent study, agreed that because "satellites are mostly made of aluminum, the amount of aluminum deposited in the atmosphere will certainly increase."

Concerns about the effects of aluminium oxides on the atmosphere have been cited by U.S. telecommunications operator Viasat in its request to the US Federal Communications Commision to suspend launches of SpaceX's Starlink megaconstellation until a proper environmental review of its possible impacts is conducted.

Spectacular stratospheric clouds are linked to ozone destruction. (Image credit: NASA/Lamont Poole)

Learning from past mistakes

In their study, Boley and his colleagues looked only at the effects of the first generation of the Starlink megaconstellation, which is expected to consist of 12,000 satellites. More than 1,700 of these have already been launched. As a result of SpaceX's activities (and to a lesser extent those of other constellation operators), the number of active and defunct satellites in low Earth orbit, the region of space below the altitude of 620 miles (1,000 km), has increased by 50% over the past two years, according to the paper.

"The problem is that there are now plans to launch about 55,000 satellites," Boley said. "Starlink second generation could consist of up to 30,000 satellites, then you have Starnet, which is China's response to Starlink, Amazon's Kuiper, OneWeb. That could lead to unprecedented changes to the Earth’s upper atmosphere."

Megaconstellation operators, inspired by the consumer technology model, expect fast development of new satellites and frequent replacement, thus the high amount of satellites expected to be burning in the atmosphere on a daily basis.

#### Extinction.

Skudlarek 16 [Cooper, pollution writer for L2P, “The Ozone Layer,” <https://letters2president.org/letters/24312>] brett

We have a problem- a big problem (a 518,000,000 square kilometer problem to be exact). The ozone layer is a belt of naturally occurring gas that protects us from harmful radiation and it is at risk. We need to regulate the amount of air pollution produced and fossil fuels burned to prevent the formation of ozone holes which allow radiation to seep into the troposphere.

The Earth’s stratosphere is a part of our atmosphere that houses the earth’s ozone layer. The ozone layer is a belt of naturally occurring gas called ozone (hence the name ozone layer) that sits 15 kilometers above earth’s surface and shields us from a form of a form of radiation produced by the sun known as ultraviolet B radiation. Over the next 14 years the levels of carbon dioxide seeping into our atmosphere will have increased by nearly 40 percent. According to the website Conserve Energy Future, “An essential property of ozone molecule is its ability to block solar radiations of wavelengths less than 290 nanometers from reaching Earth’s surface. In this process, it also absorbs ultraviolet radiations that are dangerous for most living beings. UV radiation could injure or kill life on Earth. Though the absorption of UV radiations warms the stratosphere but it is important for life to flourish on planet Earth. Research scientists have anticipated disruption of susceptible terrestrial and aquatic ecosystems due to depletion of ozone layer.” This means that although it is necessary to keep our planet habitable it is only helpful if we have the right amount and we have far too much.

This is a major issue because the excess radiation caused by holes in the ozone layer is allowing immense amounts of solar radiation to seep into the troposphere (where we live). If humans (or any species for that matter) are exposed to too much of this radiation, then we can develop serious skin diseases including cancer. In addition, to that if the plants at the bottom of the food chain receive too much solar radiation, then they will die out causing waves of distortion to ripple up the food chain and the catastrophic extinction of many species that are vital to our survival. Finally, the constant decay of our ozone layer is exponentially accelerating climate change. This leads to things such as: global warming, Arctic Circle thawing, stronger hurricanes, sea level rising, and more