## Fwk

#### I value Justice, meaning treating all members of society as they’re due. Since no one’s inherently worth more than another, we should maximize happiness and minimize suffering.

Young 03: Young, Iris Marion. [Professor of Political Science, University of Chicago] “Political Responsibility and Structural Injustice.” University of Kansas, May 5, 2003.

This, then, is what it means to me to say that structures are the subject of justice. Justice and injustice concern primarily an evaluation of how the institutions of a society work together to produce outcomes that support or minimize the threat of domination, and support or minimize everyone’s opportunities to develop and exercise capacities for living a good life as they define it. Social justice concerns the actions of particular individuals on the policies of particular institutions only secondarily, as these contribute to constituting structures that enable and constrain persons. Structural injustices are harms that come to people as a result of structural processes in which many people participate. These participants may well be aware that their actions contribute to the processes that produce the outcomes, but for many it is not possible to trace the specific causal relation between their particular actions and some particular part of the outcome. Some upper income urban dwellers, for example, may be aware that their decisions to buy condominiums in renovated center city buildings contributes to processes that displace lower income renters like Sandy. No one can say, however, that their decisions and actions have directly caused Sandy’s landlord to sell the building to a condo developer, thus necessitating Sandy’s apartment search. Thus I come to the main question of this essay: How should moral agents – both individual and organizational – think about their responsibilities in relation to structural social injustice? This questions presents a puzzle for two reasons that I referred in my account of social structure and structural injustice. First, although structures are produced by actions, in most cases it is not possible to trace which specific actions of which specific agents cause which specific parts of the structural processes or their outcomes. The effects of particular actions often influence one another in ways beyond the control and intention of any of the actors. Second, because it is therefore difficult for individuals to see a relationship between their own actions and structural outcomes, we have a tendency to distance ourselves from any responsibility for them. The dominant concept of responsibility, I suggest, operates on a liability model that seeks causally to connect an agent to a harm in order to assign the agent responsibility for it. Because the relation of any actions to structural outcomes cannot be assigned in that direct way, we have a tendency to conclude that those structural processes and outcomes are misfortunes rather than injustices, circumstances we must live with rather than try to change.

#### My value criterion is maximizing well-being, or utilitarianism

#### Util treats everyone equally

**Nathanson ND**, Stephen Nathanson, Professor at Northeastern University, “Act and Rule Utilitarianism” Internet Encyclopedia of Philosophy, a peer-reviewed academic resource <https://iep.utm.edu/util-a-r/> Livingston RB

To illustrate this method, suppose that you are buying ice cream for a party that ten people will attend. Your only flavor options are chocolate and vanilla, and some of the people attending like chocolate while others like vanilla. **As a utilitarian**, **you** should **choose** the flavor **that will result in the most pleasure** for the group as a whole. If seven like chocolate and three like vanilla and if all of them get the same amount of pleasure from the flavor they like, then you should choose chocolate. This will yield what Bentham, in a famous phrase, called “**the greatest happiness for the greatest number**.” An important point in this case is that you should choose chocolate even if you are one of the three people who enjoy vanilla more than chocolate. **The utilitarian method requires you to count everyone’s interests equally**. **You may not weigh some people’s interests**—including your own—**more heavily than others**. Similarly, if a government is choosing a policy, it should give equal consideration to the well-being of all members of the society.

#### 2] Death is bad: agents can’t act if they fear for their bodily security which constrains every ethical theory

#### 3] Only utilitarianism explains degrees of wrongness—breaking a promise to meet for lunch is not as bad as breaking a promise to take a dying person to the hospital1

#### I affirm the resolution, the appropriation of outer space by private entities is unjust.

#### Appropriation in the context of the resolution defintion

Leon 18 (Amanda M., Associate, Caplin & Drysdale, JD UVA Law) "Mining for Meaning: An Examination of the Legality of Property Rights in Space Resources." Virginia Law Review, vol. 104, no. 3, May 2018, p. 497-547. HeinOnline.

Appropriation. The term "appropriation" also remains ambiguous. Webster's defines the verb "appropriate" as "to take to oneself in exclusion of others; to claim or use as by an exclusive or pre-eminent right; as, let no man appropriate a common benefit."16 5 Similarly, Black's Law Dictionary describes "appropriate" as an act "[t]o make a thing one's own; to make a thing the subject of property; to exercise dominion over an object to the extent, and for the purpose, of making it subserve one's own proper use or pleasure."166 Oftentimes, appropriation refers to the setting aside of government funds, the taking of land for public purposes, or a tort of wrongfully taking another's property as one's own. The term appropriation is often used not only with respect to real property but also with water. According to U.S. case law, a person completes an appropriation of water by diversion of the water and an application of the water to beneficial use.167 This common use of the term "appropriation" with respect to water illustrates two key points: (1) the term applies to natural resources-e.g., water or minerals-not just real property, and (2) mining space resources and putting them to beneficial use-e.g., selling or manufacturing the mined resources could reasonably be interpreted as an "appropriation" of outer space. While the ordinary meaning of "appropriation" reasonably includes the taking of natural resources as well as land, whether the drafters and parties to the OST envisioned such a broad meaning of the term remains difficult to determine with any certainty. The prohibition against appropriation "by any other means" supports such a reading, though, by expanding the prohibition to other types not explicitly described.168

## Developing Countries

#### Outer space houses tons of valuable resources, it’s about who can get there first

**Blair 15**, Brad Blair, Expert in commercial space law, Winter 2015, "Space Mineral Resources," National Space Society - Working to Create a Spacefaring Civilization, <https://space.nss.org/space-mineral-resources/> Livingston RB

**A recently released study** by the International Academy of Astronautics (IAA) **found that space mineral resources** (SMR) **can serve as an economic gamechang**er, **opening a vast new source of wealth to benefit humanity**. The study examined technical, economic, legal, and policy-related requirements to enable SMR, and offered specific recommendations to international space agencies and commercial enterprise for moving humanity forward into a new era of space settlement and commercial resource development. The study was assembled by two prominent space lawyers. Art Dula is a professor of law at the Houston Law School, trustee of the Heinlein Prize Trust, and founder of Excalibur Exploration Limited. Zhang Zhenjun is secretary general of the China Institute of Space Law, a resident director of the Chinese Society of Astronautics, and holds an MBA from George Washington University. The work solicited and included extensive input by entrepreneurial startup companies including Deep Space Industries, Shackleton Energy Company, Planetary Resources, Excalibur Exploration, Moon Express, and Tethers Unlimited. Study findings on SMR technology and engineering design are that **mining asteroids and lunar regolith is within reach of the current state of the technical art.** The extrapolation of Earth-based mining appears to be a one-for-one trade with alterations due to vacuum, low gravity, and temperature, with bench and lab-scale testing to date in private and government labs on Earth affirming this conclusion. Indeed, the primary roadblocks to SMR today are more intimately related to reducing market, legal, and financial risk. A focus on customers, demographics, and increasing market certainty is needed to create a solid foundation for the future of space enterprise. The study found that the cost to develop Moon or asteroid water sources could become significantly lower than the delivery price from Earth, especially as distance increases, making space water a potential basis for future currency. Indeed, establishing spaceports and selling water mined in space is a key to unlocking a robust and sustainable space economy, enabling human expansion into the Solar System.

#### The private sector is responsible for the majority of space resource grabbing

Layne 19 – Freelance reporter for outlets including MIT Technology Review and Fortune and previous faculty advisor at Emerson College. Fellow at Columbia University. [Rachel, “Space case: Why reaching for the stars could soon be a $1 trillion industry”, CBS News, 7/16/19, [https://www.cbsnews.com/news/space-is-a-more-than-400-billion-market-and-getting-bigger/]//AV](https://www.cbsnews.com/news/space-is-a-more-than-400-billion-market-and-getting-bigger/%5d//AV)

Half a century after [Neil Armstrong first stepped foot on the moon](https://www.cbsnews.com/news/apollo-11-moon-landing-anniversary-nasa-legends-remember-the-nerve-wracking-moments/), the final frontier is no longer the exclusive domain of governments, or even gazillionaire entrepreneurs. While the race for commercial space travel grabs headlines, a potentially lucrative industry is also starting to take off. Here's why some experts think space could soon become a $1 trillion business. Governments and companies worldwide spent a record $415 billion last year on everything from satellite-based entertainment to real-time services such as mapping and weather forecasting -- notably, private businesses account for nearly 80% of that spending, [according](https://www.spacefoundation.org/news/space-report-reveals-2018-global-space-economy-exceeded-400-billion-first-time) to the nonprofit Space Foundation. More than half of that money went into satellite services and products like entertainment, with about a quarter for infrastructure such as satellite launch vehicles. Commercial space investment is up 79% since 2009, when Elon Musk's SpaceX launched its first commercial payload. The launch was an event that "changed everything," according to a [report](https://sbir.nasa.gov/content/publications) from private investment firm Space Angels produced for NASA's small business and technology program. Morgan Stanley analyst Adam Jonas [figures](https://www.morganstanley.com/ideas/investing-in-space) that by 2040, the market for space-related products and services will reach $1.1 trillion -- and estimate that jibes with forecasts from Goldman Sachs and Bank of America. The U.S. Chamber of Commerce is even more bullish, last fall [projecting](https://www.uschamber.com/series/above-the-fold/the-space-economy-industry-takes) what it calls the "space economy" to reach $1.5 trillion within the next two decades. Data driven. Tourist [trips](https://www.space.com/topics/space-tourism) to the International Space Station isn't what's driving growth at the moment, though the publicity stokes excitement. More important, providing entertainment services and apps that control everything from the temperature in your home to the best way to get around traffic increasingly depend on private industry's ability to zap information from outer space to earth. The business case closes in space for only a few applications right now, mostly for television and telecommunications," Matt Weinzierl, a professor at Harvard Business School who studies the [economics](https://pubs.aeaweb.org/doi/pdf/10.1257/jep.32.2.173) of space, told CBS MoneyWatch. "But the harsh reality is that the costs of transportation to and from space -- much less operation in space -- make data a uniquely feasible space product." Though U.S. government spending on the space trade is [rising](https://www.spacefoundation.org/news/us-government-investment-space-increases-10-2018-reported-new-quarterly-format-space-report), it made up just 12% of the total last year, according to the Space Foundation. Hitching a ride. Another factor driving the space investment boom is satellite "ridesharing," which lets companies put their satellite on a launch vehicle with others. That has lowered costs and invited more companies to enter the marketplace, putting more satellites into orbit. "We're only now reframing our paradigm of space and considering the potential of space to make life better on Earth," said Becki Yukman, a senior data analyst for the Space Foundation. "And like anything with a profitable bottom line, it's exploding and not liable to peter off soon," she added. Commercial space flight is regulated by the Federal Aviation Administration, just like commercial flights closer to earth. But funding for commercial satellite launch areas is shifting from the federal government to private and state entities, according to a recent [report](https://www.gao.gov/assets/700/699301.pdf) from the U.S. Government Accountability Office. So what about space travel? The industry that really captures the imagination, of course, is commercial space travel. Just last week, Richard Branson's Virgin Galactic [announced](https://www.virgingalactic.com/articles/virgin-galactic-and-social-capital-hedosophia-announce-merger-to-create-the-worlds-first-and-only-publicly-traded-commercial-human-spaceflight-company/) plans to become a publicly traded company by the end of the year. Blue Origin, run by Amazon founder Jeff Bezos, announced in May that it's building a moon lander that could put astronauts back on the surface by 2024, as well as hauling tons of cargo. Certainly, space enthusiasts are queuing up. Virgin Galactic [said](https://www.virgingalactic.com/articles/virgin-galactic-and-social-capital-hedosophia-announce-merger-to-create-the-worlds-first-and-only-publicly-traded-commercial-human-spaceflight-company/) it has reservations from more than 600 people for a ride into space and has already taken $80 million in deposits. That implies a per-flight price of $200,000, according to Morgan Stanley's Jonas. Still, the power of ordinary people blasting off may be more valuable for trumpeting space as a home for business, the Wall Street analyst wrote in a recent note. "It is difficult for us to convey the potential marketing power of sending folks into space," he said. More than billionaire thrill rides. In June, NASA [announced](https://www.federalregister.gov/documents/2019/06/12/2019-12331/agency-information-collection-activities-requests-for-comments-clearance-of-a-renewed-approval-of) it will [open the space station for commercial visitors](https://www.cbsnews.com/news/citizens-in-space-nasa-opens-space-station-to-private-sector-astronauts-commercial-visits/), ferried by Boeing and Elon Musk's SpaceX. The space agency's [blueprint](https://www.nasa.gov/leo-economy/commercial-use/introduction-to-policy) also calls for developing technology needed for research labs it can lease in the future. The NASA plan urges work to "stimulate sustainable demand" in fields from in-space manufacturing to biomedicine. Indeed, private companies have been stoked by NASA investment, as well as investment by other countries around the globe. Space Angels notes there are now 375 private companies, with $19 billion invested so far. Funding from wealthy space enthusiasts like Bezos, Musk and the [late](https://www.space.com/19333-paul-allen.html) Microsoft co-founder Paul Allen has provided momentum, with such ventures likely to get over the "tipping point" of taking paying passengers into space soon, Weinzierl predicted. "We hear so much about it in part because of the pure excitement it generates, but also because it really will mark an inflection point in the business," he said. Help wanted. More than 179,000 people are employed in the U.S. space industry, according to the Space Foundation. Of those jobs, most work in the private sector and are focused on developing and manufacturing new launchers and spacecraft. Thousands also work in areas such as satellite telecommunications and remote-sensing applications. Roughly 44,000 federal workers are in space-related fields, with about 17,000 working for NASA. But most of the growth from 2017 to 2018 was in the private sector, according to the report's compilation of figures. Europe has the next-biggest workforce, followed by India and Japan.

#### The ability to appropriate space keeps developing nations out of these valuable resources- it’s already happened with satellites

**Giacomin 19**, Nicolas Giacomin, author on space, 12-4-2019, "The Bogotá Declaration and space law," Space Legal Issues, <https://www.spacelegalissues.com/the-bogota-declaration-and-space-law/> Livingston RB

The practice of developed states **is based** on free access and priority given to the first **satellites** placed in the geostationary orbit. The placing into orbit of satellites is in accordance with the 1967 Outer Space Treaty. These satellites have the right to pursue a trajectory without interference from satellites later placed in orbit. In addition, the international regulation of the radio spectrum has favored the development of satellite telecommunications systems. Increasing congestion of the orbit and frequencies may **limit the access and opportunities of developing countries in the future**. **It will become more and more difficult** to use frequencies from the geostationary orbit under satisfactory conditions (without creating or suffering radio interference, or without incurring additional costs). Common law regime for the use of frequencies traditionally protects the first users against such interference. In this situation, new entrants must design their space telecommunication systems taking into account both the trajectory and the frequencies used by the satellites in place. Unlike the regime of orbit and outer space in general, for more than half a century, there has already been an institutionalized mechanism for access to radio frequencies. This mechanism makes it possible to coordinate the use of frequencies and thereby, prevents harmful interference between radio stations under the jurisdiction of different states. In order to avoid anarchy in this area, ITU distributes radio waves between recognized radio services. Thus, the frequencies used by the various services at the international level are determined in advance before the establishment of telecommunications stations. Any state wishing to establish a station and allocate a frequency band, must comply with the service allocation deriving from international regulations. While inter-service distribution is pre-established, the distribution among states within a given service is traditionally done according to their order of arrival: the first to notify the use of a frequency band by a station under its jurisdiction acquires a right of priority at the international level. Frequency assignments by states must be registered with the ITU. Within the latter, the International Frequency Registration Board examines the compliance of these assignments with the regulations in force and the possibility of interference with other stations already in operation. In case of conflict between an existing user registered before the International Frequency Registration Board and a newcomer, preference is given to the first one; this is sometimes described as **“first come, first served”**. Some **developing countries have argued that** the utilization of geostationary **orbit by developed countries is contrary to the 1967 Outer Space Treaty** and, in particular, to the principle of non-appropriation. For a variety of reasons, **this challenge to current practice does not really addresses the problem** of orbital saturation. First, the 1967 Outer Space Treaty and the prohibition of appropriation do not limit the use of orbital space. In addition, this instrument appears unable to provide a solution to the problem of saturation of the orbit, because it is primarily due to exogenous constraints related to the use of radio frequencies. Access to the frequency spectrum depends on International Telecommunications Law and not on space law.

#### This locks in existing global structural violence by perpetuating inequality into space

**Reinstein 99**, Ezra J. Reinstein, Owning Outer Space, 20 Nw. J. Int'l L. & Bus. 59 (1999-2000) <https://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1500&context=njilb> Livingston RB

The rights of less-developed nations create a concern that is both political and moral in character. As a matter of political reality, the less developed nations wield considerable power, due in no small part to majority voting systems in the major international regulatory bodies. Some feel, and developing nations argue, that **it is morally imperative to take the interests of the non-space-capable nations into account when designing a system of space property law.** A regime based on **the "right of grab,"** the first-come, first-served theory of property acquisition**, should be feared**. **By the time space-incapable nations develop the** technological **prowess and capital** reserves **to fund** meaningful **development of** outer **space, the earlier** space-faring **nations,** left unchecked, might already **have locked up the** most accessible and valuable **resources. Present inequities of global wealth distribution** thus **would be carried forward into** the **space** age. 38

#### Global Inequality has severe impacts that effect everyone

**Doucouliagos 17** Chris Doucouliagos, Professor of Economics, Department of Economics, Deakin Business School and Alfred Deakin Institute for Citizenship and Globalisation, Deakin University 8-6-2017, "Don't listen to the rich: inequality is bad for everyone," Conversation, <https://theconversation.com/dont-listen-to-the-rich-inequality-is-bad-for-everyone-81952> Livingston RB

A world where a few people have most of the wealth [motivates others](https://www.economist.com/blogs/economist-explains/2015/06/economist-explains-11) who are poor to strive to earn more. And when they do, they’ll [invest](http://www.jstor.org/stable/2296292?origin=JSTOR-pdf&seq=1#fndtn-page_scan_tab_contents) in businesses and other areas of the economy. That’s the argument for inequality. But it’s wrong. [**Our study**](http://business.monash.edu/__data/assets/pdf_file/0017/455111/1816inequalitymadsenislamdoucouliagos-002.pdf)**of 21 OECD countries over more than a 100 years shows income inequality actually** **restricts** people from **earning** more, **educating** themselves **and** becoming **entrepreneurs**. That flows on to businesses who in turn invest less in things like plant and equipment**. Inequality makes it harder for economies to benefit from innovation.** However, if people have access to credit or the money to move up, it can offset this effect. We measured the impact of this by looking at the number of patents for new inventions and then also looking at the Gini coefficient and the income share of the top 10%. The Gini coefficient is a measure of the distribution of income or wealth within a nation. Don’t let yourself be misled. Understand issues with help from experts. How inequality reduces innovation From 1870 to 1977, inequality measured by the Gini coefficient fell by about 40%. During this time people actually got more innovative and productivity increased, incomes also increased. **But inequality has increased in recent decades and it’s** having the opposite effect Inequality is **preventing pe**ople [with less income and wealth](https://www.jstor.org/stable/2297811?seq=1#page_scan_tab_contents) **from reaching their potential in terms of education and invention**. There’s also less [entrepreneurship](http://www.journals.uchicago.edu/doi/abs/10.1086/261876). Inequality also means **the market for new goods shrinks.** [One study](https://link.springer.com/article/10.1023/A:1009889321237) shows that if incomes are more equal among people, people who are less well off, buy more. Having this larger market for new products, incentivises companies to create new things to sell. If wealth is concentrated among only a small group of people, [it actually increases](https://www.jstor.org/stable/2937810?seq=1#page_scan_tab_contents) demand for imported luxuries and handmade products. In contrast to this, distributed incomes means more mass produced goods are manufactured. What’s been driving inequality since the 1980s is changes to economies - countries trading more with each other and advances in technology. As this happens old products and industries fade while new ones take their place. These changes have delivered significant [net benefits](http://www.pc.gov.au/research/completed/rising-protectionism/rising-protectionism.pdf) to society. **Reducing trade and innovation will only make everyone poorer.**

## Collisions

#### The appropriation of space by private entities justifies mining, which creates a slew of problems such as space debris

Boley and Byers 20 (Arron, Department of Physics and Astronomy, University of British Columbia; Michael, Department of Political Science, University of British Columbia) U.S. policy puts the safe development of space at risk, SCIENCE, 9 Oct 2020, Vol 370, Issue 6513, pp. 174-175 <https://www.science.org/doi/full/10.1126/science.abd3402> EE

Mining can generate serious operational concerns. Lunar dust is a known challenge to operations on the Moon. Any surface activity could exacerbate lunar dust migration, including by lofting dust onto trajectories that cross lunar orbits, such as that of NASA's proposed Lunar Gateway (11). Moreover, without cooperation by all actors, the limited number of useful lunar orbits could quickly become filled with space debris.

On asteroids, low escape speeds will make it difficult to prevent the loss of surface material. Even if full enclosures are used, waste material may be purposefully jettisoned. Mining could also lead to uncontrolled outbursts of volatile sublimation after the removal of surface layers. Because the asteroids targeted for mining are likely to be those with small minimum orbit intersection distances, the resulting meteoroid debris streams could threaten lunar operations as well as satellites in Earth's orbit (12). In a worst-case scenario, a trajectory change resulting from mining could eventually lead to an Earth-impact emergency.

Space missions already provide some evidence of these risks. In 2019, during the course of Japan's Hayabusa2 mission, a small impactor was used to make a crater on (162173) Ryugu (13). Some of the resulting anthropogenic meteoroids could begin reaching Earth during the 2033 apparition. In 2022, NASA will test its ability to deflect an asteroid by striking (65803) Didymos B (Dimorphos) with the Double Asteroid Redirection Test spacecraft. This impact will produce anthropogenic meteoroids, with the possibility of immediate delivery to Earth (14). Although these risks are small, they demonstrate how easily human actions can change the near-Earth environment.

#### An increase in space debris and dust from mining collides with key defense satellites

Scoles 15 Sarah Scoles [Freelance science writer, and a contributing writer at WIRED Science, with articles in places like Popular Science, the New York Times, Scientific American, Vice, Outside, and others.], 5-27-2015, "Dust from asteroid mining spells danger for satellites," New Scientist, <https://www.newscientist.com/article/mg22630235-100-dust-from-asteroid-mining-spells-danger-for-satellites/> DD AG

IF THE gold mine is too far from home, why not move it nearby? It sounds like a fantasy, but would-be miners are already dreaming up ways to drag resource-rich space rocks closer to home. Trouble is, that could threaten the web of satellites around Earth.

Asteroids are not only stepping stones for cosmic colonisation, but may contain metals like gold, platinum, iron and titanium, plus life-sustaining hydrogen and oxygen, and rocket-fuelling ammonia. Space age forty-niners can either try to work an asteroid where it is, or tug it into a more convenient orbit.

NASA chose the second option for its Asteroid Redirect Mission, which aims to pluck a boulder from an asteroid’s surface and relocate it to a stable orbit around the moon. But an asteroid’s gravity is so weak that it’s not hard for surface particles to escape into space. Now a new model warns that debris shed by such transplanted rocks could intrude where many defence and communication satellites live – in geosynchronous orbit.

According to Casey Handmer of the California Institute of Technology in Pasadena and Javier Roa of the Technical University of Madrid in Spain, 5 per cent of the escaped debris will end up in regions traversed by satellites. Over 10 years, it would cross geosynchronous orbit 63 times on average. A satellite in the wrong spot at the wrong time will suffer a damaging high-speed collision with that dust.

The study also looks at the “catastrophic disruption” of an asteroid 5 metres across or bigger. Its total break-up into a pile of rubble would increase the risk to satellites by more than 30 per cent (arxiv.org/abs/1505.03800).

That may not have immediate consequences. But as Earth orbits get more crowded with spent rocket stages and satellites, we will have to worry about cascades of collisions like the one depicted in the movie Gravity.

#### Laundry list of impacts – compromised communication, loss of military capability and more

Divorsky 15 George Divorsky [George P. Dvorsky (born May 11, 1970) is a Canadian bioethicist, transhumanist and futurist. He is a contributing editor at io9[1] and producer of the Sentient Developments blog and podcast. He was Chair of the Board for the Institute for Ethics and Emerging Technologies (IEET)[2][3] and is the founder and chair of the IEET's Rights of Non-Human Persons Program], 6-4-2015, "What Would Happen If All Our Satellites Were Suddenly Destroyed?," Gizmodo <https://gizmodo.com/what-would-happen-if-all-our-satellites-were-suddenly-d-1709006681> DD AG

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.

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 tells io9. He’s an astrophysicists and Chandra Observatory scientist who works out of the Harvard-Smithsonian Center for Astrophysics.

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, 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.

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 from New America Foundation 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:

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.”

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.

#### Collisions with high-value satellites guarantee nuclear escalation.

Egeli 21 [Sitki Egeli is an assistant professor in the Political Science and International Relations Department of Izmir University of Economics. He was previously a director for foreign affairs in Turkey’s Undersecretariat for Defense Industries (SSM) and vice president in charge of the defense and aerospace sectors of an international consulting firm.] “Space-to-Space Warfare and Proximity Operations: The Impact on Nuclear Command, Control, and Communications and Strategic Stability,” Published 25 Jun 2021, <https://www.tandfonline.com/doi/full/10.1080/25751654.2021.1942681>, VM

“Amid increased tensions, perhaps even an imminent military confrontation between **two nuclear-armed adversaries**, a high-value (for example, early-warning or strategic communication) **satellite stops functioning** or communicating **instantly and inexplicably**. SSA sensors do not pick up any anomalies. **This may be the outcome of** a technical malfunction or a natural phenomenon, such as the impact of a collision with a meteoroid or piece of **space debris small enough to have evaded detection**. Alternatively, the satellite perhaps becomes the victim of a deliberate, undetected attack. Earth-to-space kinetic, electronic, or directed energy attacks would leave behind some trails. A cyberattack, which is harder to detect and attribute, is a strong possibility. So is a stealthy attack by hostile spacecraft. In fact, the adversary is known to have experimented with ominous small spacecraft that could easily conceal or disguise themselves until conducting a final maneuver to neutralize their targets. The victim would also be aware that, especially at distant GEO and HEO altitudes, SSA is not sufficiently comprehensive to detect and give warning of all suspicious or threatening movements as they happen. As suspicions abound, decision makers are faced with hard choices. Could this perhaps be the harbinger of a wider nuclear or nonnuclear **first strike**, along with which the attacker is seeking to eliminate the **possibility of retaliation** by degrading the defender’s capacity to command, control, and communicate with its forces? Should the defender react immediately before the remaining space-enabled NC3 elements are also compromised and its control over nuclear and nonnuclear forces degrades even further? In the absence of a clear-cut picture of what actually has happened, there is a risk that impending decisions will be made on the basis of insufficient and potentially **erroneous information**, and the climate will be ripe for unfounded presumptions and predispositions. The resulting ultimatums, responses, or counteractions could **set off a dangerous cycle of escalation** and tit-for-tat actions, whereby reactions and overreactions between adversaries lead to potentially catastrophic consequences. At a minimum, heightened tension in orbit would **have the outcome of spilling down to Earth** so as to further aggravate an already tense situation.?”

#### Specifically, early warning satellites going dark signals attacks – that causes miscalc and goes nuclear.

Orwig 16 [(Jessica, MS in science and tech journalism from Texas A&M, BS in astronomy and physics from Ohio State) “Russia says a growing problem in space could be enough to spark a war,” Insider,’ January 26, 2016, <https://www.businessinsider.com/russia-says-space-junk-could-spark-war-2016-1>] [pT]

NASA has already warned that the large amount of space junk around our planet is growing beyond our control, but now a team of Russian scientists has cited another potentially unforeseen consequence of that debris: War.

Scientists estimate that anywhere from 500,000 to 600,000 pieces of human-made space debris between 0.4 and 4 inches in size are currently orbiting the Earth and traveling at speeds over 17,000 miles per hour.

If one of those pieces smashed into a military satellite it "may provoke political or even armed conflict between space-faring nations," Vitaly Adushkin, a researcher for the Institute of Geosphere Dynamics at the Russian Academy of Sciences, reported in a paper set to be published in the peer-reviewed journal Acta Astronautica, which is sponsored by the International Academy of Astronautics.

Say, for example, that a satellite was destroyed or significantly damaged in orbit — something that a 4-inch hunk of space junk could easily do traveling at speeds of 17,500 miles per hour, Adushkin reported. (Even smaller pieces no bigger than size of a pea could cause enough damage to the satellite that it would no longer operate correctly, he notes.)

It would be difficult for anyone to determine whether the event was accidental or deliberate.

This lack of immediate proof could lead to false accusations, heated arguments and, eventually, war, according to Adushkin and his colleagues.

A politically dangerous dilemma

In the report, the Adushkin said that there have already been repeated "sudden failures" of military spacecraft in the last two decades that cannot be explained.

"So, there are two possible explanations," he wrote. The first is "unregistered collisions with space objects." The second is "machinations" [deliberate action] of the space adversary.

"This is a politically dangerous dilemma," he added.

But these mysterious failures in the past aren't what concerns Adushkin most.

It's a future threat of what experts call the cascade effect that has Adushkin and other scientists around the world extremely concerned.

The Kessler Syndrome

In 1978, American astrophysicist Donald Kessler predicted that the amount of space debris around Earth would begin to grow exponentially after the turn of the millennium.

Kessler 's predictions rely on the fact that over time, space junk accumulates. We leave most of our defunct satellites in space, and when meteors and other man-made space debris slam into them, you get a cascade of debris.

The cascade effect — also known as the Kessler Syndrome — refers to a critical point wherein the density of space junk grows so large that a single collision could set off a domino effect of increasingly more collisions.

For Kessler, this is a problem because it would "create small debris faster than it can be removed," Kessler said last year. And this cloud of junk could eventually make missions to space too dangerous.

For Adushkin, this would exacerbate the issue of identifying what, or who, could be behind broken satellites.

The future

So far, the US and Russian Space Surveillance Systems have catalogued 170,000 pieces of large space debris (between 4 and 8 inches wide) and are currently tracking them to prevent anymore dilemmas like the ones Adushkin and his colleagues cite in their paper.

But it's not just the large objects that concern Adushkin, who reported that even small objects (less than 1/3 of an inch) could damage satellites to the point they can't function properly.

Using mathematical models, Adushkin and his colleagues calculated what the situtation will be like in 200 years if we continue to leave satellites in space and make no effort to clean up the mess. They estimate we'll have:

1.5 times more fragments greater than 8 inches across

3.2 times more fragments between 4 and 8 inches across

13-20 times more smaller-sized fragments less than 4 inches across

"The number of small-size, non-catalogued objects will grow exponentially in mutual collisions," the researchers reported.

#### Nuclear war causes extinction.

Starr ’17 (Steven; director of the University of Missouri’s Clinical Laboratory Science Program, senior scientist at the Physicians for Social Responsibility, Associate member of the Nuclear Age Peace Foundation, expert in the environmental consequences of nuclear war; 1/9/17; “Turning a Blind Eye Towards Armageddon — U.S. Leaders Reject Nuclear Winter Studies”; <https://fas.org/2017/01/turning-a-blind-eye-towards-armageddon-u-s-leaders-reject-nuclear-winter-studies/>; Federation of American Scientists; accessed 11/24/18; TV) [AV]

The detonation of an atomic bomb with this explosive power will **instantly ignite fires** over a surface area of three to five square miles. In the recent studies, the scientists calculated that the **blast**, **fire**, and **radiation** from a war fought with 100 atomic bombs could produce **direct fatalities** comparable to all of those worldwide in World War II, or to those once estimated for a “**counterforce**” **nuclear war** between the superpowers. However, the **long-term environmental effects** of the war **could** significantly disrupt the global weather for at least a decade, which would likely **result in** a vast **global famine**. The scientists predicted that **nuclear firestorms** in the burning cities would cause at least five million tons of **black carbon smoke** to quickly rise above cloud level into the stratosphere, where it could not be rained out. The smoke would circle the Earth in **less than two weeks** and would form **a** global **stratospheric smoke layer** that **would remain for** more than **a decade**. The smoke would absorb warming sunlight, which would **heat the smoke** to temperatures near the boiling point of water, producing **ozone losses of** 20 to **50 percent** over populated areas. This would almost double the amount of UV-B reaching the most populated regions of the mid-latitudes, and it would create UV-B indices unprecedented in human history. In North America and Central Europe, the time required to get a painful sunburn at mid-day in June could decrease to as little as six minutes for fair-skinned individuals. As the smoke layer blocked warming sunlight from reaching the Earth’s surface, it would produce the **coldest** average **surface temperatures** in the last 1,000 years. The scientists calculated that global **food production would decrease** by 20 to **40 percent** during a five-year period following such a war. Medical experts have predicted that the shortening of growing seasons and corresponding decreases in agricultural production could cause up to **two billion** people to perish from **famine**. The climatologists also investigated the effects of a nuclear war fought with the vastly more powerful modern **thermonuclear** weapons possessed by the United States, Russia, China, France, and England. Some of the thermonuclear weapons constructed during the 1950s and 1960s were 1,000 times more powerful than an atomic bomb. During the last 30 years, the average size of thermonuclear or “strategic” nuclear weapons has decreased. Yet today, each of the approximately 3,540 strategic weapons deployed by the United States and Russia is seven to **80 times** more powerful than the atomic bombs modeled in the India-Pakistan study. The smallest strategic nuclear weapon has an explosive power of **100,000 tons of TNT**, compared to an atomic bomb with an average explosive power of 15,000 tons of TNT. Strategic nuclear weapons produce much larger nuclear firestorms than do atomic bombs. For example, a standard Russian 800-kiloton warhead, on an average day, will ignite fires covering a surface area of 90 to 152 square miles. A **war** fought with hundreds or thousands of U.S. and Russian strategic nuclear weapons would **ignite immense** **nuclear firestorms** covering land surface areas of many thousands or **tens of thousands** of square miles. The scientists calculated that these fires would produce up to **180 million tons** of black carbon soot and **smoke**, which would form a dense, **global stratospheric smoke layer**. The smoke would remain in the stratosphere for 10 to **20 years**, and it **would block** as much as **70 percent of sunlight** from reaching the surface of the Northern Hemisphere and 35 percent from the Southern Hemisphere. So much sunlight would be blocked by the smoke that the noonday sun would resemble a full moon at midnight. Under such conditions, it would only require a matter of days or weeks for daily minimum **temperatures** to **fall below freezing** in the largest agricultural areas of the Northern Hemisphere, where freezing temperatures would occur every day for a period of between one to more than two years. Average surface temperatures would become colder than those experienced 18,000 years ago at the height of the last Ice Age, and the prolonged cold would cause average rainfall to decrease by up to 90%. Growing seasons would be completely eliminated for more than a decade; it would be **too cold and dark** to grow food crops, **which would doom the** majority of the **human population.** NUCLEAR WINTER IN BRIEF The profound cold and darkness following nuclear war became known as nuclear winter and was first predicted in 1983 by a group of NASA scientists led by Carl Sagan. During the mid-1980s, a large body of research was done by such groups as the Scientific Committee on Problems of the Environment (SCOPE), the World Meteorological Organization, and the U.S. National Research Council of the U.S. National Academy of Sciences; their work essentially supported the initial findings of the 1983 studies. The idea of nuclear winter, published and supported by prominent scientists, generated extensive public alarm and put political pressure on the United States and Soviet Union to reverse a runaway nuclear arms race, which, by 1986, had created a global nuclear arsenal of more than 65,000 nuclear weapons. Unfortunately, this created a backlash among many powerful military and industrial interests, who undertook an extensive media campaign to brand nuclear winter as “bad science” and the scientists who discovered it as “irresponsible.” Critics used various uncertainties in the studies and the first climate models (which are primitive by today’s standards) as a basis to criticize and reject the concept of nuclear winter. In 1986, the Council on Foreign Relations published an article by scientists from the National Center for Atmospheric Research, who predicted drops in global cooling about half as large as those first predicted by the 1983 studies and described this as a “nuclear autumn.”