# 1NC-round 3-berkeley

## 1

#### Bipartisan anti-china momentum ensures COMPETES passes now and maintains tech leadership, but its narrow

Sayers & Kanapathy 2/15 [ Eric Sayers, a senior vice president at Beacon Global Strategies, and Ivan, a vice president at Beacon Global Strategies, both guest contributors for Foreign Policy magazine “America is Showering China with New Restrctions” https://foreignpolicy.com/2022/02/15/us-china-economic-financial-decoupling-controls-restrictions-sanctions/]

In recent years, Washington’s China policies have expanded rapidly into technology sectors such as telecommunications, semiconductors, data security, and financial services. Growing bipartisan concern about Beijing’s actions and intentions have fueled these developments, with little difference between the Trump and Biden administrations or between the White House and Congress.

The result has been a flurry of new restrictions—including on exports, imports, direct investment, and financial securities—that are fundamentally reshaping the U.S.-China economic relationship. Cross-border business travel between the United States and China, essentially halted for the past two years due to the COVID-19 pandemic, is unlikely to fully rebound because of increased caution and suspicion on both sides of the Pacific.

At the same time as this more defensive approach to economic and technology competition with China has taken root, Congress has also gone on the offensive by moving to appropriate new funding to areas deemed critical to maintaining U.S. competitive advantages in technology, manufacturing, and defense. The current depth and breadth of these approaches were hard to imagine just a few years ago. The corporate sector, besides facing increased government action with respect to doing business with China, must also contend with shifting public opinion and increased investor scrutiny—for example, on human rights issues along companies’ supply lines in China. Looking ahead, 2022 promises a continuation of these trends, which will have far-reaching impacts across multiple business sectors.

In just the last three years, Washington has enacted a raft of policy changes and regulation related to economic competition with China. In early 2018, the Trump administration applied and expanded tariffs on Chinese goods in response to Beijing’s unfair practices, including industrial subsidies, forced technology transfer, and state-sponsored intellectual property theft. Leveraging new laws passed in 2018, Washington expanded the use of export controls in defense technology, imposed stricter vetting of foreign investments in strategic U.S. industries, and restricted the procurement of equipment and services from five Chinese information technology companies, the most prominent of which was Huawei.

The pace and scope of Washington’s policymaking have accelerated in ways not previously considered possible.

In addition, U.S. border agencies shifted their sights from primarily countering terrorists to screening for nontraditional intelligence collectors—for example, journalists, researchers, and businesspeople, who are frequently used by Beijing to gather information—as well as counterfeit goods and goods produced with forced labor. Using presidential emergency powers, the Trump administration also created regimes to remove untrusted contractors from U.S. IT infrastructure projects and block Americans from investing in companies that work with the Chinese military.

To Beijing’s consternation, the Biden administration has signaled its general agreement with all these approaches—and even expanded the investment ban to include Chinese surveillance technology companies. While close U.S. allies in Europe and Asia have been reluctant to impose a similarly broad sweep of policies, the Biden administration has achieved significant rhetorical alignment on defining the challenges posed by Beijing. Under pressure from the Trump administration, several U.S. allies turned away from Huawei, blocked inbound Chinese technology investments, and held up the shipment of critical semiconductor manufacturing equipment to China. However, Europe has yet to follow the United States in imposing real costs on China for its ongoing human rights violations, even though this is a declared point of convergence between the United States and the European Union.

For its part, Congress has passed a slew of China-related bills. Among other actions, legislators have reformed inbound investment screening, forced the delisting of Chinese stocks that do not comply with U.S. accounting practices, expanded requirements for the U.S. Defense Department to list Chinese companies assisting the People’s Liberation Army, strengthened sanctions authorities in response to atrocities in Xinjiang and repression in Hong Kong, presumed that all goods produced in Xinjiang are made with forced labor (and thus banned as imports), and prohibited the federal purchase of Chinese telecommunications equipment.

While Washington mainly focused on defensive measures in recent years, Congress began in 2020 to balance its approach with a more offensive agenda. Efforts to invest in semiconductor manufacturing, accelerate the adoption of 5G telecommunications capabilities, and reorganize the National Science Foundation to focus on increasing U.S competitiveness were all added to the Senate’s U.S. Innovation and Competition Act. The House of Representatives, in turn, recently passed a similar bill—the America COMPETES Act of 2022—so the prospects for final passage of a bipartisan competitiveness bill sometime this spring look strong.

This flurry of activity raises the question of what comes next. Looming issues such as rising inflation, possible new variants of COVID-19, and Russian aggression toward Ukraine could take Washington’s attention away from China policy, at least temporarily. At the same time, there is a strong bipartisan consensus—between the White House and Congress—on China. In particular, there are five policy areas where further action appears imminent this year.

#### Space policy causes immense partisan backlash that wrecks the delicate balance

Dreier 16 [Casey Dreier, Chief Advocate & Senior Space Policy Adviser for The Planetary Society, April 13, 2016. “Does Presidential Intervention Undermine Consensus for NASA?” https://www.planetary.org/blogs/casey-dreier/2016/0413-does-a-strong-president-help-or-hurt-consensus-on-NASA.html]

To see how this happens, I recommend reading the book “[Beyond Ideology](http://smile.amazon.com/Beyond-Ideology-Politics-Principles-Partisanship/dp/0226470768/ref=smi_www_rco2_go_smi_g2243582042?_encoding=UTF8&*Version*=1&*entries*=0&ie=UTF8)” by Frances Lee. The author’s larger premise is that issues having no intrinsic relation to stated party ideology have become increasingly polarized in recent years. This is a function of the two party nature of our political system. If your party coalition wins, the other one loses. It’s [It is] zero-sum. Your party can win in one of two ways: you can make a better pitch to voters by demonstrating the superiority of your agenda; or you can undermine and stymie the agenda of the opposition party, making them unpopular with voters, and pick up the seats that they lose. Since you’re the only other political party, you gain in either scenario. I’m not sure if you’ve noticed, but the “undermine and stymie” approach has been popular for quite some time now in the U.S. Congress. Given this situation, the President and their policies naturally become the symbolic target of the opposition party. Anything promoted by the President effectively induces opposition by association. Lee demonstrates the magnitude of this induced polarization on various types of issues. For highly polarized issues like the role of government in the economy, or social issues, the impact is minimal—the opposition has already been clearly defined and generally falls into clearly defined ideologies of the Republican and Democratic parties. But for issues that do not fit readily into a predefined political ideology—like space—the induced polarization by the President can be significant. In fact, Lee showed that space, science, and technology issues incur the greatest increase in partisanship based on their inclusion in the Presidential agenda. One need only look to at the responses by political operatives of the opposing party to the strong human spaceflight proposals by [Barack Obama in 2010](http://www.shelby.senate.gov/public/index.cfm/mobile/newsreleases?ID=25F3AD2E-802A-23AD-4960-F512B9E205D2), [George W. Bush in 2004](http://www.nbcnews.com/id/3950099/ns/technology_and_science-space/t/bush-sets-new-course-moon-beyond/#.Vw3UMRMrKHo), and [George H.W. Bush in 1989](http://www.nytimes.com/1989/07/21/us/president-calls-for-mars-mission-and-a-moon-base.html) to see this reflected in recent history. This isn’t to say that Presidents can’t have a significant impact on the space program. Clearly they can. But the broad consensus needed for stability after their departure from office may be undermined by the very priority they gave it during their tenure. It what amounts to a mixed blessing for NASA, the U.S. space program does have an unusually strong bipartisan group of politicians who support the program due to NASA centers in a variety of states throughout the union. Berger notes this throughout his article, and it does, in a way, act as force that is resistant to change for good and bad. This mitigates somewhat the pure polarization seen on other science and technology issues. But for a Journey to Mars—a major effort that would, at best, require stability and significant funding over many Presidential administrations—that may not be enough. Perhaps the solution is for the next President to maintain a light touch on space. Maybe they should speak softly through the budget process, and avoid the Kennedyesque speeches and declarations to Congress that induce the types of partisanship we so dearly need to avoid.

#### Chinese tech leadership causes nuke war

Kroenig & Gopalaswamy 18, \*Associate Professor of Government and Foreign Service at Georgetown University and Deputy Director for Strategy in the Scowcroft Center for Strategy and Security at the Atlantic Council. \*\*Director of the South Asia Center at the Atlantic Council. He holds a PhD in mechanical engineering with a specialization in numerical acoustics from Trinity College, Dublin. (Matthew & Bharath, 11-12-2018, "Will disruptive technology cause nuclear war?", *Bulletin of the Atomic Scientists*, https://thebulletin.org/2018/11/will-disruptive-technology-cause-nuclear-war/)

Rather, we should think more broadly about how new technology might affect global politics, and, for this, it is helpful to turn to scholarly international relations theory. The dominant theory of the causes of war in the academy is the “bargaining model of war.” This theory identifies rapid shifts in the balance of power as a primary cause of conflict.

International politics often presents states with conflicts that they can settle through peaceful bargaining, but when bargaining breaks down, war results. Shifts in the balance of power are problematic because they undermine effective bargaining. After all, why agree to a deal today if your bargaining position will be stronger tomorrow? And, a clear understanding of the military balance of power can contribute to peace. (Why start a war you are likely to lose?) But shifts in the balance of power muddy understandings of which states have the advantage.

You may see where this is going. New technologies threaten to create potentially destabilizing shifts in the balance of power.

For decades, stability in Europe and Asia has been supported by US military power. In recent years, however, the balance of power in Asia has begun to shift, as China has increased its military capabilities. Already, Beijing has become more assertive in the region, claiming contested territory in the South China Sea. And the results of Russia’s military modernization have been on full display in its ongoing intervention in Ukraine.

Moreover, China may have the lead over the United States in emerging technologies that could be decisive for the future of military acquisitions and warfare, including 3D printing, hypersonic missiles, quantum computing, 5G wireless connectivity, and artificial intelligence (AI). And Russian President Vladimir Putin is building new unmanned vehicles while ominously declaring, “Whoever leads in AI will rule the world.”

If China or Russia are able to incorporate new technologies into their militaries before the United States, then this could lead to the kind of rapid shift in the balance of power that often causes war.

If Beijing believes emerging technologies provide it with a newfound, local military advantage over the United States, for example, it may be more willing than previously to initiate conflict over Taiwan. And if Putin thinks new tech has strengthened his hand, he may be more tempted to launch a Ukraine-style invasion of a NATO member.

Either scenario could bring these nuclear powers into direct conflict with the United States, and once nuclear armed states are at war, there is an inherent risk of nuclear conflict through limited nuclear war strategies, nuclear brinkmanship, or simple accident or inadvertent escalation.

This framing of the problem leads to a different set of policy implications. The concern is not simply technologies that threaten to undermine nuclear second-strike capabilities directly, but, rather, any technologies that can result in a meaningful shift in the broader balance of power. And the solution is not to preserve second-strike capabilities, but to preserve prevailing power balances more broadly.

## 2

#### Interpretation---“Appropriation of outer space” by private entities refers to the exercise of exclusive control of space.

TIMOTHY JUSTIN TRAPP, JD Candidate @ UIUC Law, ’13, TAKING UP SPACE BY ANY OTHER MEANS: COMING TO TERMS WITH THE NONAPPROPRIATION ARTICLE OF THE OUTER SPACE TREATY UNIVERSITY OF ILLINOIS LAW REVIEW [Vol. 2013 No. 4]

The issues presented in relation to the nonappropriation article of the Outer Space Treaty should be clear.214 The ITU has, quite blatantly, created something akin to “property interests in outer space.”215 It allows nations to exclude others from their orbital slots, even when the nation is not currently using that slot.216 This is directly in line with at least one definition of outer-space appropriation.217 [\*\*Start Footnote 217\*\*Id. at 236 (“Appropriation of outer space, therefore, is ‘the exercise of exclusive control or exclusive use’ with a sense of permanence, which limits other nations’ access to it.”) (quoting Milton L. Smith, The Role of the ITU in the Development of Space Law, 17 ANNALS AIR & SPACE L. 157, 165 (1992)). \*\*End Footnote 217\*\*]The ITU even allows nations with unused slots to devise them to other entities, creating a market for the property rights set up by this regulation.218 In some aspects, this seems to effect exactly what those signatory nations of the Bogotá Declaration were trying to accomplish, albeit through different means.219

#### Private appropriation for temporary usage or perusal is distinct from appropriation “of” outer space. Sovereign claims are still universally prohibited.

Abigail D. Pershing, J.D. Candidate @ Yale, B.A. UChicago,’19, "Interpreting the Outer Space Treaty's Non-Appropriation Principle: Customary International Law from 1967 to Today," Yale Journal of International Law 44, no. 1

II. THE FIRST SHIFT IN CUSTOMARY INTERNATIONAL LAW’S INTERPRETATION OF THE NON-APPROPRIATION PRINCIPLE Since the drafting of the Outer Space Treaty, several States have chosen to reinterpret the non-appropriation principle as narrower in scope than its drafters originally intended. This reinterpretation has gone largely unchallenged and has in fact been widely adopted by space-faring nations. In turn, this has had the effect of changing customary international law relating to the non-appropriation principle. Shifting away from its original blanket application in 1967, States have carved out an exception to the non-appropriation principle, allowing appropriation of extracted space resources.53 This Part examines this shift in the context of the two branches of the United Nation’s customary international law standard: State practice and opinio juris. A. State Practice The earliest hint of a change in customary international law relating to the interpretation of the non-appropriation clause came in 1969, when the United States first sent astronauts to the moon. As part of his historic journey, astronaut Neil Armstrong collected moonrocks that he brought back with him to Earth and promptly handed off to the National Aeronautics and Space Administration (NASA) as U.S. property.54 Later, the USSR similarly claimed lunar material as government property, some of which was eventually sold to private citizens. 55 These first instances of space resource appropriation did not draw much attention, but they presented a distinct shift marking the beginning of a new period in State practice. Having previously been limited by their technological capabilities, States could now establish new practices with respect to celestial bodies. This was the beginning of a pattern of appropriation that slowly unfolded over the next few decades and has since solidified into the general and consistent State practice necessary to establish the existence of customary international law. Currently, the U.S. government owns 842 pounds of lunar material.56 There is little question that NASA and the U.S. government consider this material, as well as other space materials collected by American astronauts, to be government property.57 In fact, NASA explicitly endorses U.S. property rights over these moon rocks, stating that “[l]unar material retrieved from the Moon during the Apollo Program is U.S. government property.”5 The U.S. delegation’s reaction to the language of the 1979 Moon Agreement further cemented this interpretation that appropriation of extracted resources is a permissible exception to the non-appropriation clause of Article II. Although the United States is not a party to the Moon Agreement, it did participate in the negotiations.59 The Moon Agreement states in relevant part: Neither the surface nor the subsurface of the moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or nongovernmental organization, national organization or nongovernmental entity or of any natural person.60 In response to this language, the U.S. delegation made a statement laying out the American view that the words “in place” imply that private property rights apply to extracted resources61—a comment that went completely unchallenged. That all States seemed to accept this point, even those bound by the Moon Agreement, is further evidence of a shift in customary international law.62 B. Opinio Juris: Domestic Legislation Domestic law, both in the United States and abroad, provides further evidence of the shift in customary international law surrounding the issue of nonappropriation as it relates to extracted space resources. Domestic U.S. space law is codified at Section 51 of the U.S. Code and has been regularly modified to expand private actors’ rights in space.63 Beginning in 1984, the Commercial Space Launch Act provided that “the United States should encourage private sector launches and associated services.”64 The goal of the 1984 Act was to support commercial space launches by private companies and individuals.65 It did not, however, specifically discuss commercial exploitation of space. The first such mention of commercial use of space appeared in 2004, with the Commercial Space Launch Amendments Act.66 This Act specifically aimed at regulating space tourism but did not explicitly guarantee any private rights in space.67 The most significant change in U.S. space law came with the passage of the Spurring Private Aerospace Competitiveness and Entrepreneurship (SPACE) Act in 2015. As incorporated into Section 51 of the Code, this Act provides: A United States citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States.68 Whereas the idea that private corporations might go into space may have seemed far-fetched to the drafters of the Outer Space Treaty, the SPACE Act of 2015 was the first instance of a government recognizing such a trend and officially supporting private companies’ commercial rights to space resources under law. With the new 2015 amendment to Section 51 in place, U.S. companies can now rest assured that any profits they reap from space mining are firmly legal—at least within U.S. jurisdictions. Although the United States was the first country to officially reinterpret the non-appropriation principle, other countries are following suit. On July 20, 2017, Luxembourg passed a law entitled On the Exploration and Utilization of Space Resources with a vote of fifty-five to two.69 The law took effect on August 1, 2017.70 Article 1 of the new law states simply that “[s]pace resources can be appropriated,” and Article 3 expressly grants private companies permission to explore and use space resources for commercial purposes.71 Official commentary on the law establishes that its goal is to provide companies with legal certainty regarding ownership over space materials—a goal that the commentators regard as legal under the Outer Space Treaty despite the non-appropriation principle.72 The next country to enact similar legislation may be the United Arab Emirates (UAE). According to the UAE Space Agency director general, Mohammed Al Ahbabi, the UAE is currently in the process of drafting a space law covering both human space exploration and commercial activities such as mining.73 To further this goal, in 2017 the UAE set up the Space Agency Working Group on Space Policy and Law to specify the procedures, mechanisms, and other standards of the space sector, including an appropriate legal framework.74 C. Opinio Juris: Legal Scholarship Other major space powers are also considering similar laws in the future, including Japan, China, and Australia. 75 Senior officials within China’s space program have explicitly stated that the country’s goal is to explore outer space and to take advantage of outer space resources.76 The general international trend clearly points in this direction in anticipation of a potential “space gold rush.” 7 Mirroring the shift in State practice and domestic laws, the legal community has also changed its approach to the interpretation of the nonappropriation principle. Whereas at the time of the ratification of the Outer Space Treaty the majority of legal scholars tended to apply the non-appropriation principle broadly, most legal scholars now view appropriation of extracted materials as permissible.78 Brandon Gruner underscores that this new view is historically distinct from prior legal interpretation, noting that modern interpretations of the Outer Space Treaty’s non-appropriation principle differ from those of the Treaty’s authors.79 In contrast to earlier legal theory that denied the possibility of appropriation of any space resources, scholars now widely accept that extracting space resources from celestial bodies is a “use” permitted by the Outer Space Treaty and that extracted materials become the property of the entity that performed the extraction.80 Stressing the fact that the Treaty does not explicitly prohibit appropriating resources from outer space, other authors conclude that the use of extracted space resources is permitted, meaning that the new SPACE Act is a plausible interpretation of the Outer Space Treaty.81 However, scholars have been careful to cabin the extent to which they accept the legality of appropriation. For instance, although Thomas Gangale and Marilyn Dudley-Rowley acknowledge the legality of private appropriation of extracted space resources, they nonetheless emphasize that “[o]wnership of and the right to use extraterrestrial resources is distinct from ownership of real property” and that any such claim to real property is illegal.82 Lawrence Cooper is also careful to point out this distinction: “[t]he [Outer Space] Treaties recognize sovereignty over property placed into space, property produced in space, and resources removed from their place in space, but ban sovereignty claims by states; international law extends this ban to individuals.”83 Although there remain some scholars who still insist on the illegality of the 2015 U.S. law and State appropriation of space resources generally,84 their dominance has waned since the 1960s. These scholars are now a minority in the face of general acceptance among the legal community that minerals and other space resources, once extracted, may be legally claimed as property. 85 Taken together, the elements described above—statements made in the international arena, de facto appropriation of space resources in the form of moon rocks, the adoption of new national policies permitting appropriation of extracted space resources, and the weight of the international legal community’s opinion— indicate a fundamental shift in customary international law. The Outer Space Treaty’s non-appropriation clause has been redefined via customary international law norms from its broad application to now include a carve-out allowing appropriation of space resources once such resources have been extracted.

#### Violation---they defend banning the appropriation of outer space for mars only, which is not exclusive control.

#### Vote neg for predictable ground – they shift core ground from ownership to individual affs like tourism, weather, arms ocntorl, and an aff for each individual asteroid – that explodes limits – outweighs and turns their standards

#### No rvi – you don’t get to win for following the rules.

## 3

#### Counterplan: States should create and adopt a new set of flexible regulations concerning responsible space colonization through the UN Office of Outer Space Affairs, focused on issues of governance of space colonies and potential existential risks, including but not limited to revising treaties to allow for private outer space appropriation of [Mars].

#### Solves all their impacts about extraterrestrial colony guidance and the stuff about OST collapse because we revise it

Kovic 21 Kovic, Marko. PhD Communication and Media Studies, University of Zurich. "Risks of space colonization." Futures 126 (2021): 102638. [Quality Control]

Overall, it seems fair to say that space governance is in shambles today. Creating any kind of meaningful space colonization-related governance in such a policy and policymaking environment is difficult, to say the least. We should not expect governance work on space colonization be initiated by gov-ernmental actors any time soon, so the proverbial ball is, at the time being,probably in the academic court. If we were to draft a space colonization gov-ernance framework that would be effective at mitigating colonization-relatedrisks and maximize the positive future value, what are some factors or aspects that need to be taken into account? First, we should consider a break with the past. Existing space gover-nance based on the Outer Space Treaty has barely seen any progress over the decades, and the Outer Space Treaty does not seem geared towards questions of space colonization risks. Starting with a philosophical clean slate that is divorced from the realities of the 1960-ies is probably the easiest way forward. Second, given the uncertainty of the long-term future, a governance frame-work for space colonization should be conceptualized as provisional and mal-leable. Major principles of safe space colonization might very well be uni-versal, but the empirical realities on the ground might change in the nottoo distant future. This means that, on one hand, our understanding of space colonization-related risks will almost certainly change over time. The practical reality of policymaking on Earth, on the other hand, will probably also undergo significant changes in the future. The current political order on Earth has been, roughly speaking, stable since the Second World War, and it seems plausible to expect the global political order to roughly continue along those lines for several more decades. This means that any governance frame-work that is geared towards today’s workings of global policymaking should daim to achieve tangible results as soon as possible, before the world changesso much that the governance framework and its bodies simply become obso-lete. The philosophical timescale of such a governance project thousands tomillions of years, but the practical timescale for achieving results should be decades.

#### Private space appropriation is necessary to build the public will that makes the new regulations effective

Kovic 21 Kovic, Marko. PhD Communication and Media Studies, University of Zurich. "Risks of space colonization." Futures 126 (2021): 102638. [Quality Control]

Third, and perhaps most importantly, any such exercise in governance building can only be effective if it ranks highly enough on the agenda of the public and of policymakers. We therefore need strategies to “jump start”attention to the issue. One possibility to do so would be to build coalitions with prominent space exploration and space colonization advocates, such as, for example, wealthy and influential space entrepreneurs11. Such coali-tions would perhaps have some morally dubious aspects to them (teamingup with people who do not necessarily have humankind’s best interests but rather their own bottom line in mind is questionable), but there is some prior evidence to suggest that that might be an effective path nonetheless. For ex-ample, a 2015 open letter urging research into AI safety [59] arguably brought important public and policy attention to the issue of AI safety thanks to the mere fact that many of the signatories were prominent people with significant public presence and influence. Of course, this anecdote is a limited form ofe vidence, but early, broad and publicly visible coalition-building seems like an important tactic to consider.

## Case

### Overview

#### These are terrible arguments – the barrier to responded should be very low – they are just trix meant for me to drop

#### You have to beat back my theory shell – you should have just defended the whole rez – it was your choice to defend just mars – that is your fault – you link to the T shell and have to get out of that.

#### You don’t get to choose definations – you have to prove your arguments are better than mine or I should win – this is just avoiding clash which takes away the point of debate.

#### You have to win that your layer o/w my layers – that’s the whole point of debating – you have to weigh between arguments you don’t just win bc its “harder”

#### Neg flex – you get first and last speech – im reactionary im in a worse position.

#### ROTB is to vote for the better debater – anything else is arbritrary and shouldn’t be voted on.

### Case

#### Investing in space exploration solves extinction, the economy, and warming

Dubner, American journalist & Freakonomics Author, 8 (Steven, Is Space Exploration Worth the Cost? A Freakonomics Quorum, Freakonomics Blog, http://freakonomics.com/2008/01/11/is-space-exploration-worth-the-cost-a-freakonomics-quorum/)

Pretend that instead of being responsible for your household budget, which means paying for rent or a mortgage, transportation, some schooling costs, groceries, healthcare, vacation, etc., you are instead responsible for a considerably larger budget that provides a variety of services for about 300 million people including the maintenance of an army, protecting the borders, etc. In other words, pretend you are responsible for the U.S. Federal budget. And now ask yourself how much of that money you want to spend on manned space travel, and why. We gathered up a group of space authorities — G. Scott Hubbard, Joan Vernikos, Kathleen M. Connell, Keith Cowing, and David M. Livingston, and John M. Logsdon — and asked them the following: Is manned space exploration worth the cost? Why or why not? Their responses are below. As I suggested above, take your time. For the impatient among you, here are a few highlights: Logsdon on a not-so-obvious incentive for manned space travel: “Space exploration can also serve as a stimulus for children to enter the fields of science and engineering.” Vernikos on the R.O.I. of space travel: “Economic, scientific and technological returns of space exploration have far exceeded the investment. … Royalties on NASA patents and licenses currently go directly to the U.S. Treasury, not back to NASA.” Cowing on space expenditures relative to other costs: “Right now, all of America’s human space flight programs cost around $7 billion a year. That’s pennies per person per day. In 2006, according to the USDA, Americans spent more than $154 billion on alcohol. We spend around $10 billion a month in Iraq. And so on.” I hope you enjoy their answers, and learn from them, as much as I did. G. Scott Hubbard, professor of Aeronautics and Astronautics at Stanford University and former director of the NASA Ames Research Center: The debate about the relative merits of exploring space with humans and robots is as old as the space program itself. Werner Von Braun, a moving force behind the Apollo Program that sent humans to the moon and the architect of the mighty Saturn V rocket, believed passionately in the value of human exploration — especially when it meant beating the hated Soviet Empire. James Van Allen, discoverer of the magnetic fields that bear his name, was equally ardent and vocal about the value of robotic exploration. There are five arguments that are advanced in any discussion about the utility of space exploration and the roles of humans and robots. Those arguments, in roughly ascending order of advocate support, are the following: 1. Space exploration will eventually allow us to establish a human civilization on another world (e.g., Mars) as a hedge against the type of catastrophe that wiped out the dinosaurs. 2. We explore space and create important new technologies to advance our economy. It is true that, for every dollar we spend on the space program, the U.S. economy receives about $8 of economic benefit. Space exploration can also serve as a stimulus for children to enter the fields of science and engineering. 3. Space exploration in an international context offers a peaceful cooperative venue that is a valuable alternative to nation state hostilities. One can look at the International Space Station and marvel that the former Soviet Union and the U.S. are now active partners. International cooperation is also a way to reduce costs. 4. National prestige requires that the U.S. continue to be a leader in space, and that includes human exploration. History tells us that great civilizations dare not abandon exploration. 5. Exploration of space will provide humanity with an answer to the most fundamental questions: Are we alone? Are there other forms of life beside those on Earth? It is these last two arguments that are the most compelling to me. It is challenging to make the case that humans are necessary to the type of scientific exploration that may bring evidence of life on another world. There are strong arguments on both sides. Personally, I think humans will be better at unstructured environment exploration than any existing robot for a very long time. There are those who say that exploration with humans is simply too expensive for the return we receive. However, I cannot imagine any U.S. President announcing that we are abandoning space exploration with humans and leaving it to the Chinese, Russians, Indians, Japanese or any other group. I can imagine the U.S. engaging in much more expansive international cooperation. Humans will be exploring space. The challenge is to be sure that they accomplish meaningful exploration. Joan Vernikos, a member of the Space Studies Board of the National Academy and former director of NASA’s Life Sciences Division: Why explore? Asked why he kept trying to climb Everest, English mountaineer George Mallory reputedly replied, “Because it was there.” Exploration is intrinsic to our nature. It is the contest between man and nature mixed with the primal desire to conquer. It fuels curiosity, inspiration and creativity. The human spirit seeks to discover the unknown, and in the process explore the physical and psychological potential of human endurance. There have always been the few risk-takers who ventured for the rest of us to follow. Because of earlier pioneers, air travel is now commonplace, and space travel for all is just around the corner. Economic and societal benefits are not immediately evident, but they always follow, as does our understanding of human potential to overcome challenges. Fifty years after Sputnik, space remains the next frontier. Without risking human lives, robotic technology such as unmanned missions, probes, observatories, and landers enables space exploration. It lays the groundwork, and does the scouting. But as I heard former astronaut Thomas Jones often say, “only a human can experience what being in space feels like, and only a human can communicate this to others.” It is humans who repair the Hubble telescope. It is humans who service the International Space Station (ISS). Mercury astronauts were the first to photograph Earth from space with hand-held cameras. Earth scientists in orbit on the ISS may view aspects of global change that only a trained eye can see. In addition, studying astronauts in the microgravity of space has been the only means of understanding how gravity affects human development and health here on Earth. It is highly probable that, in this century, humans will settle on other planets. Our ability to explore and sustain human presence there will not only expand Earth’s access to mineral resources but, should the need arise, provide alternative habitats for humanity’s survival. At what cost? Is there a price to inspiration and creativity? Economic, scientific and technological returns of space exploration have far exceeded the investment. Globally, 43 countries now have their own observing or communication satellites in Earth orbit. Observing Earth has provided G.P.S., meteorological forecasts, predictions and management of hurricanes and other natural disasters, and global monitoring of the environment, as well as surveillance and intelligence. Satellite communications have changed life and business practices with computer operations, cell phones, global banking, and TV. Studying humans living in the microgravity of space has expanded our understanding of osteoporosis and balance disorders, and has led to new treatments. Wealth-generating medical devices and instrumentation such as digital mammography and outpatient breast biopsy procedures and the application of telemedicine to emergency care are but a few of the social and economic benefits of manned exploration that we take for granted. Space exploration is not a drain on the economy; it generates infinitely more than wealth than it spends. Royalties on NASA patents and licenses currently go directly to the U.S. Treasury, not back to NASA. I firmly believe that the Life Sciences Research Program would be self-supporting if permitted to receive the return on its investment. NASA has done so much with so little that it has generally been assumed to have had a huge budget. In fact, the 2007 NASA budget of $16.3 billion is a minute fraction of the $13 trillion total G.D.P. “What’s the hurry?” is a legitimate question. As the late Senator William Proxmire said many years ago, “Mars isn’t going anywhere.” Why should we commit hard-pressed budgets for space exploration when there will always be competing interests? However, as Mercury, Gemini and Apollo did 50 years ago, our future scientific and technological leadership depends on exciting creativity in the younger generations. Nothing does this better than manned space exploration. There is now a national urgency to direct the creative interests of our youth towards careers in science and engineering. We need to keep the flame of manned space exploration alive as China, Russia, India, and other countries forge ahead with substantial investments that challenge U.S. leadership in space. Kathleen M. Connell, a principal of The Connell Whittaker Group, a founding team member of NASA’s Astrobiology Program, and former policy director of the Aerospace States Association: The value of public sector human space exploration is generally perceived as worth the cost when exploration outcomes address one or more national imperatives of the era. For example, in the twentieth century, the Soviet Union’s launch of Sputnik required a bold technological retort by the U.S. Apollo put boots on the moon, winning the first space race. The resulting foreign policy boost and psychic prestige for the U.S. more that justified the cost for the Cold War generation. Unquestionably, manned exploration of that era also created unintended economic consequences and benefits, such as the spinoff of miniaturization that led to computers and cell phones. Apollo also created new NASA centers in the South, acting as an unanticipated economic development anchor for those regions, both then and now. In the twenty-first century, what would happen if U.S. manned space programs were managed based upon the contemporary demands of the planet and the American taxpayer? NASA could be rewarded to explore, but with terrestrial returns as a priority. Space exploration crews could conduct global warming research on the International Space Station National Laboratory, while other crews from the public or private sector could rapidly assemble solar energy satellites for clean energy provision to Earth. Lunar settlements could be established to develop new energy sources from rare compounds that are in abundance on the moon. Getting to Mars, to develop a terrestrial lifeboat and to better understand the fate of planets, suddenly takes on new meaning and relevance. I have to come the conclusion, after over 20 years in the space industry, that addressing global challenges with space solutions that benefit humanity and American constituents is the key to justifying the cost of manned space exploration. I believe we are about to find out, all over again, if civil manned space capability and policy can adapt and rise to meet new imperatives. Keith Cowing, founder and editor of NASAWatch.com and former NASA space biologist. Right now, all of America’s human space flight programs cost around $7 billion a year. That’s pennies per person per day. In 2006, according to the USDA, Americans spent more than $154 billion on alcohol. We spend around $10 billion a month in Iraq. And so on. Are these things more important than human spaceflight because we spend more money on them? Is space exploration less important? Money alone is not a way to gauge the worthiness of the cost of exploring space. NASA is fond of promoting all of the spinoffs that are generated from its exploits, such as microelectronics. But are we exploring space to explore space, or are we doing all of this to make better consumer electronics? I once heard the late Carl Sagan respond to this question by saying, “you don’t need to go to Mars to cure cancer.” If you learn how to do that as a side benefit, well, that’s great, but there are probably more cost effective ways to get all of these spinoffs without leaving Earth. To be certain, tax dollars spent on space projects result in jobs — a large proportion of which are high paying, high tech positions. But many other government programs do that as well — some more efficiently. Still, for those who would moan that this money could be “better spent back on Earth,” I would simply say that all of this money is spent on Earth — it creates jobs and provides business to companies, just as any other government program does. You have to spend all of NASA’s money “on Earth.” There is no way to spend it in space — at least, not yet. Where am I going with this? Asking if space exploration — with humans or robots or both — is worth the effort is like questioning the value of Columbus’s voyages to the New World in the late 1490s. The promise at the time was obvious to some, but not to others. Is manned space exploration worth the cost? If we Americans do not think so, then why is it that nations such as China and India — nations with far greater social welfare issues to address with their limited budgets — are speeding up their space exploration programs? What is it about human space exploration that they see? Could it be what we once saw, and have now forgotten? As such, my response is another question: for the U.S. in the twenty-first century, is not sending humans into space worth the cost? David M. Livingston, host of The Space Show, a talk radio show focusing on increasing space commerce and developing space tourism: I hear this question a lot. So a few years ago, I decided to see what really happened to a public dollar spent on a good space program, compared to spending it on an entitlement program or a revenue generating infrastructure program. I used the school breakfast program for the test entitlement program. I chose Hoover Dam for the revenue generating infrastructure program. The space program I chose was the manned program to the moon consisting of the Mercury, Gemini, and Apollo programs. Let me briefly summarize what I discovered. All programs, if properly managed, can produce benefits in excess to the original invested dollar. There is no guarantee that a program will be properly managed, and this includes a space program. “Properly managed” implies many things, but I don’t think space is any more or less likely to be well managed than anything else the government does. A mismanaged space program wastes money, talent, and time, just like any other faulty program. As for what happened to the dollar invested in the respective programs, the school breakfast program was successful, in that it increased the number of kids who received breakfast. However, when funding for this program or this type of program stops, as soon as the last of the funds goes through the pipeline, the program is over. It has no life past government funding. I was unable to find an inspirational or motivational quality for the program leading to downstream business, economic, or science advancements. One could make the case that kids who benefited from the program went on through school to accomplish great things, and I don’t doubt that — I simply could not document it in my research. The Hoover Dam was very interesting. This project paid off its bond cost early, was a major contributor to the U.S. victory in World War II, and has been a huge economic factor for development in the Western part of the country. However, the Hoover Dam requires overhead and maintenance investment on a continual basis. It needs repairs, updates, modernization, and security, and it employs a labor force. Were we to stop investing in the Hoover Dam, over time it would lose its effectiveness and cease to be the value to our nation that it is now. Its value to us depends on our willingness to maintain, protect, and update it as necessary. The Hoover Dam and Lake Mead have given birth to thousands of private businesses, economic growth for the region, and much more. However, as with the entitlement program above, I could not find an inspirational or motivational aspect to the Hoover Dam. What I discovered about our manned lunar program was different. When I did this study, it was 34 years after the last dime had been spent on Apollo, the last of the manned moon programs. Thirty-four years later, when I asked guests on The Space Show, students, and people in space-related fields what inspired or motivated them to start a space business or pursue their science education, over 80 percent said they were inspired and motivated because of our having gone to the moon. Businesses were started and are now meeting payrolls, paying taxes, and sustaining economic growth because the founder was inspired by the early days of the manned space program, often decades after the program ended! This type of inspiration and motivation seems unique to the manned space program and, of late, to some of our robotic space missions. I found the same to be true when I asked the same question to Space Show guests from outside the U.S. John M. Logsdon, director of the Space Policy Institute and acting director of the Center for International Science and Technology Policy at George Washington University’s Elliott School of International Affairs: The high costs of sending humans into orbit and beyond are measured in dollars, rubles, or yuan. The benefits of human spaceflight are not so easily calculated, since they include both tangible and intangible payoffs. So answering the question, “Do the benefits outweigh the costs?” is not straightforward. If the payoffs are limited to scientific discovery, the position taken by many critics of human spaceflight is “no.” With both current and, especially, future robotic capabilities, the added value of human presence to missions aimed primarily at new understanding of the moon, Mars, near-Earth asteroids, and other celestial destinations most likely does not justify the added costs and risks involved. However, Steve Squyres, the principal investigator for the Mars Exploration Rovers, has frequently said that he wished that spirit and opportunity were working in partnership with humans on the surface of Mars; that combination, he argues, would greatly increase the scientific payoffs of the mission. To me, the primary justifications for sending people into space require that they travel beyond low Earth orbit. For the next few decades, the major payoffs from humans traveling to the moon and Mars are intangible, and linked to both national pride and national power. Space exploration remains an effort that can be led by only a few countries, and I believe that it should be part of what the United States does in its desire to be seen by both its citizens and the global public as a leader, one to be admired for its continued willingness to invest in pushing the frontiers of human activity. In the longer run, I believe that human exploration is needed to answer two questions. One is: “Are there activities in other places in the solar system of such economic value that they justify high costs in performing them?” The other is: “Can humans living away from Earth obtain at least a major portion of what they need to survive from local resources?” If the answer to both questions is “yes,” then I believe that eventually some number of people in the future will establish permanent settlements away from Earth, in the extreme case to ensure that the human species will survive a planetary catastrophe, but also because people migrate for both economic opportunities and new experiences. That is a big jump from today’s argument regarding the costs and benefits of human spaceflight, but I believe such a long range perspective is the best way to justify a new start in human space exploration.

#### Economic decline causes extinction.

Qian **Liu 18**. China-based economist. “From economic crisis to World War III.” Project Syndicate. 11-8-2018. https://www.project-syndicate.org/commentary/economic-crisis-military-conflict-or-structural-reform-by-qian-liu-2018-11

The next economic crisis is closer than you think. But what you should really worry about is what comes after: in the **current** **social, political, and technological** **landscape**, a **prolonged** **economic crisis**, combined with rising income inequality, could well escalate into a **major global military conflict**. The 2008-09 global financial crisis almost bankrupted governments and caused systemic collapse. Policymakers managed to pull the global economy back from the brink, using massive monetary stimulus, including **q**uantitative **e**asing and near-zero (or even negative) interest rates. But monetary stimulus is like an adrenaline shot to jump-start an arrested heart; it can revive the patient, but it does nothing to cure the disease. Treating a sick economy requires structural reforms, which can cover everything from financial and labour markets to tax systems, fertility patterns, and education policies. Policymakers have utterly failed to pursue such reforms, despite promising to do so. Instead, they have remained preoccupied with politics. From Italy to Germany, forming and sustaining governments now seems to take more time than actual governing. Greece, for example, has relied on money from international creditors to keep its head (barely) above water, rather than genuinely reforming its pension system or improving its business environment. The lack of structural reform has meant that the unprecedented excess liquidity that central banks injected into their economies was not allocated to its most efficient uses. Instead, it raised global asset prices to levels even higher than those prevailing before 2008. In the United States, housing prices are now 8% higher than they were at the peak of the property bubble in 2006, according to the property website Zillow. The price-to-earnings (CAPE) ratio, which measures whether stock-market prices are within a reasonable range, is now higher than it was both in 2008 and at the start of the Great Depression in 1929. As monetary tightening reveals the vulnerabilities in the real economy, the collapse of asset-price bubbles will trigger another economic crisis – one that could be even more severe than the last, because we have built up a tolerance to our strongest macroeconomic medications. A decade of regular adrenaline shots, in the form of ultra-low interest rates and unconventional monetary policies, has severely depleted their power to stabilise and stimulate the economy. If history is any guide, the consequences of this mistake could extend far beyond the economy. According to Harvard’s Benjamin Friedman, **prolonged** **periods of** **economic** **distress** have been characterised also by public **antipathy toward** **minority groups or** **foreign countries** – attitudes that can help to **fuel unrest**, **terrorism**, or even **war**. For example, during the Great Depression, US President Herbert Hoover signed the 1930 **Smoot-Hawley** Tariff Act, intended to protect American workers and farmers from foreign competition. In the subsequent five years, global trade shrank by two-thirds. Within a decade, **World War II** had begun. To be sure, WWII, like World War I, was caused by a multitude of factors; there is no standard path to war. But there is reason to believe that high levels of inequality can play a significant role in stoking conflict. According to research by the economist Thomas **Piketty**, a spike in income inequality is often followed by a great crisis. Income inequality then declines for a while, before rising again, until a new peak – and a new disaster. Though causality has yet to be proven, given the limited number of data points, this correlation should not be taken lightly, especially with wealth and income inequality at historically high levels. This is all the more worrying in view of the numerous other factors stoking social unrest and diplomatic tension, including technological disruption, a record-breaking migration crisis, anxiety over globalisation, political polarisation, and rising nationalism. All are symptoms of failed policies that could turn out to be trigger points for a future crisis. Voters have good reason to be frustrated, but the emotionally appealing **populists** to whom they are increasingly giving their support are offering ill-advised solutions that will **only** **make matters worse**. For example, despite the world’s unprecedented interconnectedness, **multilateralism is** **increasingly** **being eschewed**, as countries – most notably, Donald J. Trump’s US – pursue unilateral, isolationist policies. Meanwhile, **proxy wars** are **raging in Syria and Yemen**. Against this background, we must take seriously the possibility that the **next** **economic** **crisis could lead to a large-scale military confrontation**. By the logic of the political scientist Samuel Huntington, considering such a scenario could help us avoid it because it would force us to take action. In this case, the key will be for policymakers to pursue the structural reforms that they have long promised while replacing finger-pointing and antagonism with a sensible and respectful global dialogue. The alternative may well be global conflagration.

#### c/a their warming impact on case

#### Space colonization solves extinction and is a filter for all other risks – their own author!

**Torres 16** – PhD Candidate @ Rice (Phil, “Top Three Strategies for Avoiding an Existential Risk,” Institute for Ethics and Emerging Technologies, https://ieet.org/index.php/IEET2/print/11654)

(3) Space colonization. I would argue that this offers perhaps the **most practicable strategy** for avoiding an existential catastrophe, all things considered. It requires neither the invention of a superintelligence nor the sort of radical cognitive enhancements discussed above. The idea is simple: the wider we spread out in the world, the less chance there is that a single event will have worldwide consequences. A collapse of the global ecosystem on Earth wouldn’t affect colonies on Mars, nor would a grey goo disaster on (say) Gliese 667 Cc affect those living on spaceship Earth. Similarly, a disaster that wipes out the Milky Way in 1,000 years might be survivable if our progeny also resides in the Andromeda Galaxy. As it happens, NASA recently announced that there will be Earth-independent colonies on Mars by the 2030s, and Elon Musk has said that he’s hoping to launch the first flight to Mars “in around 2025.” As Musk described his motivation in 2014, “there is a strong humanitarian argument for making life multi-planetary . . . in order to safeguard the existence of humanity in the event that something catastrophic were to happen.” This sentiment was echoed by the former NASA administrator, Michael Griffin, who claimed that “human expansion into the solar system is, in the end, fundamentally about the survival of the species.” Similarly, Hawking has opined that he doesn’t “think the human race will survive the next thousand years, unless we spread into space.” So, there’s growing momentum to distribute the human population throughout this strange universe in which we find ourselves, and numerous intellectuals have explicitly recognized the existential significance of space colonization. Given the minimal risks involved, the relatively minimal cost of colonization programs (for example, it requires neither “(1)” nor “(2)” to be realized), and the potential gains of establishing self-sustaining colonies throughout the galaxy, this strategy ought to be among the top priorities for existential risk activists. **To survive, we must colonize**.

#### Outweighs scope of all living humans by like 10^30 – so tiny risk of this o/w all their stuff

Bostrom 3 – Department of Philosophy, Yale University, Director of the Future of Humanity Institute at Oxford University, 2002 (Nick, “Astronomical Waste: The Opportunity Cost of Delayed Technological Development,” Preprint, Utilitas Vol. 15, No. 3, pp. 308-314, http://www.nickbostrom.com/astronomical/waste.html)

As I write these words, suns are illuminating and heating empty rooms, unused energy is being flushed down black holes, and our great common endowment of negentropy is being irreversibly degraded into entropy on a cosmic scale. These are resources that an advanced civilization could have used to create value-structures, such as sentient beings living worthwhile lives. The rate of this loss boggles the mind. One recent paper speculates, using loose theoretical considerations based on the rate of increase of entropy, that the loss of potential human lives in our own galactic supercluster is at least ~10^46 per century of delayed colonization.[1] This estimate assumes that all the lost entropy could have been used for productive purposes, although no currently known technological mechanisms are even remotely capable of doing that. Since the estimate is meant to be a lower bound, this radically unconservative assumption is undesirable. We can, however, get a lower bound more straightforwardly by simply counting the number or stars in our galactic supercluster and multiplying this number with the amount of computing power that the resources of each star could be used to generate using technologies for whose feasibility a strong case has already been made. We can then divide this total with the estimated amount of computing power needed to simulate one human life. As a rough approximation, let us say the Virgo Supercluster contains 10^13 stars. One estimate of the computing power extractable from a star and with an associated planet-sized computational structure, using advanced molecular nanotechnology[2], is 10^42 operations per second.[3] A typical estimate of the human brain’s processing power is roughly 10^17 operations per second or less.[4] Not much more seems to be needed to simulate the relevant parts of the environment in sufficient detail to enable the simulated minds to have experiences indistinguishable from typical current human experiences.[5] Given these estimates, it follows that the potential for approximately 10^38 human lives is lost every century that colonization of our local supercluster is delayed; or equivalently, about 10^31 potential human lives per second. While this estimate is conservative in that it assumes only computational mechanisms whose implementation has been at least outlined in the literature, it is useful to have an even more conservative estimate that does not assume a non-biological instantiation of the potential persons. Suppose that about 10^10 biological humans could be sustained around an average star. Then the Virgo Supercluster could contain 10^23 biological humans. This corresponds to a loss of potential equal to about 10^14 potential human lives per second of delayed colonization. What matters for present purposes is not the exact numbers but the fact that they are huge. Even with the most conservative estimate, assuming a biological implementation of all persons, the potential for one hundred trillion potential human beings is lost for every second of postponement of colonization of our supercluster.[6]

#### We’ll answer their Torres stuff line by line

#### Colony wars – wrong

Globus ’20 [Al, co-founded the NASA Ames Space Settlement Contest for 6-12th grade students. 6-12th grade students. He also co-founded the NASA Ames Nanotechnology Group, which, at first, worked on materials for space elevators and diamondoid machine phase matter to build $50,000 personal spacecraft. He has designed three orbital space settlements (Lewis One, Kalpana One, and Kalpana Two) and published over 45 papers in technical conferences and journals, won a Feynman Prize in Nanotechnology, a NASA Software of the Year award, and a NASA Public Service Medal. He has discussed space colonization and nanotechnology on the History Channel, Danish radio, a French magazine, on a European Commission video, and elsewhere. He is co-author of the book The High Frontier: An Easier Way, “Not so dark skies”, 07-13-2020, https://www.thespacereview.com/article/3985/1]//pranav

War (Geopolitical Malefic)

Argument: Space settlement creates an endless frontier extending for millions of light-years into the cosmos. Frontiers tend to be violent places, creating wars not only at the frontier but between the polities that support the expansion. The vast size of the cosmos means that settlers are widely separated for much of the time, perhaps even evolving new species. When they come close enough to interact there may be little fellow feeling and little reluctance for the stronger to exterminate the weaker.

Counter-argument: With space settlement development there are a number of factors inhibiting violence and warfare. For one, the vast energy and materials resources available will tend to make resource wars obsolete. The fragility of space settlements, particularly free-space settlements in orbit, mandates that settlers avoid pointless provocations and chest-beating exercises. The enormous size of the space inhabited, up to and including the entire galaxy, makes it extremely unlikely that war will consume more than a small fraction of the population and resources available. It is difficult, if not impossible, to predict whether space settlement will lead to an increase or decrease in the odds that any given individual or group is involved in warfare or not. Preventing space settlement may be more or less dangerous than allowing it to proceed; it’s impossible to say.

Comparison with no space settlement: It is reassuring that since World War II warfare has decreased substantially and rarely involves the great powers directly killing each other’s citizens. That is left to proxies. However, not all wars are intentional. Consider World War I and the Cuban Missile Crisis. These suggest that there is a possibility—some would say probability—of an accidental humanity-ending nuclear war.

Space settlement could reduce this probability a bit by exposing large numbers of people to the Overview Effect created by the view of Earth from space, where some astronauts have come to value Earth and the unity of Earth’s people much more than before. More substantively, a sufficiently developed space settlement society surviving a war can repopulate Earth and restock other species if prevention fails. Thus the chance of a humanity-ending nuclear war is much lower with a sufficiently advanced space settlement society.

#### Terraforming is thousands of years beyond modern tech – Mars is inhospitable without it – this answers the entirety of the AFF because there’s no risk of private companies colonizing Mars or anyone colonizing space or even really trying to

Dvorsky 19 [George, senior staff reporter at Gizmodo,interviewing Louis Friedman, Louis Friedman, co-founder of the Planetary Society and author of [Human Spaceflight: From Mars to the Stars](https://www.amazon.com/Human-Spaceflight-Stars-Louis-Friedman-ebook/dp/B015PSMY0U/ref=sr_1_1?ascsubtag=feef34302a6f72b4900cf2e8c74515f465a2d4e2&keywords=louis%20friedman%20human%20spaceflight&qid=1561146564&s=books&sr=1-1&tag=gizmodoamzn-20) “Humans Will Never Colonize Mars”, July 30 2019, https://gizmodo.com/humans-will-never-colonize-mars-1836316222]

Indeed, there’s the whole terraforming issue to consider. By terraforming, scientists are referring to the hypothetical prospect of geoengineering a planet to make it habitable for humans and other life. For Mars, that would mean the injection of oxygen and other gases into the atmosphere to raise surface temperature and air pressure, among other interventions. A common argument in favor of colonizing Mars is that it’ll allow us to begin the process of transforming the planet to a habitable state. This scenario has been tackled by a number of science fiction authors, including Kim Stanley Robinson in his acclaimed [Mars Trilogy](https://en.wikipedia.org/wiki/Mars_trilogy). But as Friedman told Gizmodo, “that’s thousands of years in the making at least.”

Briony Horgan, assistant professor of planetary science at Purdue University, said Martian terraforming is a pipedream, a prospect that’s “way beyond any kind of technology we’re going to have any time soon,” she told Gizmodo.

When it comes to terraforming Mars, there’s also the logistics to consider, and the materials available to the geoengineers who would dare to embark upon such a multi-generational project. In their 2018 Nature [paper](https://www.nature.com/articles/s41550-018-0529-6.epdf?referrer_access_token=lqERczHSI99c5B_64JaYztRgN0jAjWel9jnR3ZoTv0OEVA2jqQmP7EVNMm-ws-AK2qvV3jqjjKzdN3x5KmRjmQqju09-PjQJ8zCeWpX5cRBf1vFd-yEmo1uJPuaXmvDPws9JVqzbyoFDp346VCec3whkw9iiPnIcbAeDD8uUX9zd-LSpnBLUypHl3m4cvyWC5IONDo6Lad1p4XaikY8S_nWQI6osakR76L4Cnq8XEKS9j2bBP2FKXYwK8iUjT8I5GzL4Y1OrnmKJh2sCP1t73sbZ9lXyJs1dDxTDiIgsjZWHMv4sPRPSPcXBIVgNi81s&tracking_referrer=www.newscientist.com), Bruce Jakosky and Christopher Edwards from the University of Colorado, Boulder sought to understand how much carbon dioxide would be needed to increase the air pressure on Mars to the point where humans could work on the surface without having to wear pressure suits, and to increase temperature such that liquid water could exist and persist on the surface. Jakosky and Edwards concluded that there’s [not nearly enough CO2 on Mars required for terraforming](https://www.newscientist.com/article/2175414-terraforming-mars-might-be-impossible-due-to-a-lack-of-carbon-dioxide/), and that future geoengineers would have to somehow import the required gases to do so.

#### Water on Mars is impossible – growing food there is impossible with current tech

Dvorsky 19 [George, senior staff reporter at Gizmodo,interviewing Louis Friedman, Louis Friedman, co-founder of the Planetary Society and author of [Human Spaceflight: From Mars to the Stars](https://www.amazon.com/Human-Spaceflight-Stars-Louis-Friedman-ebook/dp/B015PSMY0U/ref=sr_1_1?ascsubtag=feef34302a6f72b4900cf2e8c74515f465a2d4e2&keywords=louis%20friedman%20human%20spaceflight&qid=1561146564&s=books&sr=1-1&tag=gizmodoamzn-20) “Humans Will Never Colonize Mars”, July 30 2019, https://gizmodo.com/humans-will-never-colonize-mars-1836316222]

Finally, there’s the day-to-day survival to consider. Limited access to fundamental resources, like food and water, could place further constraints on a colony’s ability to grow and thrive.

“Establishing stable resources to live off for a long period of time is possible, but it’ll be tough,” said Horgan. “We’ll want to be close to water and water ice, but for that we’ll have to go pretty far north. But the further north you go, the rougher the conditions get on the surface. The winters are cold, and there’s less sunlight.”

Colonists will also need stable food sources, and figure out a way to keep plants away from radiation. The regolith, or soil, on Mars is toxic, containing dangerous [perchlorate chemicals](https://www.space.com/37402-mars-life-soil-toxic-perchlorates-radiation.html), so that also needs to be avoided. To grow crops, colonists will likely build [subterranean hydroponic greenhouses](https://www.nasa.gov/feature/lunar-martian-greenhouses-designed-to-mimic-those-on-earth). This will require specialized lighting, [genetically modified plants designed specifically for Mars](https://theconversation.com/how-to-grow-crops-on-mars-if-we-are-to-live-on-the-red-planet-99943), and plenty of water, the latter of which will be difficult to source on Mars.

“People don’t realize how complicated this is,” said Horgan. “Trying to think about establishing colonies to point of what we would consider safe will be a big challenge.”

Technological solutions to these problems may exist, as are medical interventions to treat Martian-specific diseases. But again, nothing that we could possibly develop soon. And even if we do develop therapies to treat humans living on Mars, these interventions are likely to be limited in scope, with patients requiring constant care and attention.

#### Mars is impossible to terraform- too much of previous atmosphere is already gone

Coates 18 [Andrew, Professor of Physics, Deputy Director (Solar System) at the Mullard Space Science Laboratory, “Sorry Elon Musk, but it’s now clear that colonising Mars is unlikely – and a bad idea”, August 2 2018, http://theconversation.com/sorry-elon-musk-but-its-now-clear-that-colonising-mars-is-unlikely-and-a-bad-idea-100964 ]

Perhaps even more damning, the long-suggested idea of terraforming Mars is now firmly locked in the realm of science fiction. Musk has previously indicated that he wants to terraform the planet to make it more Earth-like, so you can “[eventually walk around outside without anything on](https://www.cbsnews.com/news/elon-musk-on-mars-its-a-fixer-upper-of-a-planet/).” This would most easily be done by producing an atmosphere made of heat-trapping greenhouse gases locked in the planet’s ice in order to raise its temperature and pressure. Musk has suggested that we could [drop thermonuclear bombs](http://www.iflscience.com/space/elon-musk-says-we-could-terraform-mars-dropping-thermonuclear-bombs-it/) on the ice at its poles in order to heat it up to release the carbon dioxide.

But according to a new study, [published in Nature Astronomy](https://www.newscientist.com/article/2175414-terraforming-mars-might-be-impossible-due-to-a-lack-of-carbon-dioxide/), Mars has lost so much of its potential greenhouse gases to space over billions of years that there is now no possibility of transforming the remaining atmosphere into a breathable one with available technology.

The study is based on measurements of the recent escape rate of gases to space measured over the last 15 years by Mars Express and the last four years by [MAVEN](https://mars.nasa.gov/maven/). This can tell us how much effective greenhouse gases, carbon dioxide and water are available at Mars. The measurements, combined with knowledge of the inventories of carbon dioxide and water on Mars from recent space missions, show that greenhouses gases locked in the ice caps are not enough to provide the necessary heating.

More may be available deep within the planet but extracting that is well beyond today’s technology. Also, the atmosphere is still being lost due to the lack of a magnetic field, so that would need to be somehow slowed to maintain any changes achieved by terraforming. This means that potential explorers would need to use heavy, airtight walls, roofs or buildings to provide the right atmosphere and the required screening from cosmic radiation.

While Musk may be disappointed by these new results, most Mars scientists are breathing a sigh of relief. There may be present or past life on Mars, and we can now focus on finding it.

We will be searching for signs of life with the [ESA-Russian ExoMars 2020 rover](https://theconversation.com/decades-of-attempts-show-how-hard-it-is-to-land-on-mars-heres-how-we-plan-to-succeed-in-2021-69734), and the NASA [Mars 2020 mission](https://mars.nasa.gov/mars2020/) will gather samples for eventual return to Earthbound laboratories by around 2030. The results of all this may tell us if there was, is or could be life elsewhere. In our solar system, the best targets are Mars, [Saturn’s moon Enceladus](https://theconversation.com/nasa-saturn-moon-enceladus-is-able-to-host-life-its-time-for-a-new-mission-76102) and [Titan](https://theconversation.com/saturns-moon-titan-may-harbour-simple-life-forms-and-reveal-how-organisms-first-formed-on-earth-81527), and [Jupiter’s moons Europa](https://theconversation.com/signs-of-water-plumes-boost-chances-of-finding-life-on-jupiters-moon-europa-96507). And these just hint of the potential for life on the many planets beyond our own solar system.

Mars is bright in our skies this week, the brightest since 2003. The red planet is never far from our thoughts, whether as a potential cradle for life beyond Earth or as a target for humans in the future. We live in exciting times when it comes to space exploration. So let’s not spoil one of the largest and most fundamental experiments for humankind by letting dreams of colonisation go too far – at least until we know whether there is life.

#### Planetary colonization is impossible under current legal framework – private entities can’t lay claim to territory on Mars

Kovic 2018 [Marko, co-founder and president of the nonprift thinktank  [Zurich Institute of Public Affairs Research](https://zipar.org/), “Political, moral, and security challenges of space colonization”, June 2018, https://zipar.org/discussion-paper/political-moral-security-challenges-space-colonization/]

Imagine two disparate colonization attempts of Mars. First, NASA decides to establish a colony on Mars, for research and exploration purposes. Second, the European Space Agency decides to do much the same. Which of these two colo- nization projects is allowed? Both are. As are any number of other colonization efforts: Any individual or organization or country is allowed to engage in space colonization, because space is legally regarded as belonging to all of humankind. The foundational legal framework for space colonization is the Outer Space Treaty from 1967 [8, 9]. One of the main goals of the Outer Space Treaty is to promote peaceful exploration and use of space that benets all of humankind. The treaty does not generally restrict activities in space, with the exceptions of procuring weapons of mass destruction into space and appropriating celestial bodies unilaterally.

The basic idea of the Outer Space Treaty is therefore that space belongs to all of humankind and that it should be explored and used for peaceful purposes only. The notion that space should belong to all of humankind is appealing, because it implies a peaceful and cooperative future. However, the current legal situation is also creating uncertainties. Consider, for example, a private mining company that is pondering establishing colonies on the Moon and on Mars in order to extract minerals and metals in order to bring them back to Earth. The company does not want to lay claim neither to the Moon nor to Mars, so it is not in outright violation of the Outer Space Treaty. However, under the Outer Space Treaty, it is not clear whether the mining company would actually be allowed to mine on the Moon and on Mars for business purposes [10]. The Outer Space Treaty prevents any actor from appropriating any celestial body, but it is not clear whether the hypothetical mining company would be engaging in a form of appropriation or in a permissible activity.

The logic of colonization activity in space is somewhat similar to the logic of activity in international waters under maritime law [11]. Individuals and organizations who are present in international waters generally have to obey the 7 Space colonization ZIPAR Discussion Paper Series laws of their country of origin. That principle also applies to space colonization, and it has the benet of preventing a state of complete lawlessness. The drawback of this principle is that individual countries might opt to act unilaterally in devising laws that regulate space colonization eorts in ways that are aligned with their interests, but not necessarily with the interests of all of humankind.

Unilateralism might ultimately defeat the purpose of common frameworks such as the Outer Space Treaty and exacerbate problems such as the tragedy of the commons [12] (the problem of overusing of a shared system of resources that is ultimately detrimental to everyone). The tragedy of the commons is already a problem of current space exploration, for example in the context of space debris [13]. Unilateral developments such as a proposed 2017 bill in the United States that is intended as a stimulus for commercial space exploration and colonization [14] demonstrate that unilateral decision-making in matters of space colonization is already starting to become a reality.

However, and on the other hand, a strict interpretation of the Outer Space Treaty is probably not a solution to the looming coordination problems. Interpreting and enforcing the Outer Space Treaty in a strict and restrictive manner might have a disincentivizing, negative effect on both public as well as private entrepreneurial colonization . Coordinated international work on space-related regulatory rules and frame- works has made little progress in recent years [15]. No international consensus on a modern approach to space colonization and colonization-related problems is on the horizon.

#### Physical deterioration in zero G makes even missions to Mars impossible

Piersma 10 [Theunis, Dutch professor of Global Flyway Ecology at the University of Groningen, winner of the 2014 Spinoza Prize “Why space is the impossible frontier”, 10 November 2010, https://www.newscientist.com/article/mg20827860-100-why-space-is-the-impossible-frontier/]

To function properly, we need gravity. Without it, the environment is less demanding on the human body in several ways, and this shows upon the return to Earth. Remember the sight of weakened astronauts emerging after the Apollo missions? That is as nothing compared with what would happen to astronauts returning from Mars.

One of the first things to be affected is the heart, which shrinks by as much as a quarter after just one week in orbit ([The New England Journal of Medicine, vol 358, p 1370](http://www.nejm.org/doi/full/10.1056/NEJMra072139)). Heart atrophy leads to decreases in blood pressure and the amount of blood pushed out by the heart. In this way heart atrophy leads to reduced exercise capacity. Astronauts returning to Earth after several months in the International Space Station experience dizziness and blackouts because blood does not reach their brains in sufficient quantities.

Six weeks in bed leads to about as much atrophy of the heart as one week in space, suggesting that the atrophy is caused by both weightlessness and the concomitant reduction in exercise.

Other muscle tissue suffers too. The effects of weightlessness on the muscles of the limbs are easy to verify experimentally. Because they bear the body’s weight, the “anti-gravity” muscles of the thighs and calves degenerate significantly when they are made redundant during space flight.

Despite the best attempts to give replacement exercise to crew members on the International Space Station, after six months they had still lost 13 per cent of their calf muscle volume and 32 per cent of the maximum power that their leg muscles could deliver ([Journal of Applied Physiology, vol 106, p 1159](http://dx.doi.org/10.1152/japplphysiol.91578.2008)).

Various metabolic changes also occur, including a decreased capacity for fat oxidation, which can lead to the build-up of fat in atrophied muscle. Space travellers also suffer deterioration of immune function both during and after their missions ([Aviation, Space, and Environmental Medicine, vol 79, p 835](http://dx.doi.org/10.3357/ASEM.2276.2008)).

Arguably the most fearsome effect on bodies is bone loss ([The Lancet, vol 355, p 1569](http://dx.doi.org/10.1016/S0140-6736(80)02208-8)). Although the hardness and strength of bone, and the relative ease with which it fossilises, give it an appearance of permanence, bone is actually a living and remarkably flexible tissue. In the late 19th century, the German anatomist Julius Wolff discovered that bones adjust to the loads that they are placed under. A decrease in load leads to the loss of bone material, while an increase leads to thicker bone.

It is no surprise, then, that in the microgravity of space bones demineralise, especially those which normally bear the greatest load. Cosmonauts who spent half a year in space lost up to a quarter of the material in their shin bones, despite intensive exercise ([The Lancet, vol 355, p 1607](http://dx.doi.org/10.1016/S0140-6736(00)02217-0)). Although experiments on chicken embryos on the International Space Station have established that bone formation does continue in microgravity, formation rates are overtaken by bone loss.

What is of greatest concern here is that, unlike muscle loss which levels off with time, bone loss seems to continue at a steady rate of 1 to 2 per cent for every month of weightlessness. During a three-year mission to Mars, space travellers could lose around 50 per cent of their bone material, which would make it extremely difficult to return to Earth and its gravitational forces. Bone loss during space travel certainly brings home the maxim “use it or lose it”.