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#### Private space tourism boosts medical innovation.

Caplan et al. 17 [(Nick, Associate Professor of Musculoskeletal Health, Northumbria University, Newcastle) (Andrew Winnard, Lecturer, Northumbria University, Newcastle) (Kirsty Lindsay, PhD Candidate, Northumbria University, Newcastle) “Space tourism could help boost science and health research – here’s how,” The Conversation, 6/22/17. <https://theconversation.com/space-tourism-could-help-boost-science-and-health-research-heres-how-79812>] RR

Such adventures will be made possible through futuristic spaceplanes, as are already in development by companies such as Virgin Galactic, that will enable us mere mortals to experience weightlessness. If this sounds only of interest to those who can afford the six-figure ticket price, it also has major implications for scientific discovery. Space travel-related research has probably already had a more substantial positive impact on your life than you realise, and this announcement could increase this still further.

Space agencies such as ESA and NASA currently provide access to simulated microgravity for scientific research using parabolic flights. These allow human physiology research to be carried out more easily than on the International Space Station, but the time spent in microgravity is very short. Spaceplanes may provide longer sessions, which could enable more comprehensive research to inform the design of experiments into the longer-term physiological changes from spaceflight.

Perhaps one day we will see research teams launching groups of participants to spend a few weeks or months aboard a space hotel in order to study medical interventions that would slow the ageing process on Earth, and to help the human species colonise the Moon or even Mars.

Research dating back to the early years of the space race has led to technologies that benefit us all. Many scientific discoveries have come since the arrival of inhabitable space stations that act as orbital laboratories. NASA’s first space station Skylab helped understand the effects on the human body of spending months in space and paved the way for the International Space Station.

A huge number of research studies have been completed on the ISS since the year 2000 in the areas of human physiology, biology, biotechnology, physical science and earth and space science. These studies have led to discoveries such as enhanced protein crystal growth for drug development, efficient combustion of fuel droplets, and an understanding of the effects of long duration exposure to microgravity on the human body, revealing that spaceflight has effects similar to ageing on Earth.

Despite much human physiological research being carried out in space, it has one major limitation – there are simply not enough humans currently going to space to act as research participants, leading to difficulties in research design. In fact, only 550 or so humans have ever been into space since Russian cosmonaut Yuri Gagarin first orbited the Earth in 1961.

Human physiological experiments in space tend to have very small participant numbers (for example, the NASA twins study) or they have to take place over many years. Could the boom in commercial human spaceflight accelerate the speed of human physiological discoveries in space? We certainly think so.

Commercial spaceflight companies such as SpaceX and Orbital are already launching rockets taking supplies and research equipment to the International Space Station. SpaceX is developing its habitable Dragon capsule to take space tourists around the moon, with ambitions to use its sibling, Red Dragon, to land astronauts on Mars.

Others are developing sub-orbital spaceplanes, such as Virgin Galactic’s SpaceShipTwo, which will enable passengers to experience microgravity for a number of minutes or travel 30 times faster between cities than passenger airlines. To safely send throngs of space tourists beyond the atmosphere, we need to understand the health implications of just getting these “non-professional” astronauts into space through new medical research, and developing spaceports will provide access to exciting new platforms to expand these frontiers of science.

#### Biopharmaceutical innovation is key to prevent future pandemics and bioterror.

Marjanovic and Feijao 20 [(Sonja Marjanovic, Ph.D., Judge Business School, University of Cambridge. Carolina Feijao, Ph.D. in biochemistry, University of Cambridge; M.Sc. in quantitative biology, Imperial College London; B.Sc. in biology, University of Lisbon.) "How to Best Enable Pharma Innovation Beyond the COVID-19 Crisis," RAND Corporation, 05-2020, https://www.rand.org/pubs/perspectives/PEA407-1.html] TDI

As key actors in the healthcare innovation landscape, pharmaceutical and life sciences companies have been called on to develop medicines, vaccines and diagnostics for pressing public health challenges. The COVID-19 crisis is one such challenge, but there are many others. For example, MERS, SARS, Ebola, Zika and avian and swine flu are also infectious diseases that represent public health threats. Infectious agents such as anthrax, smallpox and tularemia could present threats in a bioterrorism context.1 The general threat to public health that is posed by antimicrobial resistance is also well-recognised as an area in need of pharmaceutical innovation. Innovating in response to these challenges does not always align well with pharmaceutical industry commercial models, shareholder expectations and competition within the industry. However, the expertise, networks and infrastructure that industry has within its reach, as well as public expectations and the moral imperative, make pharmaceutical companies and the wider life sciences sector an indispensable partner in the search for solutions that save lives. This perspective argues for the need to establish more sustainable and scalable ways of incentivising pharmaceutical innovation in response to infectious disease threats to public health. It considers both past and current examples of efforts to mobilise pharmaceutical innovation in high commercial risk areas, including in the context of current efforts to respond to the COVID-19 pandemic. In global pandemic crises like COVID-19, the urgency and scale of the crisis – as well as the spotlight placed on pharmaceutical companies – mean that contributing to the search for effective medicines, vaccines or diagnostics is essential for socially responsible companies in the sector. 2 It is therefore unsurprising that we are seeing industry-wide efforts unfold at unprecedented scale and pace. Whereas there is always scope for more activity, industry is currently contributing in a variety of ways. Examples include pharmaceutical companies donating existing compounds to assess their utility in the fight against COVID19; screening existing compound libraries in-house or with partners to see if they can be repurposed; accelerating trials for potentially effective medicine or vaccine candidates; and in some cases rapidly accelerating in-house research and development to discover new treatments or vaccine agents and develop diagnostics tests.3,4 Pharmaceutical companies are collaborating with each other in some of these efforts and participating in global R&D partnerships (such as the Innovative Medicines Initiative effort to accelerate the development of potential therapies for COVID-19) and supporting national efforts to expand diagnosis and testing capacity and ensure affordable and ready access to potential solutions.3,5,6 The primary purpose of such innovation is to benefit patients and wider population health. Although there are also reputational benefits from involvement that can be realised across the industry, there are likely to be relatively few companies that are ‘commercial’ winners. Those who might gain substantial revenues will be under pressure not to be seen as profiting from the pandemic. In the United Kingdom for example, GSK has stated that it does not expect to profit from its COVID-19 related activities and that any gains will be invested in supporting research and long-term pandemic preparedness, as well as in developing products that would be affordable in the world’s poorest countries.7 Similarly, in the United States AbbVie has waived intellectual property rights for an existing combination product that is being tested for therapeutic potential against COVID-19, which would support affordability and allow for a supply of generics.8,9 Johnson & Johnson has stated that its potential vaccine – which is expected to begin trials – will be available on a not-for-profit basis during the pandemic.10 Pharma is mobilising substantial efforts to rise to the COVID-19 challenge at hand. However, we need to consider how pharmaceutical innovation for responding to emerging infectious diseases can best be enabled beyond the current crisis. Many public health threats (including those associated with other infectious diseases, bioterrorism agents and antimicrobial resistance) are urgently in need of pharmaceutical innovation, even if their impacts are not as visible to society as COVID-19 is in the immediate term. The pharmaceutical industry has responded to previous public health emergencies associated with infectious disease in recent times – for example those associated with Ebola and Zika outbreaks.11 However, it has done so to a lesser scale than for COVID-19 and with contributions from fewer companies. Similarly, levels of activity in response to the threat of antimicrobial resistance are still low.12 There are important policy questions as to whether – and how – industry could engage with such public health threats to an even greater extent under improved innovation conditions.

#### Extinction – defense is wrong

Piers Millett 17, Consultant for the World Health Organization, PhD in International Relations and Affairs, University of Bradford, Andrew Snyder-Beattie, “Existential Risk and Cost-Effective Biosecurity”, Health Security, Vol 15(4), http://online.liebertpub.com/doi/pdfplus/10.1089/hs.2017.0028

Historically, disease events have been responsible for the greatest death tolls on humanity. The 1918 flu was responsible for more than 50 million deaths,1 while smallpox killed perhaps 10 times that many in the 20th century alone.2 The Black Death was responsible for killing over 25% of the European population,3 while other pandemics, such as the plague of Justinian, are thought to have killed 25 million in the 6th century—constituting over 10% of the world’s population at the time.4 It is an open question whether a future pandemic could result in outright human extinction or the irreversible collapse of civilization.

A skeptic would have many good reasons to think that existential risk from disease is unlikely. Such a disease would need to spread worldwide to remote populations, overcome rare genetic resistances, and evade detection, cures, and countermeasures. Even evolution itself may work in humanity’s favor: Virulence and transmission is often a trade-off, and so evolutionary pressures could push against maximally lethal wild-type pathogens.5,6

While these arguments point to a very small risk of human extinction, they do not rule the possibility out entirely. Although rare, there are recorded instances of species going extinct due to disease—primarily in amphibians, but also in 1 mammalian species of rat on Christmas Island.7,8 There are also historical examples of large human populations being almost entirely wiped out by disease, especially when multiple diseases were simultaneously introduced into a population without immunity. The most striking examples of total population collapse include native American tribes exposed to European diseases, such as the Massachusett (86% loss of population), Quiripi-Unquachog (95% loss of population), and theWestern Abenaki (which suffered a staggering 98% loss of population).

In the modern context, no single disease currently exists that combines the worst-case levels of transmissibility, lethality, resistance to countermeasures, and global reach. But many diseases are proof of principle that each worst-case attribute can be realized independently. For example, some diseases exhibit nearly a 100% case fatality ratio in the absence of treatment, such as rabies or septicemic plague. Other diseases have a track record of spreading to virtually every human community worldwide, such as the 1918 flu,10 and seroprevalence studies indicate that other pathogens, such as chickenpox and HSV-1, can successfully reach over 95% of a population.11,12 Under optimal virulence theory, natural evolution would be an unlikely source for pathogens with the highest possible levels of transmissibility, virulence, and global reach. But advances in biotechnology might allow the creation of diseases that combine such traits. Recent controversy has already emerged over a number of scientific experiments that resulted in viruses with enhanced transmissibility, lethality, and/or the ability to overcome therapeutics.13-17 Other experiments demonstrated that mousepox could be modified to have a 100% case fatality rate and render a vaccine ineffective.18 In addition to transmissibility and lethality, studies have shown that other disease traits, such as incubation time, environmental survival, and available vectors, could be modified as well.19-2

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#### CP: The appropriation of outer space by private entities except for private entities in the People’s Republic Of China is unjust.

#### Xi is consolidating unprecedented political power – that’s only possible with strong PLA support

Chang 21 [(Gordon, columnist, author and lawyer, has given briefings at the National Intelligence Council, the CIA, and the State Department, JD from Cornell Law School) “China Is Becoming a Military State,” Newsweek, 1/14/2021] JL

At this moment, the Communist Party is taking back power from all others in society, including the State Council, and the military is gaining influence inside Party circles.

Why is the People's Liberation Army making a comeback? The answer lies in succession politics.

Xi Jinping was selected the top leader because he was not identified with any of the main factional groupings—like the Communist Youth League of Hu Jintao or the Shanghai Gang of Jiang—that dominated Party politics. Xi, in short, was the least unacceptable choice to the Party's squabbling factional elders.

Xi, once chosen, apparently decided that in order to rule, he needed a base, so he made certain officers the core of his support. As longtime China watcher Willy Lam told Reuters in 2013, Xi Jinping's faction is the military.

And with the help of the military, Xi has accumulated almost unprecedented political power, ending the Party's two-decade-old consensus-driven system and replacing it with one-man rule.

As Wang, a professor at the Georgia Institute of Technology, notes, Xi, with the amendments to the National Defense Law, is demonstrating his power of "leading everything and everyone." He is wrapping that effort in a "rule by law" move that is formalizing his perch at the top of the Chinese political system.

How is Xi using his newfound power? There is a hint in the National Defense Law amendments. These changes, Fisher tells us, "increase the powers of the CMC to mobilize the civilian sector for wartime and to better authorize the CMC to engage in foreign military exercises to defend China's 'development interests.'" As such, the changes "point to China's ambition to achieve 'whole nation' levels of military mobilization to fight wars, and give the CMC formal power to control the future Chinese capabilities for global military intervention."

"The revised National Defense Law also embodies the concept that everyone should be involved in national defense," reports the Communist Party's *Global Times*, summarizing the words of an unnamed CMC official. "All national organizations, armed forces, political parties, civil groups, enterprises, social organizations and other organizations should support and take part in the development of national defense, fulfill national defense duties and carry out national defense missions according to the law."

That sounds like Xi is getting ready to pick even more fights with neighbors—and perhaps the United States. On January 5, he ordered People's Liberation Army generals and admirals to be prepared to "act at any second."

Why would Xi want to start a war? "This is really indicative of there being instability in China, and Mr. Xi seeking to consolidate power around himself. ...The new National Defense Law essentially removes the alternative power base of the premier of the State Council, in this case Li Keqiang, from interfering with Mr. Xi's own power ambitions," said Charles Burton of the Ottawa-based Macdonald-Laurier Institute to John Batchelor, the radio host, earlier this month. As Burton noted, the amendments to the National Defense Law undermine Premier Li Keqiang, the head of the State Council and long-standing rival to Xi.

"I think this really gives the green light for him to dispatch the military on any pretext that he feels is necessary to defend his power," Burton says. "China is becoming a military state."

#### The plan alienates the PLA – they view space dominance as the linchpin of China’s legitimacy – specifically, public-private tech development is key

Economic Times 20 [(Economic Times, Indian daily newspaper, internally cites Dean Cheng, Senior Research Fellow at the Heritage Foundation and the Davis Institute for National Security and Foreign Policy, former analyst in the International Security and Space Program at the Office of Technology Assessment, BA in Politics from Princeton University) “China attempting to militarize space as it seeks to modernize its military power,” 8/31/2020] JL

The Jamestown Foundation, a US think-tank, hosted a webinar on August 19 entitled "China's Space Ambitions: Emerging Dimensions of Competition." One presenter, Dean Cheng, Senior Research Fellow at The Heritage Foundation, noted that Beijing's space programme is linked to China's central concept of comprehensive national power. "This is basically how the Chinese think about how they rack and stack, how they compare with other countries."

China recognises that military power is important, but it is not the only factor in being a great power. Cheng drew a parallel with the former USSR, where military power alone did not ensure survival of that communist state. Other comprehensive national power factors are political unity, economic power, diplomatic strength, science and technology, and even culture. "Space touches every one of these aspects in comprehensive national power, and that is a part of why Chinese see space as so important."

Indeed, a strong space industrial complex will generate benefits that ripple through the rest of China's economy. Furthermore, he said space achievements "promote pride within China, especially for the Chinese Communist Party (CCP) ... It's symbolic of how far China has come," he said, and "it gives the CCP legitimacy".

China is pushing into space services, including satellite launches, satellite applications and Earth observation/satellite imagery for others. Satellite customers include Belarus, Laos, Pakistan and Venezuela, for example, attracting hard currency and influence. Cheng said most underestimate the impact this has, as such countries grow almost totally dependent on Chinese equipment, assets and training over time. Incidentally, China could have manufactured back doors into these systems for foreigners to allow it access.

Mark Stokes, Executive Director at the US-based Project 2049 Institute think-tank, said in the same webinar that PLA requirements have always been fundamental to development of Chinese space capabilities. Potential PLA space missions in support of joint warfighting in a crisis include targeting (battlefield surveillance, electronic reconnaissance and ocean surveillance), communications, PNT services (obtaining target data, navigation information, navigation support and timing services), space jamming (encompassing space communications, radar, electro-optical and PNT) and space protection.

Stokes said the end of 2015 was "significant" for Chinese space efforts because consolidation of end-users under the PLA's Strategic Support Force (PLASSF) occurred, specifically within the Space Systems Department. In terms of developing and meeting requirements, the PLASSF is now "much more efficient," the American analyst posited.

Indeed, China created its space force in 2015, just a few months after Russia. After formally establishing its Space Force in December 2019, the US is still getting its equivalent off the ground. Cheng said both China and Russia have been pushing to militarise space, even though such a term is probably meaningless given that 95 per cent of space technology has dual applications for both military and civilian use. Certainly, outer space can no longer be viewed as a sanctuary.

Stokes said that "not much has changed really in terms of the space launch infrastructure and the launch, tracking and control of space ... but they are now integrated with end-users, and that is going to have an effect on making the whole system more efficient."

China has freedom of action in space, and the creation of the PLASSF and consolidation of space/counter-space research, development and acquisition, as well as training and operations, have benefitted from a single integrated command. The PLA's ability to interfere with American military operations in places like Taiwan will continue to grow yearly.

Cheng said, "The Chinese see future war as revolving around joint operations, which are not just land, air and sea forces." They also include the outer space and electronic warfare domains, which are necessary for information dominance." China, therefore, wishes to deny an adversary like the US the use of space, plus it needs to give the Chinese military every advantage.

China has therefore developed the ability to target hostile space-based assets (from the ground or space) and their all-important data-links. Indeed, jamming and electronic warfare complement anti-satellite weapons (which China has already tested), any of which can achieve effective mission kills against US and allied satellites. Stokes has not yet ascertained which agency is responsible for satellite kinetic kills, but it could well be the PLA Rocket Force, which is traditionally very tightly controlled by the Central Military Commission.

A detailed report entitled China's Space and Counter-space Capabilities and Activities, prepared for the US-China Economic and Security Review Commission, was published on March 30. Its authors, Mark Stokes, Gabriel Alvarado, Emily Weinstein and Ian Easton, summarised China's counter-space capabilities as follows.

"China has an operational counter-space capability that will evolve through 2020 and out to 2035. These capabilities include anti-satellite kinetic kill vehicles (KKV) and space electronic countermeasures ... On the non-kinetic side, the PLA has an operational ground-based satellite electronic countermeasures capability designed to disrupt adversary use of satellite communications, navigation, search and rescue, missile early warning and other satellites through use of jamming."

China obtained its first ground-based satellite jammers from Ukraine in the late 1990s, but it has developed its own solutions since then. "The PLA is capable of carrying out electronic countermeasures to disrupt, deny, deceive or degrade space services. Jamming prevents users from receiving intended signals and can be accomplished by attacking uplinks and downlinks.

The PLA and defence industry are developing and deploying jammers capable of targeting satellite communications over a large range of frequencies, including dedicated military communication bands. The PLASSF also has advanced cyber capabilities that could be applied in parallel with counter-space operations."

Nonetheless, the report asserted that the US still assumed a technological lead in space.

"China also is carrying out research, development and testing on potential space-based counter-space systems. The PLASSF and defense industry have carried out advanced satellite maneuvers and are likely testing orbital technologies that could be applied to counter-space operations." The PLASSF Network Systems Department probably oversees satellite jamming operations.

#### That factionalizes the CCP and emboldens challenges to Xi – the PLA is increasingly powerful and not unconditionally subservient

Simpson 16 [(Kurtis, Centre Director with Defence Research and Development Canada, has been conducting research on China’s leadership, Communist Party politics, the People’s Liberation Army and foreign policy for over 30 years,Master’s Degree and a Ph.D from York University, previously served as an intelligence analyst at the Privy Council Office and leader of the Asia Research Section at the Department of National Defence’s Chief Defence Intelligence (CDI) organization) “China’s Re-Emergence: Assessing Civilian-Military Relations In Contemporary Era – Analysis,” Eurasia Review, 12/21/2016] JL

Paralleling divided loyalties between Chinese Party, military and government bodies, one must also recognize that within each, factions exist, based upon generational, personal, professional, geographic, or institutional allegiances.19 These minor fault lines are most pronounced during crises, and they continue independent of professionalization.20 As was demonstrated by the civil-military dynamics of the Chinese government’s suppression of student demonstrators, both divisions and allegiances of interests emerged with respect to how to contain this situation and factional interests largely determined which troops would carry out the orders, who commanded them, what civilian Party leaders supported the actions, and who would be sanctioned following the mêlée. A consequence of factionalism within the PLA is that the Party’s control mechanisms (particularly because rule of law and constitutional restraints on the military are weak) needs to be robust to control not only a single military chain of command but (particularly during crises) perhaps more than one. This is not likely the case. A review of the evidence indicates the military’s influence, on the whole, is increasing, and the Party’s control decreasing.

On one level, the Party clearly controls the military as the Central Military Commission or CMC (the highest military oversight body in the PRC) is chaired by a civilian, President Xi Jinping. Moreover, the PLAs representation on formal political decision-making bodies (such as the Politburo Standing Committee, the Politburo, the Central Committee, and the NPC) has decreased over the years, but this does not necessary equate to a reduced level of influence. For example, the two Vice-Chairman of the CMC are now military generals, as are the remaining other eight members. Irrespective of institutional membership, military leaders retain considerable say. Personal interactions and informal meetings with senior party elites provide venues to sway decisions. They do, also, hold important places on leading small groups dedicated to issues like Taiwan and other security questions, such as the South China Seas.21

In a similar vein, other methods of Party influence, as exercised through political commissars, party committees, and discipline inspection commissions are no longer empowered to enforce the ideological dictates of a paramount leader. In the face of diffuse reporting chains, competing allegiances, and often effective socialization by the military units they are supposed to be watching over, most do not provide the Party guardian and guidance function once so pervasive.

While perhaps overstated, Paltiel’s observation that “…China’s energies over the past century and half have given the military a prominent and even dominant role in the state, preempting civilian control and inhibiting the exercise of constitutional authority” is likely now truer than ever before in history.22 While still loyal to the party as an institution, the PLA is not unconditionally subservient to a particular leader and retains the resources to enter the political arena if (at the highest levels) a decision is made to do so.

The civilian-military trend lines evident in China since the end of the Cultural Revolution affirm that the symbiotic nature of the Party-PLA relationship has morphed in important respects since the late 1960s. The promotion of professionalism, a reduced role for ideological indoctrination, an increasing bifurcation of civil-military elites, and growing state powers (complete with divided loyalties and continued factionalism) has complicated the political landscape informing how the CCP interacts with the PLA. If, as postulated, we have moved from a fused, ‘dual role elite’ model to one of ‘conditional compliance’ in which the military actually holds a preponderance of the power capabilities and where its interests are satisfied through concessions, bargaining, and pay-offs, empirical evidence should reflect this. A review of China’s three major leadership changes since the transition from the revolutionary ‘Old Guard’ to the modern technocrats confirms this.

Formally anointed and legitimized by Deng in 1989, Jiang assumed leadership without military credentials and few allies, viewed by many as a ‘caretaker’ Party Secretary in the wake of the Tiananmen Massacre. Despite his limitations, Jiang was well versed in the vicissitudes of palace politics. Informed by a high political acumen, he immediately promoted an image as an involved Commander-in-Chief, personally visiting all seven military regions, a sign of commitment not made by either the likes of Mao or Deng. Symbolic gestures like this were bolstered by his providing incentives to the PLA, such as: consistent raises in the defence budget; funds for military modernization; as well as equipment, logistics, and augmented R&D.23

Referred to as the ‘silk-wrapped needle,’ Jiang marshalled Party resources to not only reward, but to punish.24 His institutional authority over appointments enabled him to manipulate factions, dismiss those who opposed him, enforce new rigid retirement standards, and promote loyalists. A delicate equilibrium was established during the early-1990s until his semi-retirement in 2004,25 where Jiang guaranteed military priorities such as supporting ‘mechanization’ and an ‘information-based military’ (promoting the concept of RMA with Chinese characteristics) in exchange for the PLA backing of his legacy contributions to Marxist Leninist Mao Zedong thought with the enshrinement of his “Three Represents” doctrine.

Like Jiang, Hu Jintao’s succession was the product of negotiation, compromise, and concessions. While neither opposed by the PLA, nor supported by the military ‘brass,’ Hu was a known commodity, having served as Vice-President (1998) and CMC Vice-Chairman since 1999. He was deemed acceptable until proven otherwise. In the shadow of Jiang (who retained the position of CMC Chair until 2004), Hu did not exert the same kind of influence in, nor engender the same kind of deference from, China’s military, but equally proved capable of fostering a pragmatic relationship with the army which ensured its interests, and in so doing, legitimized his leadership position.

Ceding much of the military planning and operational decisions to the PLA directly, Hu played to his strengths and focused upon national security issues (such as the successful resolution of SARs in China), which bolstered his credibility as a populist leader among the masses, indirectly increasing his power within both the military and the Party. Additionally, he focused upon foreign military security affairs (most notably, North Korea-US negotiations), which enabled him to link his personal political agenda with the military’s latest ambitions.

In according the military a distinct place in China’s national development plan, supporting China’s rise, and ensuring its vital interests, Hu recognized the military’s evolving requirement to ‘go global’ and its worldwide interests in non-combat operations, such as peacekeeping and disaster relief, as well as stakes in the open seas, outer space, and cyberspace as interest frontiers with no geographic boundaries.26 Under the slogan of ‘China’s historical mission in the new phase of the new century’ and his acquiescence to the PLA’s stated requirements ‘to win local wars under modern conditions’ by funding new technology acquisition, Hu received the army’s formal recognition for his contributions to military thought based upon “scientific development” which informed a “strategic guiding theory,” resulting in a new operational orientation for China’s military. Emulating his predecessor, Hu won ‘conditional compliance’ from the PLA by successfully bartering military needs and wants for the army’s support and endorsement of his political tenure. This was not done outside of self-interest. Hu, as did Jiang, skillfully coopted, fired, and promoted select Generals to serve his greater ends, and he did this through varied means. Ultimately, however, it was done in a manner acceptable to the military.

Xi Jinping’s rise to power in 2012, while replicating the ‘horse-trading’ of Jiang and Hu, marks a fundamental departure in leadership style. Often described as a transformative leader, Xi is openly critical of his predecessors and rails against earlier periods where reform stalled and corruption grew.27 An advocate of ‘top-level design,’ incrementalism is being supplanted by a massive attempt to centralize all aspects of the CCP’s power, which includes a major restructuring of the economy, government, administration, and military.

Nicknamed “the gun and the knife” as a slight for his attempts to simultaneously control the army, police, spies, and the ‘graft busters,’ Xi’s power appears uncontested at present. Nevertheless, he is also viewed as ‘pushing the envelope too far’ and endangering the equilibrium which has been established between the Party and PLA over the past 25 years. For example, only two years into his mandate, he fostered a Cult of Personality, “the Spirit of Xi Jinping” which was officially elevated to the same standing as that of Mao and Deng, by comparison, foundational figures in Chinese history. His open attacks of political ‘enemies’ (most notably Zhou Yongkang, a Politburo Standing Committee member and former security czar) breeds fear among almost every senior official, all of whom are vulnerable on some point. Equally true, an unprecedented anti-corruption campaign is inciting comrades to turn on comrades, not unlike a massive game of prisoner’s dilemma.

Nowhere is the pressure for reform greater than in the PLA. Xi advocates administering the army with strictness and austerity, promoting frugality and obedience. At his direction, “mass-line educational campaigns” designed to “rectify work style” through criticism and self-criticism are being implemented.28 Ideological and political building is now equated with army building, as a means of ensuring the Party’s uncontested grip over the troops ideologically, politically, and organizationally. Select military regions (those opposite Taiwan and adjacent to the South China Seas) and commanders from those regions are witnessing favoritism and promotion at the expense of others. Moreover, a new “CMC Chairmanship Responsibility System” has been instituted, which directly calls into question the support of some of Xi’s senior-most generals.

A ‘hardliner’ by nature, Xi recognizes that he must earn the support of the PLA. New military priorities he supports include: accelerating modernization; Joint Command and C4ISR; training; talent management, as well as equipment and force modernization. That said, his goal of achieving the Chinese dream of building a “wealthy, powerful, democratic, civilized, and harmonious socialist modernized nation” by 2021, the 100th anniversary of the founding of the CCP, is exceptionally ambitious. It will require endless commitments to competing interests in a period of economic stagnation and global economic downturn. Should the PLA come to believe they are not first in line for government largess, support for Xi could erode very quickly.29

#### CCP instability collapses the international order – extinction

Perkinson 12 [(Jessica, MA in international affairs from American University) “The Potential for Instability in the PRC: How the Doomsday Theory Misses the Mark,” American University School of International Service, 2012] JL

Should the CCP undergo some sort of dramatic transformation – whether that be significant reform or complete collapse, as some radical China scholars predict2 – the implications for international and US national security are vast. Not only does China and the stability of the CCP play a significant role in the maintenance of peace in the East Asian region, but China is also relied upon by many members of the international community for foreign direct investment, economic stability and trade. China plays a key role in maintaining stability on the Korean Peninsula as one of North Korea’s only allies, and it is argued that instability within the Chinese government could also lead to instability in the already sensitive military and political situation across the Taiwan Strait. For the United States, the effect of instability within the CCP would be widespread and dramatic. As the United States’ largest holder of US treasury securities, instability or collapse of the CCP could threaten the stability of the already volatile economic situation in the US. In addition, China is the largest trading partner of a number of countries, including the US, and the US is reliant upon its market of inexpensive goods to feed demand within the US.

It is with this in mind that China scholars within the United States and around the world should be studying this phenomenon, because the potential for reform, instability or even collapse of the CCP is of critical importance to the stability of the international order as a whole. For the United States specifically, the potential - or lack thereof - forreform of the CCP should dictate its foreign policy toward China. If the body of knowledge on the stability of the Chinese government reveals that the Chinese market is not a stable one, it is in the best interests of the United States to look for investors and trade markets elsewhere to lessen its serious dependence on China for its economic stability, particularly in a time of such uncertain economic conditions within the US.

#### Independently, Xi will lash out to preserve cred in the SCS – US draw-in ensures extinction

Mastro 20 [(Oriana Skylar, Assistant Professor of Security Studies at Georgetown University's Edmund A. Walsh School of Foreign Service, Resident Scholar at the American Enterprise Institute) “Military Confrontation in the South China Sea,” Council on Foreign Relations, 5/21/2020] JL

The risk of a military confrontation in the South China Sea involving the United States and China could rise significantly in the next eighteen months, particularly if their relationship continues to deteriorate as a result of ongoing trade frictions and recriminations over the novel coronavirus pandemic. Since 2009, China has advanced its territorial claims in this region through a variety of tactics—such as reclaiming land, militarizing islands it controls, and using legal arguments and diplomatic influence—without triggering a serious confrontation with the United States or causing a regional backlash. Most recently, China announced the creation of two new municipal districts that govern the Paracel and Spratly Islands, an attempt to strengthen its claims in the South China Sea by projecting an image of administrative control. It would be wrong to assume that China is satisfied with the gains it has made or that it would refrain from using more aggressive tactics in the future. Plausible changes to China’s domestic situation or to the international environment could create incentives for China’s leadership to adopt a more provocative strategy in the South China Sea that would increase the risk of a military confrontation.

The United States has a strong interest in preventing China from asserting control over the South China Sea. Maintaining free and open access to this waterway is not only important for economic reasons, but also to uphold the global norm of freedom of navigation. The United States is also at risk of being drawn into a military conflict with China in this region as a result of U.S. defense treaty obligations to at least one of the claimants to the contested territory, the Philippines. China’s ability to control this waterway would be a significant step toward displacing the United States from the Indo-Pacific region, expanding its economic influence, and generally reordering the region in its favor. Preventing China from doing so is the central objective of the U.S. National Security Strategy and the reason the Indo-Pacific is the U.S. military’s main theater of operations. For these reasons, the United States should seek ways to prevent Chinese expansion, ideally while avoiding a dangerous confrontation and being prepared to deftly manage any crises should they arise.

China considers the majority of the South China Sea to be an inalienable part of its territory. Exercising full sovereignty over this area is a core component of President Xi Jinping’s “China Dream.” China does not accept or respect the sovereignty claims of Brunei, Indonesia, Malaysia, the Philippines, Taiwan, or Vietnam in this region. Although China has been cautious in pressing its claims thus far, three developments could convince Xi that China should be more assertive.

Xi could feel compelled to accelerate his timeline in the South China Sea to maintain his consolidated position within the Chinese Communist Party (CCP), particularly if the political situation in Hong Kong worsens, peaceful reunification with Taiwan becomes less likely, or domestic criticism of his management of the novel coronavirus outbreak increases. With China’s economic growth for 2020 projected to hit only 1.2 percent—the lowest since the mid-1970s—Xi could find it necessary to demonstrate strength while Beijing deals with internal fallout from the pandemic. China has already declared two new administrative districts in the South China Sea in April 2020 and has escalated its criticism of U.S. freedom of navigation operations (FONOPs) in the area. Moreover, with expectations that the first stage of China’s military modernization efforts will be completed in 2020, Xi could become more confident that China would succeed in pressing its claims militarily, especially if the United States is distracted internally with managing the coronavirus pandemic or its aftermath.

## 1NC

#### JCPOA passes now – political will is key

Reuters 2/18 [(Reuters) “Iran nuclear deal could be agreed very soon, EU official says” Reuters, 2/18/2022. https://www.reuters.com/world/middle-east/iran-nuclear-deal-could-be-agreed-very-soon-eu-official-says-2022-02-18/] BC

BRUSSELS:

A senior European Union official said on Friday that a US-Iranian deal to revive Iran's 2015 nuclear agreement was close but success depended on the political will of those involved.

"I expect an agreement in the coming week, the coming two weeks or so," the EU official said. "I think we have now on the table text that are very, very close to what is going to be the final agreement," the official said.

Reuters reported on Feb 17 details of a possible deal negotiated by envoys from Iran, Russia, China, Britain, France, Germany, the European Union and United States.

"Most of the issues are already agreed. But as a principle in this kind of negotiations, nothing is agreed until everything is agreed. So we still have...some questions, some of them rather political and difficult to agree," the official said.

The official said a deal was necessary as Iran's sensitive uranium enrichment programme was moving ahead quickly. Iran has always denied it is seeking nuclear weapons.

"On the ground they are advancing very much at a speed that is not compatible with the long-term survival of the JCPOA," the official said, referring to the Joint Comprehensive Plan of Action, as the 2015 nuclear deal between Iran and world powers is formally titled.

#### Space diplomacy directly trades off with nonproliferation agreements – finite manpower, money, and political will within the AVC

Johnson-Freeze 16 [(Joan, Professor and former Chair of National Security Affairs at the US Naval War College, Newport, Rhode Island) “Space Warfare in the 21st Century: Arming the Heavens,” Cass Military Studies, 11/8/2016] JL

 \*The plan is legislated in the AVC (same bureau of the State Department that’s concerned with the JCPOA)

Proactive policymaking takes commitment, manpower, and money. A quick look at the money and manpower devoted to diplomacy in the US State and Defense departments compared to the resources available for the hardwareproducing military–industrial complex efforts described in Chapter 5 is enlightening. The Assistant Secretary of State for Arms Control, Verification, and Compliance (AVC) leads space-related diplomacy in the State Department. The AVC Bureau is responsible for “all matters related to the implementation of certain international arms control, nonproliferation, and disarmament agreements and commitments; this includes staffing and managing treaty implementation commissions.”34 The AVC arms control portfolio includes nuclear, biological, and chemical weapons and all related issues. The AVC section charged with space issues is the Office of Emerging Security Challenges; this office also handles missile defense issues and the promotion of transparency, cooperation, and building confidence regarding cybersecurity. As of financial year 2013, AVC had a budget of $31.2 million and 141 employees35 to be active participants and leaders in all of these issues.

By way of comparison, the Space Security and Defense Program, a joint program of the DoD and the Office of the Director of National Intelligence (ODNI) was programmed for a similar budget amount in financial year 2015: $32.3 million. That program is described as a “center of excellence for options and strategies (materiel, non-materiel, cross-Title, cross-domain) leading to a more resilient and enduring National Security Space (NSS) Enterprise.”36 A majority of SSDP funding is allocated to the development of offensive space control strategies. So basically, the same budget is allocated for all US global space diplomacy efforts as for an in-house Pentagon think tank to devise counterspace strategies.

Within the Pentagon, the Deputy Assistant Secretary of Defense for Space Policy is charged with all issues related to space policy, including diplomacy. The responsibilities of the Space Policy office are to:

• Develop policy and strategy for a domain that is increasingly congested, competitive, and contested

• Implement across DoD — plans, programs, doctrine, operations — and with the IC and other agencies

• Engage with allies and other space-faring countries in establishing norms and augmenting our capabilities.37

The breadth of those responsibilities, which includes reviewing space acquisitions, means that there may be only a handful of individuals actually engaged in multilateral diplomatic efforts, acting, for example, as advisors to diplomatic discussions such as those through the United Nations. Additionally, the expanse of the Pentagon results in a chain of command that makes organizational competition for attention to subject matter challenging at best. The Deputy Assistant Secretary of Defense for Space Policy reports to the Assistant Secretary of Defense for Homeland Defense, who then reports to the Principle Deputy Secretary of Defense for Homeland Defense and Global Security, who then reports to the Under Secretary of Defense for Defense Policy. There are also a multitude of space players in other governmental organizations to coordinate and contend with, particularly within the Air Force and intelligence communities. Personnel are spread thin.

US government-wide space diplomacy needs a mandate, manpower, and a supporting budget. Diplomacy, especially multilateral diplomacy, can be timeconsuming, manpower-intensive, and frustrating; and patience is not a strong American virtue. The recent experience in the UN LTS Working Group is emblematic of everything that causes the United States to shun multilateralism. Under the auspices of this group, countries had worked in good faith over the past five years to develop technical guidelines as reciprocal constraints, as insisted upon by the developing countries when they rejected the ICOC. Yet group success appeared thwarted at the February 2016 meeting of the LTS Working Group by one country, Russia.

#### Iranian proliferation goes nuclear – causes regional war and spurs proliferation cascades across the Middle East

Chilton and Hoshovsky 20 – [(Kevin, led U.S. Strategic Command and has participated in the Jewish Institute for National Security of America’s Generals and Admirals Program; Harry, policy analyst at JINSA’s Gemunder Center for Defense and Strategy) "Avoiding a nuclear arms race in the Middle East," Defense News, 2-13-2020, https://www.defensenews.com/opinion/commentary/2020/02/13/avoiding-a-nuclear-arms-race-in-the-middle-east/] TDI

This raises two immediate concerns. First, **should Iran race for the bomb, it is** almost inevitable that the United States and/or Israel will take preventative military action **to stop it from crossing that fateful threshold**. This could easily spiral into a regional war as Iran activates its various proxy forces against the United States and its allies.

Second, **an Iranian nuclear breakout attempt could** spur a proliferation cascade throughout the Middle East, **beginning with Saudi Arabia.**

Mohammed bin Salman, **the Saudi crown prince, openly stated in 2018 that if Iran developed nuclear weapons**, Riyadh would quickly “follow suit.” **One suggested approach would see Saudi Arabia purchase a nuclear power reactor from a major supplier like South Korea and then build a reprocessing plant that would yield enough weapons-grade plutonium in five years**.

A half-decade delay isn’t optimal, however, when the goal is achieving nuclear deterrence quickly. Thus, there is the so-called Islamabad option.

This refers to Riyadh’s role in financing Pakistan’s nuclear weapons program and an alleged commitment from Islamabad that it would repay the favor. While Pakistani and Saudi officials have denied any such understanding, **there is the possibility that the two could work out an arrangement where Islamabad could deploy some of its nuclear arsenal on Saudi soil following a successful Iranian breakout.**

Although this maneuver would draw sharp, international criticism, in theory, it would allow Riyadh to remain in good standing vis-a-vis the nuclear nonproliferation treaty. Nevertheless, Pakistan might not be willing to play spoiler against a nuclearized Iran. If it is, Middle Eastern geopolitics would become extremely unstable.

**If Saudi Arabia acquires nuclear weapons**, many believe Turkey would follow suit. Last September, Turkish President Recep Tayyip **Erdogan declared that he “cannot accept” the argument from Western nations that Turkey should not be allowed to attain nuclear weapons.** In 1958, Charles de Gaulle proclaimed that a nation without nuclear weapons “does not command its own destiny”; two years later, France tested its first bomb. Erdogan’s comments echo those earlier remarks and raise the possibility that Ankara could become the second NATO member to leave the alliance’s nuclear umbrella in favor of its own independent arsenal.

#### Prolif cascades undermine deterrence and cause nuclear war – this is predictive of what a multi-nuclear Middle East would look like

Krepinevich 13 – [(Dr. Andrew F, the President of the Center for Strategic and Budgetary Assessments) “Critical Mass: Nuclear Proliferation in the Middle East,” 2013, https://csbaonline.org/uploads/documents/Nuclear-Proliferation-in-the-Middle-East.pdf] TDI

As more countries over time develop nuclear capabilities and build up their nuclear arsenals, the competition will evolve from an Israeli-Iranian affair to a multi-state rivalry. For illustrative purposes **we will assume that** in the 2025-2030 timeframe, **Iran**, **Saudi Arabia, Turkey, and perhaps Egypt** and/or Iraq **have nuclear arsenals** in the low double-digit range (i.e., ten to forty weapons). What form might a nuclear competition among these powers and Israel assume? The remainder of this chapter attempts to shed some light on this issue, and its potential implications, with emphasis on those affecting regional stability.

The challenge of preserving stability when confronted with military competition among five nuclear-armed states within the Middle East and with other powers external to the region engaged in a Great Game for influence is formidable. At first blush, one thing seems apparent: **many** Cold War-era metrics **for assessing the competition and gauging where it might be headed** appear to be of little utility; in fact, **they may actually prove misleading and dangerous**. The same can be said of those looking to apply Cold War-era arms control metrics as a way of keeping the peace in general and avoiding nuclear use in particular.

**During the Cold War, many nuclear strategists came to view nuclear parity** (the possession of roughly equivalent arsenals capable of inflicting roughly equivalent levels of destruction) **between the United States and the Soviet Union as stabilizing**. The perception of these strategists is that the rough equivalence contributed to the tradition of non-use of nuclear weapons, and was thus desirable. Parity enabled both sides to avoid the perception of being inferior to their rival, and perceptions are critical to deterrence and to preserving the confidence of one’s allies and security partners. If accepted by both sides, parity could enable them to avoid the cost and instability associated with “racing” toward ever-larger arsenals. Accordingly, maintaining parity was a major objective of U.S.-Soviet (and later U.S.-Russian) arms control negotiations. Yet irrespective of its merits, parity is not an option for states engaged in an n-player competition. Each competitor cannot have a nuclear force equivalent to all the others. Even if the competition should solidify into two coalitions so as to mimic the two-player Cold War competition, questions would almost certainly arise regarding the willingness of a coalition partner that has not been attacked to risk its own destruction by using its nuclear weapons in response to an attack on its ally. Indeed, these concerns were raised during the Cold War, and formed a major justification for France pursuing its own force de frappe. 93

**In a Middle Eastern “n-player” competition, all nuclear powers would be** challenged to establish an “assured destruction” capability **against all the other regional nuclear powers**, another Cold War desideratum, **given their relatively modest economies. An “assured destruction” capability in an n-state competition would require that each state have weapons sufficient to survive an initial attack by all potential rivals and still be able to devastate the countries of all attackers**. It would also require that the source of the attack be reliably identified. As noted earlier, this may prove difficult given likely limitations on these states’ ability to field advanced early warning systems. For example, would Israel be able to determine with confidence the owner of a ballistic missile launched from a location along the Iranian-Turkish border? The origin of any cruise missile launched from a sea-based platform? Even assuming a state could identify the source (or sources) of an attack, could its command and control systems survive the attack sufficiently intact to execute a retaliatory strike? **A decapitation strike could preclude an “assured destruction” retaliatory strike even if sufficient weapons survive to execute one.**

**This, in turn,** raises the possibility of a “catalytic” war**—one that is initiated between two states by a third party. Given a proliferated Middle East as described above, the chances that a regime would incorrectly attribute the source of an attack cannot be easily dismissed. To the extent** cyber weapons can introduce false information **into a state’s decision-making process, the risks of catalytic war only increase.**

Further complicating matters, **the early warning requirement following a proliferation cascade could be multidirectional, and at some point perhaps 360 degrees**, especially if nuclear rivals begin deploying a portion of their nuclear forces at sea. **Early warning requirements would be stressed even further** (and the costs of such a system increase correspondingly) **if a neighboring state** (e.g., Iran in the case of Turkey or Iraq; Turkey in the case of Israel; etc.) **were to acquire nuclear weapons**. In this case warning times would be even more compressed than in an Israeli-Iranian competition. Owing to its proximity to Iran, **Saudi Arabia**, for example, **could have less than five minutes to react to an Iranian ballistic missile attack no matter how advanced its early warning and command and control systems are.**

As noted earlier in this assessment, regardless of what assumptions are made regarding a regional nuclear power’s early warning system, given the short ballistic missile flight times it seems likely that preserving command and control of the state’s nuclear forces while under attack will prove challenging. **States might be tempted to adopt a launch-on-warning posture**, but this requires both early warning and a highly responsive command and control system. Should a state determine that it will not be able to launch-on-warning and instead attempt to “ride-out” a nuclear first strike and retaliate, it would still need its command and control system to function effectively in the wake of the nuclear attack. **Absent a highly resilient command and control system,** a state’s ability to launch a retaliatory **nuclear strike** may require nuclear release authority to be diffused to lower-level commanders. But again, absent an effective early warning system it may not be possible to determine the attack source with confidence in a region with multiple nuclear powers.

#### \*Nuclear war causes extinction – famine and climate change

Starr 15 [(Steven, Director of the University of Missouri’s Clinical Laboratory Science Program and a senior scientist at the Physicians for Social Responsibility) “Nuclear War, Nuclear Winter, and Human Extinction,” Federation of American Scientists, 10/14/2015] DD

While it is impossible to precisely predict all the human impacts that would result from a nuclear winter, it is relatively simple to predict those which would be most profound. That is, a nuclear winter would cause most humans and large animals to die from nuclear famine in a mass extinction event similar to the one that wiped out the dinosaurs.

Following the detonation (in conflict) of US and/or Russian launch-ready strategic nuclear weapons, nuclear firestorms would burn simultaneously over a total land surface area of many thousands or tens of thousands of square miles. These mass fires, many of which would rage over large cities and industrial areas, would release many tens of millions of tons of black carbon soot and smoke (up to 180 million tons, according to peer-reviewed studies), which would rise rapidly above cloud level and into the stratosphere. [For an explanation of the calculation of smoke emissions, see Atmospheric effects & societal consequences of regional scale nuclear conflicts.]

The scientists who completed the most recent peer-reviewed studies on nuclear winter discovered that the sunlight would heat the smoke, producing a self-lofting effect that would not only aid the rise of the smoke into the stratosphere (above cloud level, where it could not be rained out), but act to keep the smoke in the stratosphere for 10 years or more. The longevity of the smoke layer would act to greatly increase the severity of its effects upon the biosphere.

Once in the stratosphere, the smoke (predicted to be produced by a range of strategic nuclear wars) would rapidly engulf the Earth and form a dense stratospheric smoke layer. The smoke from a war fought with strategic nuclear weapons would quickly prevent up to 70% of sunlight from reaching the surface of the Northern Hemisphere and 35% of sunlight from reaching the surface of the Southern Hemisphere. Such an enormous loss of warming sunlight would produce Ice Age weather conditions on Earth in a matter of weeks. For a period of 1-3 years following the war, temperatures would fall below freezing every day in the central agricultural zones of North America and Eurasia. [For an explanation of nuclear winter, see Nuclear winter revisited with a modern climate model and current nuclear arsenals: Still catastrophic consequences.]

Nuclear winter would cause average global surface temperatures to become colder than they were at the height of the last Ice Age. Such extreme cold would eliminate growing seasons for many years, probably for a decade or longer. Can you imagine a winter that lasts for ten years?

The results of such a scenario are obvious. Temperatures would be much too cold to grow food, and they would remain this way long enough to cause most humans and animals to starve to death.

Global nuclear famine would ensue in a setting in which the infrastructure of the combatant nations has been totally destroyed, resulting in massive amounts of chemical and radioactive toxins being released into the biosphere. We don’t need a sophisticated study to tell us that no food and Ice Age temperatures for a decade would kill most people and animals on the planet.  Would the few remaining survivors be able to survive in a radioactive, toxic environment?

## Case

### Alien bacteria

#### No internal link— 1 company going up into spcae doesn’t trigger the impact

#### No aliens— prefer carded ev over theirs just asserting it

Jim **al-Khalili 18**, British theoretical physicist, PhD from the University of Surrey, “Aliens may not exist---but that’s good news for our survival,” https://www.theguardian.com/commentisfree/2018/jun/27/aliens-exist-survival-universe-jim-alkhalili, // SIR

In 1950 Enrico Fermi, an Italian-born American Nobel prize-winning physicist, posed a very simple question with profound implications for one of the most important scientific puzzles: whether or not **life exists beyond Earth**. The story goes that during a lunchtime chat with colleagues at the Los Alamos National Laboratory in New Mexico, the issue of flying saucers came up. The conversation was lighthearted, and it doesn’t appear that any of the scientists at that particular gathering believed in aliens. But Fermi merely wanted to know: “Where is everybody?” The most likely cradles for life inside our solar system Read more His point was that, since the age of the universe is so great and its size so vast, with hundreds of billions of stars in the Milky Way alone, then unless the Earth is astonishingly special, the universe should be teeming with life. This might include intelligent species advanced enough to have the knowledge and technology necessary for space travel. They ought to have colonised the entire galaxy by now. So where are they all? More recently, the late Stephen Hawking argued along similar lines. He said, “To my mathematical brain, the numbers alone make thinking about aliens perfectly rational.” Hawking was articulating the same popular argument as Fermi---that the sheer vastness of the universe all but guarantees we have company. Advertisement In recent years, scientists have begun to take the subject more seriously again. One of the most exciting areas of research in astronomy has been the discovery of extra-solar planets, worlds orbiting stars other than our sun. Many of them even appear to be Earth-like in size and climate. Astronomers now believe there are billions of these other worlds, many of which will have conditions suitable for life. The probability of life, maybe even intelligent life, existing on at least one of them must surely, therefore, be overwhelming. Now however, scientists at the wonderfully named Future of Humanity Institute in Oxford have poured **cold water** on Hawking’s and others’ optimism. They have carried out a thoughtful statistical analysis by **dissecting** a mathematical relation known as **the Drake equation**, which allows us to calculate the probability of extraterrestrial life based on the combined probabilities of all the ingredients for life being in place. Let me make clear at the outset that the Drake equation is not very scientific, for the sole reason that some of the factors that need to be fed into it are pure **guesswork** at this stage. Not the least of these is the big question: given all the things we believe are necessary for life (a source of energy, liquid water and organic molecules), how likely is it that life will emerge? The authors of the new study offer two insights, one pessimistic and the other more cheery. The first is that Fermi’s paradox is **easy** to resolve. The reason we have not had any messages from ET is because, **well,** **there is no ET** **out there**. They calculate the probability we are alone in the universe to be in the range of 39%–85% and the probability that we are alone in our own galaxy to be between 53% and 99.6%. Basically, don’t hold your breath. Biologists, of course, hate all this silly speculation. They quite rightly point out that we still do not properly understand how life originated here on Earth, so how can we possibly have any confidence in anticipating its existence or nonexistence elsewhere? There are some who argue that life on Earth appeared pretty quickly after the right conditions emerged almost 4bn years ago, which was when our planet had cooled sufficiently for liquid water to exist. Doesn’t that mean it could easily appear elsewhere too? Actually, no. A **statistical sample** of one tells us nothing.

It is quite possible that **biology is a freak local aberration**, the product of a chemical fluke so improbable that it **didn’t happen anywhere else** in the **observable universe**. So where do we stand? Well, there are reasons to believe that we may have an answer in the coming decade or two, one way or the other. Astrobiologists are about to search exoplanets for the gases produced by microbial life using sophisticated next-generation space telescopes. There is also the possibility of finding microbial life closer to home, under the ice of several of the moons of Jupiter and Saturn. I did say that the study also provided some cheer. Some have claimed we have not found ET yet because intelligent life (including us) always **annihilates itself** before it can successfully develop the technology for interstellar travel or communication. But maybe the silence is simply because **no such alien civilisations exist**. So, as the authors put it, pessimism about our own future is therefore unfounded. **We may be alone**, but we may just survive.

#### \*No aliens risk

**Ćirković 19** [Milan M. Ćirković, research professor at the Astronomical Observatory of Belgrade, and a research associate of the Future of Humanity Institute at Oxford University, “Space colonization remains the only long-term option for humanity: A reply to Torres,” 2019, Futures, Vol. 105, pp. 166-173, https://doi.o **Aliens are mathmatically improbable**

**Al-Khalili**, 6-27-20**18** - Jim Al-Khalili, professor of physics and professor of the public engagement in science at the University of Surrey; "Aliens may not exist – but that’s good news for our survival," Guardian, https://www.theguardian.com/commentisfree/2018/jun/27/aliens-exist-survival-universe-jim-alkhalili

Now however, **scientists at the wonderfully named Future of Humanity Institute in Oxford have poured cold water on Hawking’s and others’ optimism**. They have carried out a thoughtful statistical analysis by dissecting a mathematical relation known as the Drake equation, **which allows us to calculate the probability of extraterrestrial life based on the combined probabilities of all the ingredients for life being in place.**

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#### No disease- pathogenesis needs intimacy.

Smith, 17 [Drew Smith, scientist, worked in the biotech and medtech industries for 25 years as a bench scientist, a director of R&D and a CEO, "Would Extraterrestrial Bacteria Be Dangerous To Humans?", 6-16-2017, Forbes, https://www.forbes.com/sites/quora/2017/06/16/would-extraterrestrial-bacteria-be-dangerous-to-humans/, accessed 1-8-2020]

The chance that extraterrestrial bacteria would be deadly to humans is zero. Not just very, very small. Zero.

Pathogenesis requires intimacy. This intimacy is attained through millions of years of co-evolution. The need for intimacy is apparent when you look at how bacteria and viruses cause infections and disease.

Infection requires binding to a cell surface. Bacteria (and viruses) bind to human cells through proteins that recognize human proteins and carbohydrates. The structure of these human proteins and carbohydrates is, to a first approximation, arbitrary. There are an almost infinite number of permutations of them that could exist and work just fine. But only one does exist. The chance that an alien bacteria would have evolved to stick to that protein is infinitesimally small.

Even if this alien bacterium were able to stick to a cell surface, this alone would not establish an infection. Infecting bacteria secrete all kinds of toxins and virulence factors. These toxins and factors bind to specific human proteins. They block or modify their activity in ways that degrade cells and tissues, releasing nutrients that the bacteria can feed upon.

Again, the target proteins have fairly arbitrary structures. They are the result of billions of years of evolutionary history and their precise structure - and even their existence - is not at all predictable. The chance that an alien bacterium would have evolved toxins that precisely target them is infinitesimally small.

Pathogenicity is extremely rare on Earth. There are millions, perhaps billions, of species of bacteria. The number of potential human pathogens among them is very small, no more than a couple hundred. And only a couple dozen are able to infect otherwise healthy humans. These are bacteria that have been with us for millions of years, evolving as we evolve, becoming intimately familiar with our proteins, our cells, our immune systems.

This knowledge is stamped into their genomes; it is a diary of their long association with us. It is not a book that could be written in an alien language. Alien bacteria are no more likely to be human pathogens than intelligent aliens are likely to speak Urdu as their native tongue. It just isn’t possible.

#### Looking for aliens is key to cooperation to address collective actions problems—

Zutshi 18 [(Vikram, a filmmaker, independent scholar and columnist based in Los Angeles. His debut feature Max Kennedy and the American Dream was filmed at various points along the two thousand mile US-Mexico border and has since been globally broadcast. He writes frequently on Art, Religion, Politics, Culture and Cinema and is currently in post-production on a new film called ‘Darshan.’) “Could extraterrestrials help us save the Earth?” OpenDemocracy, 1/9/18. <https://www.opendemocracy.net/en/transformation/could-extraterrestrials-help-us-save-earth/>] RR

In July 2015, a group led by physicist Stephen Hawking launched “Breakthrough Listen,” an initiative that’s claimed to be the largest ever scientific research program aimed at finding evidence of civilizations beyond Earth. During the launch of the initiative at the Royal Society in London, Hawking voiced his fears about what might happen in any such encounter, and why humankind needed to be much better prepared for what they might bring:

“We don't know much about aliens,” he told the audience, “but we know about humans. If you look at history, contact between humans and less intelligent organisms have often been disastrous from their point of view, and encounters between civilizations with advanced versus primitive technologies have gone badly for the less advanced.”

Science journalist Ann Druyan—who was part of the announcement panel—seemed more upbeat: “We may get to a period in our future where we outgrow our evolutionary baggage and evolve to become less violent and shortsighted,” she said. “My hope is that extraterrestrial civilizations are not only more technologically proficient than we are but more aware of the rarity and preciousness of life in the cosmos.”

Whether you’re an optimist or a pessimist about the possibilities of life on other planets, it’s here, beyond all the technical details about UFOs and ‘Advanced Aviation Threats’ and what exactly has been witnessed by whom, that the real interest lies. To put it bluntly, if human beings are so ineffective in confronting planetary problems, shouldn’t we seek out help wherever we can find it even if it comes from an inter-planetary source?

With religious and ethnic chauvinism on the rise, self-serving corporations wreaking havoc on the environment, and populist demagogues commandeering significant swathes of the populace, it’s clear that humanity needs an urgent wake-up call—something that shakes us out of our complacency and short-sightedness and forces us to recognize that we all share a symbiotic relationship with each other and with this fragile planet.

Breakthrough Listen and other similar initiatives may be a sign that this tipping point is getting closer, or at least that humanity is becoming more serious in its search for help. Other governments and academics are already studying UFO-like phenomena in the UK Canada, Peru, France, Belgium, Spain, Sweden, Chile, Brazil, Uruguay, Mexico, Japan and the ex-Soviet Union.

The SETI Institute in California (shorthand for “Search for Extra-Terrestrial Intelligence”) is gaining increasing credibility under the leadership of Dr. Seth Shostak, an astrophysicist from CalTech, while in India, Kumaresan Ramanathan, a senior technical engineer with a Chennai based IT firm, recently became that country’s first ‘certified UFO investigator.’ Ramanathan is part of MUFON (the “Mutual UFO Network”), one of the oldest and largest civilian non-profits investigating UFOs with thousands of members worldwide that was launched as far back as 1969. He was assigned 60 cases of credible UFO sightings from across the country when he started work.

After a decade studying the phenomenon, Leslie Kean, one of the authors of the New York Times report, published the results of her work as a book in 2010 entitled “UFOs: Generals, Pilots and Government Officials Go on the Record.” Aided by former White House Chief of Staff John Podesta, Kean examined reams of government documents, aviation reports, radar data, and case studies corroborated by physical evidence including scientifically analyzed photographs.

Kean’s book contains detailed personal accounts of UFO sightings by a host of high-level sources including US Air Force generals, Fife Symington III, (the former governor of Arizona), and Nick Pope, former head of the British Defence Ministry’s UFO Investigative Unit. Mirroring the increasing seriousness of this coverage, recent Hollywood offerings like Dennis Villeneuve’s film “Arrival,” with its emphasis on new forms of sophisticated, non-verbal communication between humans and aliens, may help to support a more intelligent debate about what might be learned from extra-terrestrial teachers.

The realization that we are not alone in the universe may be exactly what is needed at this stage of our evolution to help unite us in common purpose and actualize the full potential of our shared humanity. With the realization that perhaps we are only one of many civilizations in a vast galaxy comes the need for a broader and more encompassing vision of the future. It may be the catalyst required for our species to develop a planetary consciousness and cast off the old, redundant affiliations that no longer serve.

#### International cooperation solves climate change

Maskin 20 [(Eric, an American economist and 2007 Nobel laureate recognized with Leonid Hurwicz and Roger Myerson "for having laid the foundations of mechanism design theory". He is the Adams University Professor and Professor of Economics and Mathematics at Harvard University) “International cooperation needed to tackle climate change, financial crises: Eric Maskin,” The Economic Times, 1/4/20. <https://economictimes.indiatimes.com/news/international/world-news/south-africa-says-vaccines-prior-infection-help-mildness-of-covid-19-cases/articleshow/88345412.cms>] RR

The major global challenges of [climate change](https://economictimes.indiatimes.com/topic/climate-change) and financial crises can be solved only if countries agree to cooperate with each other and resist isolationism, economist and Nobel laureate Eric Stark Maskin said on Saturday. However, he added that global collaboration will not be easy as more and more nations turn inward-looking.  
"We can try to come together globally and devise an international treaty. Countries may be willing to sign an international treaty in which they promise to reduce their carbon emissions to a safe level," Maskin said at an event here while explaining the '[mechanism design](https://economictimes.indiatimes.com/topic/mechanism-design)' problems facing the world today.  
He said solving climate change is not so easy because every country, though delighted if other nations reduce their carbon emissions, is reluctant to make those reductions itself as it is economically painful.  
To reduce carbon emissions, countries must take steps like using new technology, which is expensive, as well as shutting down old factories, which will have a negative impact on their economies, he added.

Another big mechanism design problem is how to stop financial crises, said Maskin, who was awarded the Nobel Prize in economics in 2007.

"About 10 years ago, there was an enormous financial crisis, the biggest one since the 1930s. And this led to a global recession. In some ways, we still haven't recovered from it. I think stopping financial crises is as much a political problem as it is a technical problem," he said.

"I think the fact that we are becoming more national in our orientation, rather than international, is a worrying trend," Maskin noted.

International problems like climate change and financial crises can be solved only through international cooperation and not countries turning inward-looking, he added. SM ABM ABM

### Rocket launches

#### No link— your ev is only about 1 company launching, that can’t solve for all of the ozone.

#### Public sector rocket launches thump— Nasa launches hundreds of rockets, those don’t cause depletion

#### No internal link to climate— your internal link is about ozone depletion but your impact card is about degrees.

#### No Ozone Impact.

Ridley 14 (Matthew White Ridley, BA and PhD in Zoology from Oxford. “THE OZONE HOLE WAS EXAGGERATED AS A PROBLEM,” *Rational Optimist*, 9/25/14, <http://www.rationaloptimist.com/blog/the-ozone-hole-was-exaggerated-as-a-problem.aspx>) dwc 19

Serial hyperbole does the environmental movement no favours My recent Times column argued that the alleged healing of the ozone layer is exaggerated, but so was the impact of the ozone hole over Antarctica: The ozone layer is healing. Or so said the news last week. Thanks to a treaty signed in Montreal in 1989 to get rid of refrigerant chemicals called chlorofluorocarbons (CFCs), the planet’s stratospheric sunscreen has at last begun thickening again. Planetary disaster has been averted by politics. For reasons I will explain, this news deserves to be taken with a large pinch of salt. You do not have to dig far to find evidence that the ozone hole was never nearly as dangerous as some people said, that it is not necessarily healing yet and that it might not have been caused mainly by CFCs anyway. The timing of the announcement was plainly political: it came on the 25th anniversary of the treaty, and just before a big United Nations climate conference in New York, the aim of which is to push for a climate treaty modelled on the ozone one. Here’s what was actually announced last week, in the words of a Nasa scientist, Paul Newman: “From 2000 to 2013, ozone levels climbed 4 per cent in the key mid-northern latitudes.” That’s a pretty small change and it is in the wrong place. The ozone thinning that worried everybody in the 1980s was over Antarctica. Over northern latitudes, ozone concentration has been falling by about 4 per cent each March before recovering. Over Antarctica, since 1980, the ozone concentration has fallen by 40 or 50 per cent each September before the sun rebuilds it. So what’s happening to the Antarctic ozone hole? Thanks to a diligent blogger named Anthony Watts, I came across a press release also from Nasa about nine months ago, which said: “ Two new studies show that signs of recovery are not yet present, and that temperature and winds are still driving any annual changes in ozone hole size.” As recently as 2006, Nasa announced, quoting Paul Newman again, that the Antarctic ozone hole that year was “the largest ever recorded”. The following year a paper in Nature magazine from Markus Rex, a German scientist, presented new evidence that suggested CFCs may be responsible for less than 40 per cent of ozone destruction anyway. Besides, nobody knows for sure how big the ozone hole was each spring before CFCs were invented. All we know is that it varies from year to year. How much damage did the ozone hole ever threaten to do anyway? It is fascinating to go back and read what the usual hyperventilating eco-exaggerators said about ozone thinning in the 1980s. As a result of the extra ultraviolet light coming through the Antarctic ozone hole, southernmost parts of Patagonia and New Zealand see about 12 per cent more UV light than expected. This means that the weak September sunshine, though it feels much the same, has the power to cause sunburn more like that of latitudes a few hundred miles north. Hardly Armageddon. The New York Times reported “an increase in Twilight Zone-type reports of sheep and rabbits with cataracts” in southern Chile. Not to be outdone, Al Gore wrote that “hunters now report finding blind rabbits; fisherman catch blind salmon”. Zoologists briefly blamed the near extinction of many amphibian species on thin ozone. Melanoma in people was also said to be on the rise as a result. This was nonsense. Frogs were dying out because of a fungal disease spread from Africa — nothing to do with ozone. Rabbits and fish blinded by a little extra sunlight proved to be as mythical as unicorns. An eye disease in Chilean sheep was happening outside the ozone-depleted zone and was caused by an infection called pinkeye — nothing to do with UV light. And melanoma incidence in people actually levelled out during the period when the ozone got thinner.

#### No extinction – it takes 12 degrees without adaptation

Farquhar et al 17 [Sebastian Farquhar (PhD Candidate in Philosophy at Oxford and Project Manager at Future of Humanity Institute), John Halstead (climate activist and one of the co-founders of 350 Indiana-Calumet), Owen Cotton-Barratt (PhD in pure mathematics at Oxford. Previously worked as an academic mathematician and as Director of Research at the Centre for Effective Altruism), Stefan Schubert (Researcher at Department of Experimental Psychology at University of Oxford), Haydn Belfield (Associate Fellow at the Leverhulme Centre for the Future of Intelligence. He has a background in policy and politics, including as a Senior Parliamentary Researcher to a British Shadow Cabinet Minister, as a Policy Associate to the University of Oxford’s Global Priorities Project, and a degree in Philosophy, Politics and Economics from Oriel College, University of Oxford), Andrew Snyder-Beattie (Director of Research at the Future of Humanity Institute at Oxford, Holds degrees in biomathematics and economics and is currently pursuing a PhD in Zoology at Oxford), Existential Risk: Diplomacy and Governance, Global Priorities Project (Bostrom’s Institute), 2017-01-23, https://www.fhi.ox.ac.uk/wp-content/uploads/Existential-Risks-2017-01-23.pdf] TDI

The most likely levels of global warming are very unlikely to cause human extinction.15 The existential risks of climate change instead stem from tail risk climate change – the low probability of extreme levels of warming – and interaction with other sources of risk. It is impossible to say with confidence at what point global warming would become severe enough to pose an existential threat. Research has suggested that warming of 11-12°C would render most of the planet uninhabitable,16 and would completely devastate agriculture.17 This would pose an extreme threat to human civilisation as we know it.18 Warming of around 7°C or more could potentially produce conflict and instability on such a scale that the indirect effects could be an existential risk, although it is extremely uncertain how likely such scenarios are.19 Moreover, the timescales over which such changes might happen could mean that humanity is able to adapt enough to avoid extinction in even very extreme scenarios. The probability of these levels of warming depends on eventual greenhouse gas concentrations. According to some experts, unless strong action is taken soon by major emitters, it is likely that we will pursue a medium-high emissions pathway.20 If we do, the chance of extreme warming is highly uncertain but appears non-negligible. Current concentrations of greenhouse gases are higher than they have been for hundreds of thousands of years,21 which means that there are significant unknown unknowns about how the climate system will respond. Particularly concerning is the risk of positive feedback loops, such as the release of vast amounts of methane from melting of the arctic permafrost, which would cause rapid and disastrous warming.22 The economists Gernot Wagner and Martin Weitzman have used IPCC figures (which do not include modelling of feedback loops such as those from melting permafrost) to estimate that if we continue to pursue a medium-high emissions pathway, the probability of eventual warming of 6°C is around 10%,23 and of 10°C is around 3%.24 These estimates are of course highly uncertain. It is likely that the world will take action against climate change once it begins to impose large costs on human society, long before there is warming of 10°C. Unfortunately, there is significant inertia in the climate system: there is a 25 to 50 year lag between CO2 emissions and eventual warming,25 and it is expected that 40% of the peak concentration of CO2 will remain in the atmosphere 1,000 years after the peak is reached.26 Consequently, it is impossible to reduce temperatures quickly by reducing CO2 emissions. If the world does start to face costly warming, the international community will therefore face strong incentives to find other ways to reduce global temperatures.

### Mining

#### No internal link to resource wars— this is just an inherency arg about why asteroid mining is happening.

#### Gilliard card— about militarization broadly, not miltarization in space, means no internal link between those wars and in space.

#### Asteroids solve resource wars—

#### Climate change makes water shortages inevitable – that causes hydro-political conflict escalation which goes nuclear

Jamail 19 [(Dahr, writes for *Truthout* about climate change issues, recipient of the 2008 Martha Gellhorn Prize for Journalism, frequent guest on *Democracy Now!*) “The World Is on the Brink of Widespread Water Wars,” Truth Out, 2/11/2019] JL

Mark’s words should be a call to attention, and a call to action. The plight of farmers in Australia illustrates a larger reality: As planetary temperatures continue to increase and rainfall patterns shift due to human-caused climate disruption, our ability to grow crops and have enough drinking water will become increasingly challenged, and the outlook is only going to worsen.

The most recent United Nations Intergovernmental Panel on Climate Change report warned of increasingly intense droughts and mass water shortages around large swaths of the globe.

But even more conservative organizations have been sounding the alarm. “Water insecurity could multiply the risk of conflict,” warns one of the World Bank’s reports on the issue. “Food price spikes caused by droughts can inflame latent conflicts and drive migration. Where economic growth is impacted by rainfall, episodes of droughts and floods have generated waves of migration and spikes in violence within countries.”

Meanwhile, a study published in the journal Global Environmental Change, looked at how “hydro-political issues” — including tensions and potential conflicts — could play out in countries expected to experience water shortages coupled with high populations and pre-existing geopolitical tensions.

The study warned that these factors could combine to increase the likelihood of water-related tensions — potentially escalating into armed conflict in cross-boundary river basins in places around the world by 74.9 to 95 percent. This means that in some places conflict is practically guaranteed.

These areas include regions situated around primary rivers in Asia and North Africa. Noted rivers include the Tigris and Euphrates, the Indus, the Nile, and the Ganges-Brahmaputra.

Consider the fact that 11 countries share the Nile River basin: Egypt, Burundi, Kenya, Eritrea, Ethiopia, Uganda, Rwanda, Sudan, South Sudan, Tanzania and the Democratic Republic of Congo. All told, more than 300 million people already live in these countries, — a number that is projected to double in the coming decades, while the amount of available water will continue to shrink due to climate change.

For those in the US thinking these potential conflicts will only occur in distant lands — think again. The study also warned of a very high chance of these “hydro-political interactions” in portions of the southwestern US and northern Mexico, around the Colorado River.

Potential tensions are particularly worrisome in India and Pakistan, which are already rivals when it comes to water resources. For now, these two countries have an agreement, albeit a strained one, over the Indus River and the sharing of its water, by way of the 1960 Indus Water Treaty.

However, water claims have been central to their ongoing, burning dispute over the Kashmir region, a flashpoint area there for more than 60 years and counting.

The aforementioned treaty is now more strained than ever, as Pakistan accuses India of limiting its water supply and violating the treaty by placing dams over various rivers that flow from Kashmir into Pakistan.

In fact, a 2018 report from the International Monetary Fund ranked Pakistan third among countries facing severe water shortages. This is largely due to the rapid melting of glaciers in the Himalaya that are the source of much of the water for the Indus.

To provide an idea of how quickly water resources are diminishing in both countries, statistics from Pakistan’s Islamabad Chamber of Commerce and Industry from 2018 show that water availability (per capita in cubic meters per year) shrank from 5,260 in 1951, to 940 in 2015, and are projected to shrink to 860 by just 2025.

In India, the crisis is hardly better. According to that country’s Ministry of Statistics (2016) and the Indian Ministry of Water Resources (2010), the per capita available water in cubic meters per year was 5,177 in 1951, and 1,474 in 2015, and is projected to shrink to 1,341 in 2025.

Both of these countries are nuclear powers. Given the dire projections of water availability as climate change progresses, nightmare scenarios of water wars that could spark nuclear exchanges are now becoming possible.

#### Asteroid mining solves water access – only NEOs are sufficiently proximate and hydrated.

Tillman 19 [(Nola Taylor, has been published in Astronomy, Sky & Telescope, Scientific American, New Scientist, Science News (AAS), Space.com, and Astrobiology magazine, BA in Astrophysics) “Tons of Water in Asteroids Could Fuel Satellites, Space Exploration,” Space, 9/29/2019] JL

When it comes to mining space for water, the best target may not be the moon: Entrepreneurs' richest options are likely to be asteroids that are larger and closer to Earth.

A recent study suggested that roughly 1,000 water-rich, or hydrated, asteroids near our planet are easier to reach than the lunar surface is. While most of these space rocks are only a few feet in size, more than 25 of them should be large enough to each provide significant water. Altogether, the water locked in these asteroids should be enough to fill somewhere around 320,000 Olympics-size swimming pools — significantly more than the amount of water locked up at the lunar poles, the new research suggested.

Because asteroids are small, they have less gravity than Earth or the moon do, which makes them easier destinations to land on and lift off from. If engineers can figure out how to mine water from these space rocks, they could produce a source of ready fuel in space that would allow spacecraft designers to build refuelable models for the next generation of satellites. Asteroid mining could also fuel human exploration, saving the expense of launching fuel from Earth. In both cases, would-be space-rock miners will need to figure out how to free the water trapped in hydrated minerals on these asteroids.

"Most of the hydrated material in the near-Earth population is contained in the largest few hydrated objects," Andrew Rivkin, an asteroid researcher at Johns Hopkins University Applied Physics Research Laboratory in Maryland, told Space.com. Rivkin is the lead author on the paper, which estimated that near Earth asteroids could contain more easily accessible water than the lunar poles.

According to the United Nations Office for Outer Space Affairs, more than 5,200 of the objects launched into space are still in orbit today. While some continue to function, the bulk of them buzz uselessly over our heads every day. They carry fuel on board, and when they run out, they are either lowered into destructive orbits or left to become space junk, useless debris with the potential to cause enormous problems for working satellites. Refueling satellites in space could change that model, replacing it with long-lived, productive orbiters.

"It's easier to bring fuel from asteroids to geosynchronous orbit than from the surface of the Earth," Rivkin said. "If such a supply line could be established, it could make asteroid mining very profitable."

Hunting for space water from the surface of the Earth is challenging because the planet's atmosphere blocks the wavelength of light where water can be observed. The asteroid warming as it draws closer to the sun can also complicate measurements.

Instead, Rivkin and his colleagues turned to a class of space rocks called Ch asteroids. Although these asteroids don't directly exhibit a watery fingerprint, they carry the telltale signal of oxidized iron seen only on asteroids with signatures of water-rich minerals, which means the authors felt confident assuming that all Ch asteroids carry this rocky water.

Based on meteorite falls, a previous study estimated that Ch asteroids could make up nearly 10% of the near-Earth objects (NEOs). With this information, the researchers determined that there are between 26 and 80 such objects that are hydrated and larger than 0.62 miles (1 km) across.

Right now, only three NEOs have been classified as Ch asteroids, although others have been spotted in the asteroid belt. Most NEOs are discovered and observed at wavelengths too short to reveal the iron band that marks the class. Carbon-rich asteroids, which include Ch asteroids and other flavors, are also darker than the more common stony asteroids, making them more challenging to observe.

Although Ch asteroids definitely contain water-rich minerals, that doesn’t necessarily mean that they will always be the best bet for space mining. It comes down to risk. Would an asteroid-mining company rather visit a smaller asteroid that definitely has a moderate amount of water, or a larger one that could yield a larger payday but could also come up dry?

"Whether getting sure things with no false positives, like the Ch asteroids, is more important or if a greater range of possibilities is acceptable with the understanding that some asteroids will be duds is something the miners will have to decide," Rivkin said.

In addition to estimating the number of large, water-rich asteroids might be available, the study also found that as many as 1,050 smaller objects, roughly 300 feet (100 meters) across, may also linger near Earth. Their small bulk will make them easier to mine because their low gravity will require less fuel to escape from, but they will produce less water overall, and Rivkin expects that the handful of larger space rocks will be the first targets.

"It seems likely that the plan for these companies will be to find the largest accessible asteroid with mineable material with the expectation that it will be more cost-effective than chasing down a large number of smaller objects," Rivkin said. "How 'accessible' and 'mineable material' and 'cost-effective' are defined by each company is to be seen."

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

**Dobos 19** [(Bohumil Doboš, scholar at the Institute of Political Studies, Faculty of Social Sciences, Charles University in Prague, Czech Republic, and a coordinator of the Geopolitical Studies Research Centre) “Geopolitics of the Outer Space, Chapter 3: Outer Space as a Military-Diplomatic Field,” Pgs. 48-49] TDI

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