### framework

#### concede fw

### contention 1 – for the money

#### Free market, free space! Space-for-space economic growth is sustainable and critical to economic preservation

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There’s no shortage of hype surrounding the commercial space industry. But while tech leaders promise us moon bases and settlements on Mars, the space economy has thus far remained distinctly local — at least in a cosmic sense. Last year, however, we crossed an important threshold: For the first time in human history, humans accessed space via a vehicle built and owned not by any government, but by a private corporation with its sights set on affordable space settlement. It was the first significant step towards building an economy both in space and for space. The implications — for business, policy, and society at large — are hard to overstate.

In 2019, 95% of the estimated $366 billion in revenue earned in the space sector was from the space-for-earth economy: that is, goods or services produced in space for use on earth. The space-for-earth economy includes telecommunications and internet infrastructure, earth observation capabilities, national security satellites, and more. This economy is booming, and though research shows that it faces the challenges of overcrowding and monopolization that tend to arise whenever companies compete for a scarce natural resource, projections for its future are optimistic. Decreasing costs for launch and space hardware in general have enticed new entrants into this market, and companies in a variety of industries have already begun leveraging satellite technology and access to space to drive innovation and efficiency in their earthbound products and services.

In contrast, the space-for-space economy — that is, goods and services produced in space for use in space, such as mining the Moon or asteroids for material with which to construct in-space habitats or supply refueling depots — has struggled to get off the ground. As far back as the 1970s, research commissioned by NASA predicted the rise of a space-based economy that would supply the demands of hundreds, thousands, even millions of humans living in space, dwarfing the space-for-earth economy (and, eventually, the entire terrestrial economy as well). The realization of such a vision would change how all of us do business, live our lives, and govern our societies — but to date, we’ve never even had more than 13 people in space at one time, leaving that dream as little more than science fiction.

Today, however, there is reason to think that we may finally be reaching the first stages of a true space-for-space economy. SpaceX’s recent achievements (in cooperation with NASA), as well as upcoming efforts by Boeing, Blue Origin, and Virgin Galactic to put people in space sustainably and at scale, mark the opening of a new chapter of spaceflight led by private firms. These firms have both the intention and capability to bring private citizens to space as passengers, tourists, and — eventually — settlers, opening the door for businesses to start meeting the demand those people create over the next several decades with an array of space-for-space goods and services.

Welcome to the (Commercial) Space Age

In our recent research, we examined how the model of centralized, government-directed human space activity born in the 1960s has, over the last two decades, made way for a new model, in which public initiatives in space increasingly share the stage with private priorities. Centralized, government-led space programs will inevitably focus on space-for-earth activities that are in the public interest, such as national security, basic science, and national pride. This is only natural, as expenditures for these programs must qbe justified by demonstrating benefits for citizens — and the citizens these governments represent are (nearly) all on earth.

In contrast to governments, the private sector is eager to put people in space to pursue their own personal interests, not the state’s — and then supply the demand they create. This is the vision driving SpaceX, which in its first twenty years has entirely upended the rocket launch industry, securing 60% of the global commercial launch market and building ever-larger spacecraft designed to ferry passengers not just to the International Space Station (ISS), but also to its own promised settlement on Mars.

Today, the space-for-space market is limited to supplying the people who are already in space: that is, the handful of astronauts employed by NASA and other government programs. While SpaceX has grand visions of supporting large numbers of private space travelers, their current space-for-space activities have all been in response to demand from government customers (i.e., NASA). But as decreasing launch costs enable companies like SpaceX to leverage economies of scale and put more people into space, growing private sector demand (that is, tourists and settlers, rather than government employees) could turn these proof-of-concept initiatives into a sustainable, large-scale industry.

This model — of selling to NASA with the hopes of eventually creating and expanding into a larger private market — is exemplified by SpaceX, but the company is by no means the only player taking this approach. For instance, while SpaceX is focused on space-for-space transportation, another key component of this burgeoning industry will be manufacturing.

Made In Space, Inc. has been at the forefront of manufacturing “in space, for space” since 2014, when it 3D-printed a wrench onboard the ISS. Today, the company is exploring other products, such as high-quality fiber-optic cable, that terrestrial customers may be willing to pay to have manufactured in zero-gravity. But the company also recently received a $74 million contract to 3D-print large metal beams in space for use on NASA spacecraft, and future private sector spacecraft will certainly have similar manufacturing needs which Made In Space hopes to be well-positioned to fulfill. Just as SpaceX has begun by supplying NASA but hopes to eventually serve a much larger, private-sector market, Made In Space’s current work with NASA could be the first step along a path towards supporting a variety of private-sector manufacturing applications for which the costs of manufacturing on earth and transporting into space would be prohibitive.

Another major area of space-for-space investment is in building and operating space infrastructure such as habitats, laboratories, and factories. Axiom Space, a current leader in this field, recently announced that it would be flying the “first fully private commercial mission to space” in 2022 onboard SpaceX’s Crew Dragon Capsule. Axiom was also awarded a contract for exclusive access to a module of the ISS, facilitating its plans to develop modules for commercial activity on the station (and eventually, beyond it).

This infrastructure is likely to spur investment in a wide array of complementary services to supply the demand of the people living and working within it. For example, in February 2020, Maxar Technologies was awarded a $142 million contract from NASA to develop a robotic construction tool that would be assembled in space for use on low-Earth orbit spacecraft. Private sector spacecraft or settlements will no doubt have need for a variety of similar construction and repair tools.

And of course, the private sector isn’t just about industrial products. Creature comforts also promise to be an area of rapid growth, as companies endeavor to support the human side of life in the harsh environment of space. In 2015, for example, Argotec and Lavazza collaborated to build an espresso machine that could function in the zero-gravity environment of the ISS, delivering a bit of everyday luxury to the crew.

To be sure, people have dreamt of using the vacuum and weightlessness of space to source or make things that cannot be made on earth for half a century, and time and again the business case has failed to pan out. Skepticism is natural. Those failures, however, have been in space-for-earth applications. For example, two startups of the 2010s, Planetary Resources, Inc. and Deep Space Industries, recognized the potential of space mining early on. For both companies, however, the lack of a space-for-space economy meant that their near-term survival depended on selling mined material — precious metals or rare elements — to earthbound customers. When it became clear that demand was insufficient to justify the high costs, funding dried up, and both companies pivoted to other ventures.

These were failures of space-for-earth business models — but the demand for in-space mining of raw building material, metals, and water will be enormous once humans are living in space (and are therefore far cheaper to supply). In other words, when people are living and working in space, we are likely to look back on these early asteroid mining companies less as failures and more as simply ahead of their time.

Seizing the Space-for-Space Opportunity

The opportunity presented by the space-for-space economy is huge — but it could easily be missed. To seize this moment, policymakers must provide regulatory and institutional frameworks that will enable the risk-taking and innovation necessary for a decentralized, private-sector-driven space economy. There are three specific policy areas we believe will be especially important:

1. Enabling private individuals to take on greater risk than would be tolerable for government-employed astronauts.

First, as part of a general shift to that more decentralized, market-oriented space sector, policymakers should consider allowing private space tourists and settlers to voluntarily take on more risk than states would tolerate for government-employed astronauts. In the long run, ensuring high safety levels will be essential to convince larger numbers of people to travel or live in space, but in the early years of exploration, too great an aversion to risk will stop progress before it starts.

An instructive analogy can be found in how NASA works with its contractors: In the mid-2000s, NASA shifted from using cost-plus contracts (in which NASA shouldered all the economic risk of investing in space) to fixed-price contracts (in which risk was distributed between NASA and their contractors). Because of private companies’ greater tolerance for risk, this shift catalyzed a burst of activity in the sector — sometimes referred to as “New Space.” A similar shift in how we approach voluntary risk-taking by private-sector astronauts may be necessary in order to launch the space-for-space economy.

#### Growth is sustainable.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

#### Spreading capitalism creates global prosperity and environmental sustainability. Abandoning it is disastrous.

Rhonheimer, 20—teaching professor at the Pontifical University of the Holy Cross (Martin, “Capitalism is Good for the Poor – and for the Environment,” <https://austrian-institute.org/en/subjects-en/catholic-social-doctrine-2/capitalism-is-good-for-the-poor-and-for-the-environment/>, dml)

It is not social policy but capitalism that has created today’s prosperity.

What is important is that what made today’s mass prosperity possible – a phenomenon unprecedented in history – was not social policy or social legislation, organised trade union pressure, or corrective interventions in the capitalist economy, but rather market capitalism itself, due to its enormous potential for innovation and the ever-increasing productivity of human labour that resulted from it.

Increasing prosperity and quality of life are always the result of increasing labour productivity. Only increased productivity enabled higher social standards, better working conditions, the overcoming of child labour, a higher level of education, and the emergence of human capital. This process of increasing triumph over poverty and the constantly rising living standards of the general masses is taking place on a global scale – but only where the market economy and capitalist entrepreneurship are able to spread.

From industrial overexploitation of nature to ecological awareness

The first phase of industrialisation and capitalism was characterised by an enormous consumption of resources and frequent overexploitation of nature, which soon gave the impression that this process could not be sustainable. Since the end of the 19th century, disaster and doom scenarios have repeatedly been put forward, but in retrospect they have proved to be wrong: The combination of technological innovation, market competition, and entrepreneurial profit-seeking (with the compulsion to constantly minimise costs) have meant that these scenarios never occurred. The ever-increasing population has been increasingly better supplied thanks to innovative technologies, ever-increasing output with lower consumption of resources less harmful to the environment – e.g. less arable land in agriculture, or oil and electricity instead of coal for rapidly increasing mobility. More recent disaster scenarios, such as those spread by reputable scientists since the late 1960s and in the 1970s, have also proved to be inaccurate.

The reason things developed differently was the always underestimated innovative dynamism of the capitalist market economy, a growing ecological awareness and, as a result, legislative intervention that took advantage of the logic of market capitalism: As a result of the ecological movement that had come out of the United States since 1970, wise legislation began to use the price mechanism to apply market incentives to internalize negative externalities. Environmental pollution was given a price-tag.

This led to an enormous decrease in air pollution and other ecological consequences of growth, which is only possible in free, market-based societies, because the production process here is characterized by competition and constant pressure to reduce costs, i.e. to the most profitable use of resources. On the other hand, all forms of socialism, i.e. a state-controlled economy, have proved to be ecological disasters and have left behind destruction of gigantic proportions, without providing the population with anything that is near comparable in prosperity, often even by destroying existing prosperity, such as happened in Venezuela.

Capitalist profit motive combined with digitalization as a solution: Increasing decoupling of growth and resource consumption

Moreover, technological innovations combined with capitalist profit-seeking and market competition have led to a new and surprising phenomenon over the past decades, which is still hardly noticed in the public debate: the decoupling of growth and resource consumption (“dematerialization”). In a wide variety of industrial sectors, the developed countries, above all the U.S., are now achieving ever greater productive output with increasingly fewer resources. This has a lot to do with technology, especially the digitalization of the economy and of our entire lives.

As the well-known MIT professor Andrew McAfee shows in his book More from Less, published in October 2019, this process also follows the logic of capitalist profit maximization. To get it going, we do not need politics, even though wise, properly incentivizing legislation can be helpful and sometimes necessary. Above all, however, it is the combination of technological innovation, capitalist profit-seeking, and market-based entrepreneurial competition that will also solve the problem of man-made global warming.

In addition, property rights and their protection are decisive for the careful use of natural resources. And where this is not possible, legal support for collective self-governing structures, in accordance with the principle of subsidiarity, are important—as is analysed by Nobel Economic Prize winner Elinor Ostrom. By contrast, the growing ideologically motivated anti-capitalist eco-activism, and the policies influenced by it, are leading in the wrong direction, distracting precisely from what would be best for the climate and the environment—and distracting us from what could help protect us against the inevitable consequences of global warming.

#### The spread of capitalism causes world peace!

Mousseau, 19—Professor in the School of Politics, Security, and International Affairs at the University of Central Florida (Michael, “The End of War: How a Robust Marketplace and Liberal Hegemony Are Leading to Perpetual World Peace,” International Security, Volume 44, Issue 1, Summer 2019, p.160-196, dml)

Is war becoming obsolete? There is wide agreement among scholars that war has been in sharp decline since the defeat of the Axis powers in 1945, even as there is little agreement as to its cause.1 Realists reject the idea that this trend will continue, citing states' concerns with the “security dilemma”: that is, in anarchy states must assume that any state that can attack will; therefore, power equals threat, and changes in relative power result in conflict and war.2 Discussing the rise of China, Graham Allison calls this condition “Thucydides's Trap,” a reference to the ancient Greek's claim that Sparta's fear of Athens' growing power led to the Peloponnesian War.3

This article argues that there is no Thucydides Trap in international politics. Rather, the world is moving rapidly toward permanent peace, possibly in our lifetime. Drawing on economic norms theory,4 I show that what sometimes appears to be a Thucydides Trap may instead be a function of factors strictly internal to states and that these factors vary among them. In brief, leaders of states with advanced market-oriented economies have foremost interests in the principle of self-determination for all states, large and small, as the foundation for a robust global marketplace. War among these states, even making preparations for war, is not possible, because they are in a natural alliance to preserve and protect the global order. In contrast, leaders of states with weak internal markets have little interest in the global marketplace; they pursue wealth not through commerce, but through wars of expansion and demands for tribute. For these states, power equals threat, and therefore they tend to balance against the power of all states. Fearing stronger states, however, minor powers with weak internal markets tend to constrain their expansionist inclinations and, for security reasons, bandwagon with the relatively benign market-oriented powers.

I argue that this liberal global hierarchy is unwittingly but systematically buttressing states' embrace of market norms and values that, if left uninterrupted, is likely to culminate in permanent world peace, perhaps even something close to harmony. My argument challenges the realist assertion that great powers are engaged in a timeless competition over global leadership, because hegemony cannot exist among great powers with weak markets; these inherently expansionist states live in constant fear and therefore normally balance against the strongest state and its allies.5 Hegemony can exist only among market-oriented powers, because only they care about global order. Yet, there can be no competition for leadership among market powers, because they always agree with the goal of their strongest member (currently the United States) to preserve and protect the global order based on the principle of self-determination. If another commercial power, such as a rising China, were to overtake the United States, the world would take little notice, because the new leading power would largely agree with the global rules promoted and enforced by its predecessor. Vladimir Putin's Russia, on the other hand, seeks to create chaos around the world. Most other powers, having market-oriented economies, continue to abide by the hegemony of the United States despite its relative economic decline since the end of World War II.6

To support my theory that domestic factors determine states' alignment decisions, I analyze the voting preferences of members of the United Nations General Assembly from 1946 to 2010. I find that states with weak internal markets tend to disagree with the foreign policy preferences of the largest market power (i.e., the United States), but more so if they are major powers or have stronger rather than weaker military and economic capabilities. The power of states with robust internal markets, in contrast, appears to have no effect on their foreign policy preferences, as market-oriented states align with the market leader regardless of their power status or capabilities. I corroborate that this pattern may be a consequence of states' interest in the global market order by finding that states with higher levels of exports per capita are more likely than other states to have preferences aligned with those of the United States; those with lower levels of exports are more likely to have interests that do not align with the United States, but again more so if they are stronger rather than weaker.

Liberal scholars of international politics have long offered explanations for why the incidence of war may decline, generally beginning with the assumption that although the security dilemma exists, it can be overcome with the help of factors external to states.7 Neoliberal institutionalists treat states as like units and international organization as an external condition.8 Trade interdependence is dyadic and thus an external condition.9 Democracy is an internal factor, but theories of democratic peace have an external dimension: peace is the result of the expectations of states' behavior informed by the images that leaders create of each other's regime types.10 In contrast, I show that the security dilemma may not exist at all and how peace can emerge in anarchy with states pursuing their interests determined entirely by internal factors.11

#### Two framing issues:

#### If we win the direction of recent trends, we win. Our arg isn’t that things are good enough, but that they will get better.

McAfee, 19—cofounder and codirector of the MIT Initiative on the Digital Economy at the MIT Sloan School of Management, former professor at Harvard Business School and fellow at Harvard’s Berkman Center for Internet and Society (Andrew, “Getting So Much Better,” *More from Less: The Surprising Story of How We Learned to Prosper Using Fewer Resources—and What Happens Next*, Chapter 11, pg 223, Kindle, dml)

Before I show the evidence, I want to be clear about one thing: I'm not trying to make the case that things today are good enough. Because they’re certainly not. The world has too many poor, hungry, and sick people. Too many children are malnourished and uneducated. Too many people, despite the laws on the books, are forced into indentured servitude and slavery. We continue to pump greenhouse gases into the atmosphere, dump plastic into the oceans, kill rare animals, cut down tropical forests, and otherwise befoul our planet.

But we can document improvements without saying or implying that everything's okay now. We should document the improvements because they tell us something critically important: what we're doing is working and therefore we should keep doing it instead of contemplating huge course changes. As Lomborg wrote in The Skeptical Environmentalist, 'When things are improving we know we are on the right track.... Maybe we can do even more to improve... but the basic approach is not wrong."

The basic approach we've taken in recent decades— letting the four horsemen of the optimist gallop faster around the world—is far from wrong. It's causing some startlingly fast and broad improvements. So we need to encourage them to ride faster and farther. We need to step on the accelerator, not yank the steering wheel in a different direction.

#### Problems with capitalism aren’t inevitable, but emerge where there isn’t enough of it.

McAfee, 19—cofounder and codirector of the MIT Initiative on the Digital Economy at the MIT Sloan School of Management, former professor at Harvard Business School and fellow at Harvard’s Berkman Center for Internet and Society (Andrew, “Adam Smith Said That: A Few Words about Capitalism,” *More from Less: The Surprising Story of How We Learned to Prosper Using Fewer Resources—and What Happens Next*, Chapter 8, pg 170-171, Kindle, dml)

But hasn't capitalism also let people down in Latin America and the world's other less developed regions? Perhaps its failures haven't been as rapid and grotesque as socialism's in Venezuela, but hasn't it still failed? Ricardo Hausmann argues that it hasn't. It's worked quite well where it has taken hold. The problem, he points out, is that it hasn't been allowed to spread widely. As he puts it, "The capitalist reorganization of production petered out in the developing world, leaving the vast majority of the labor force outside its control. The numbers are astounding. While only one in nine people in the United States are self-employed, the proportion in India is nineteen out of twenty. Fewer than one-fifth of workers in Peru are employed [in] private businesses... In Mexico, about one in three are." In the rich world self-employed people are often freelancers or consultants, interacting professionally with companies when they choose to. In the developing world, however, the great majority of the self-employed would love to have a job with a company, but none are available. So people have to try to make a living as solo farmers, merchants, or tradespeople.

Hausmann has observed that different regions in developing countries have different economies, and he notes a fascinating pattern: where there is more capitalism, there is more prosperity. In the Mexican state of Nuevo León, for example, two-thirds of the people are employed by companies. In Chiapas, meanwhile, fewer than 15 percent are. Average incomes in Nuevo León are nine times higher. Hausmann doesn't think this is a coincidence: "The developing world's fundamental problem is that capitalism has not reorganized production and employment in the poorest countries and regions, leaving the bulk of the labor force outside its scope of operation. "

### contention 2 – climate

#### contention 2 is climate

#### Private space exploration tech is key to monitoring the future of climate

**Thales 20** (Thales, global leader in building a trustable future, “Monitoring Earth and Climate Change Impact from Space”, 7/7/20, <https://www.thalesgroup.com/en/group/magazine/monitoring-earth-and-climate-change-impact-space>) // el

The blue planet or the green one? As climate change is becoming one of the greatest long-term challenges that society is facing, its consequences on Earth are more and more visible, starting with its colour, when observed from space. To anticipate the consequences of global warming and protect our planet, we need precise information about how the natural environment is changing. Some Earth Observation satellites can provide reliable and highly accurate information on Earth over long periods of time and on a global scale. While meteorology was the first scientific discipline to use space capabilities in the 1960s, satellites are now able to help us monitor how healthy – or not – the planet we call home is, based on a broad range of data including weather analyses, the oceans’ colour and temperature, or measures of earth gravity. Three-quarters of the data used in numerical weather prediction models depend on satellite measurements, says OECD's quarterly magazine, OECD Observer. “It’s not something we can study from Earth. Of course we would get some data, but we wouldn’t be able to get a global view. It would be like watching television through a little hole,” says Sandrine Mathieu, Product Line Manager for Meteorology, Environment and Oceanography, at Thales Alenia Space. “Satellites give us a global view that progresses in time, showing how events are related and how fast they are evolving,” she adds. Some of the observation satellites orbiting around the Earth are purpose-designed for environmental monitoring. Satellites allow scientists and decision makers to better monitor the impact of climate change, and they can also be the only solution to monitor parts of the world where ground systems are not deployable. Every day, their eyes stay focused on our planet, capturing images that provide invaluable data to help us respond when nature goes wild, as well as to understand climate change, make better use of natural resources and protect populations at risk. Creating a ‘digital twin’ of Earth For example, satellites were able to detect the impact that the intense bushfires in Australia at the end of 2019 had on air quality in the United States, 15,000 kilometres away. Another key purpose of satellites is the monitoring of oceans. Around 70% of the planet’s surface is covered by oceans, which have a crucial impact on climate, regulating heat, absorbing CO2 and providing food as well as economic sustenance to coastal communities. Monitoring the oceans from space means we can have a comprehensive picture of their health by checking their depth with millimetre accuracy thanks to radar technology, their temperature with thermal infra-red sensors, and their salinity and – last but not least – their colour through the eyes of optical sensors. Oceans are not always blue. Their hue depends on the concentration of phytoplankton and other particle matters that could indicate discharges or the presence of pollution. By keeping an eye on oceans, we can detect algae bloom, which have a deadly effect on marine wildlife. The new-generation satellites will offer greater capabilities. The next step in the study of the Earth from space will be a hyperspectral 2D sounding meteorology mission that will provide a 3D vision of the atmosphere, compared with the surface data we can gather today. This will provide a gigantic leap in the knowledge we can apply to air transport, as well as the study of typhoons and air quality. “The logical continuation is the creation of a ‘digital twin’ for the Earth, which will allow us to gather all sorts of environment parameters (biodiversity, agricultural ressources, water quality, water height, …) on the global surface planet and monitor them in real time. By observing and understanding interactions we will eventually be able to anticipate pollution, extreme events, harvests, forest fires, climate change impacts, etc ,” says Sandrine Mathieu. Providing technology that benefits the daily lives of people At Thales, we’re fully aware of the impact of global warming. For more than 40 years now, Thales Alenia Space engineers have leveraged their expertise to give the world’s scientists and decision-makers the means they need to acquire vital data for environmental monitoring, oceanography and meteorology. Thales Alenia Space has been at the forefront of European geostationary meteorology, as prime contractor for three generations of Meteosat weather satellites on behalf of the European Space Agency (ESA) and EUMETSAT, the European operational satellite agency for monitoring weather, climate and the environment. The company is also involved in major Sentinel missions, a key to Europe’s environmental monitoring efforts. Sentinel satellites are being built on behalf of ESA as part of the European Union’s Copernicus programme. Thales Alenia Space is a major partneronboard this very ambitious programme, which is designed to monitor land and ocean, vegetation, soil and coastal areas, and study sea-surface as well as the temperature and colour of sea and land. As a world leader in altimetry and a major partner onboard the most iconic international missions dedicated to oceanography, Thales Alenia Space is also working on the French-American oceanography satellite SWOT (Surface Water Ocean Topography), which will revolutionise modern oceanography by detecting ocean features with 10 times better resolution than current technologies. Thales, which aims to provide technology that benefits the daily lives of people around the world, is committed to fighting climate disruption. Observation of the Earth from space is crucial to defining and implementing responsible environmental policies as satellite missions ensure that the environment we live in – the air we breathe, the water where we bathe and the forests we walk in -- remains as clean as possible.

#### Climate change triggers sweeping death and population loss (AGW = anthropogenic global warming)

**Parncutt, 19** - Professor of Systematic Musicology at the University of Graz. Honours (Master's) degree in Physics from University of New England (UNE), Australia. Interdisciplinary PhD in psychology, music and physics from UNE (Richard, Edited by: Eric Brymer, Australian College of Applied Psychology, Australia Reviewed by: José Gutiérrez-Pérez, University of Granada, Spain; Robert Martin Rees, Scotland’s Rural College, United Kingdom, 10-16-2019, accessed on 6-28-2021, Frontiers in Psychology, "The Human Cost of Anthropogenic Global Warming: Semi-Quantitative Prediction and the 1,000-Tonne Rule", doi: 10.3389/fpsyg.2019.02323)ao **AGW = Anthropogenic Global Warming**

Today, about 30% of global population experiences deadly heat for over 20 days per year. By 2100, this will rise to 48% if GHG emissions are drastically reduced and 74% if they continue to grow (Mora et al., 2017). The combination of AGW and high population growth in developing African countries such as Equatorial Guinea, Omar, Niger, Uganda, Angola, and Congo will lead to unprecedented death rates due to poverty (hunger, disease, and violence) and massive population displacement. Africa’s population (currently 1.3 × 109) will rise to roughly 2.5 × 109 by 2050 and 4 × 109 by 21002. Between 2017 and 2050, 26 African countries may double their populations (United Nations, 2017b). Even without AGW, it will not be possible to produce and deliver sufficient food and fresh water (Godfray et al., 2010). AGW will exacerbate the crisis—even without considering population growth (McMichael et al., 2006, 2008). By 2100, the total death toll due to 2°C AGW may approach 10^9 in Africa alone. There will be severe climate impacts in the Middle East and Northern Africa, with mean temperature increases well above GMST and displacement of large human populations (Economist, 2018). Thomas et al. (2004) estimated that 15% of all species will be extinct by 2050 if AGW is limited to 1.5°C; 37% if limited to 2°C. Ecological dependencies may multiply the direct effects of environmental change on the collapse of planetary diversity by 10 (Strona and Bradshaw, 2018). Loss of biodiversity will make it impossible to feed a larger African population (Frison et al., 2011). Insect populations will be affected by a combination of AGW and insecticides (Boggs, 2016). Forty percent of the world’s insect species may go extinct in coming decades (Resnick, 2019; Sánchez-Bayo and Wyckhuys, 2019). In the past 50 years, bee pollinations have declined as demand for agricultural pollination has approximately tripled, triggering a pollination crisis that affects crop yields (Goulson et al., 2015). Extinction of bee species could lead to the extinction of plant species that depend on bees for pollination, leading to other animal, plant, and insect extinctions, which in turn affects insect-eating bird populations (Goulson, 2014). Biodiverse coral reefs will be degraded due to pollution, overfishing, and rising temperature and acidity of ocean waters (Hughes et al., 2017). Oceanic oxygen concentration is also falling (Poppick, 2019). Most reefs will be seriously threatened or irreversibly damaged by 2050 (Burke et al., 2011) and the rest may die by 2100. Sekerci and Petrovskii (2015) showed that “the oxygen production by marine phytoplankton can stop suddenly if the water temperature exceeds a certain critical value. Since the ocean plankton produces altogether more than one half of the total atmospheric oxygen, it would mean oxygen depletion not only in the water but also in the air. Should it happen, it would obviously kill most of life on Earth” (p. 2349). Soil will be degraded by chemical-heavy farming techniques and deforestation-induced erosion, reducing crop yields (Arsenault, 2014). “There is rapidly escalating competition between the demand for land functions that provide food, water, and energy, and those services that support and regulate all life cycles on Earth” (United Nations, 2017c, p. 8). Groundwater (Dalin et al., 2017) is the largest available store of global freshwater and 2 × 10^9 people rely on it. About 6% of global groundwater is readily available and can be replenished with a human lifespan (Gleeson et al., 2016). Where groundwater is depleted, recovery may take centuries or millennia (Cuthbert et al., 2019, p. 140). About 10% of global land is covered by glaciers, and 10^9 people depend on their meltwater (Qui, 2019). AGW will cause non-polar glacier volume to fall by 29–41% in 2100; “glaciers in Central Europe, low-latitude South America, Caucasus, North Asia, Western Canada, and US are projected to lose more than 80% of their volume by 2100” with “major implications for regional hydrology and water availability in the near future” (Radić et al., 2014). Clarke et al. (2015) predicted that by 2100 Western Canadian glaciers will shrink by 70% relative to 2005, affecting aquatic ecosystems, agriculture, forestry, and water quality. Iceland’s glaciers will shrink by 40% in 2100 and 100% in 2200 (Poore et al., 2000). Accelerated deglaciation in Greenland from 2003 to 2013 suggests a tipping point driven by changes in air temperature and solar radiation (Bevis et al., 2019). Pathogens such as anthrax may emerge from melting permafrost (Revich and Podolnaya, 2011; Legendre et al., 2015) and cause regional or global pandemics (Wu et al., 2016). Humans have little immune resistant to zoonoses—diseases transmitted between human and non-human animals, such as ebola and salmonellosis. In the 14th century, bubonic plague (spread by fleas or body fluids from plague-infected animals) killed 25–40% of European children and adults (Galvani and Slatkin, 2003). 2°C AGW will trigger conflicts over natural resources (Barnett and Adger, 2007). Political destabilization could lead to use of nuclear weapons, causing radioactive fallout and ozone depletion (Mills et al., 2008). In a zeroth-order estimate, one or more of these points could alone cause 10^7 deaths per year for a century—a total of 10^9 deaths each. If that is true, a worst-case estimate of 3 × 10^9 for the worst-case AGW death toll may be realistic. That would correspond to roughly 30% of future world population, which will reach 9.8 × 10^9 in 2050 and 11.2 × 109 in 2100 (or between 8 × 109 and 15 × 109; United Nations (2017a). Given the high degree of uncertainty, a more precise estimate is hardly realistic.

### contention 3 – for the show

#### Space colonization is key to human survival

**David 15** (Javier E. David, CNBC weekend editor, “Why Humanity's Survival May Depend on Colonizing Mars”, CNBC, 10/17/15, <https://www.nbcnews.com/tech/innovation/why-humanitys-survival-may-depend-colonizing-mars-n446196>) // el

After decades of space exploration and countless movies on the subject, why exactly does Mars continue to inspire such high levels of cultural and scientific fascination? Both the red planet and NASA are coasting on a wave of newfound popularity, taking center stage in big-budget Hollywood productions. Whether by coincidence or design, the favorable treatment of NASA by Tinseltown comes at a time when the space agency recently discovered evidence for flowing water on Mars, and last week openly declared colonizing the planet within the next 20 years "an achievable goal." And at least a few scientists think the survival of humanity may hinge on finding a new, hospitable planet to colonize. Just a few years ago, NASA critics and even some supporters were openly questioning whether the Mars science laboratory was worth its $2.5 billion price tag. Fast forward a few years, and the space agency is moving full speed toward establishing a human presence on the planet — a quest that looks less and less quixotic by the day. "Mars is obviously the logical next place to expand our capabilities and getting Earth crews there," Edwin "Buzz" Aldrin told CNBC in a recent interview. The famed astronaut and second man to walk on the moon's surface said sending humans to the planet would be an accomplishment "that's unparalleled in humanity." In a document outlining its rationale for sending humans to the far-flung planet — which lies 140 million miles from the Earth — NASA invoked the 1969 Apollo voyage, adding that unlike the moon, a mission to Mars would involve "going to stay." Mars' atmosphere is noted for its thin, carbon dioxide-filled air and ferocious dust storms that last for months. But given the right conditions, some think Mars could eventually be capable of sustaining humans. "We need to keep public interest stimulated and demonstrate to our leaders ... this is a most historical opportunity," Aldrin said, speaking from a conference in Israel. He added the human race was in a prime position to become "pilgrims in setting up permanence on Mars." In fact, the prospect of humans pioneering on Mars is gradually becoming more and more of a reality — and in some ways may be a necessity, a top-ranking NASA scientist told CNBC recently. "If the human species is going to survive, is it going to survive solely on Earth or not," asked Jim Greene, NASA's director of planetary science. "The appeal has been that as we explore, the next frontier beyond our atmosphere is Mars. That captures a lot of imagination in science, but also in science fiction." Yet Greene also underscored the inherent dangers of outer space, and the imperative to discover other systems capable of sustaining human life. He characterized Earth as existing in "a dangerous part of the solar system" that runs the outside risk of being hit by a "planet-killing" asteroid.Although it may sound like a plot from a science fiction movie, Greene explained that NASA has identified 876 out of more than 12,000 near-Earth objects that the agency is "really monitoring carefully." "In the last 500 million years of the Earth's history there have been five mass extinctions of species. The last one was the end of the dinosaurs," Greene said, referencing the event that scientists surmise brought about the extinction of dinosaurs more than 65 million years ago. Within the known range of potential "planet killers" — asteroids that are at least 2 km in size — that the space agency monitors, "there are more than 150 that we're really watching carefully," Greene said. These "potentially hazardous asteroids" will come within 5 million miles of the planet over the next 100 years. “They cross our orbit frequently, and we know we're going to get hit again," Greene said. "It’s not a matter of if, but when." Within the last several decades, there have been minor brushes with asteroids, but none that have the potential to endanger human life on a large scale — at least not yet. Recently, NASA disclosed it was monitoring a 480-meter asteroid that could collide with the Earth sometime within the next four decades. British astronomers have been even more stark in speaking of the likelihood that a space rock of large enough size could create pandemonium around the world. Asteroids "cross our orbit frequently, and we know we're going to get hit again," Greene said, underscoring that factors such as trajectory and conditions in space can determine whether asteroids hit the earth or pass it by. However, "it's not a matter of if, but when. This planet won't have a planet killer hit it for many hundreds of years, but it will happen," he added. The panoply of risks makes it important to seek out viable alternatives to ensure humanity's survival. Likening the idea of an extraterrestrial colony to a computer's external hard drive, Greene told CNBC that "If we're going to live as a species, we're going to have to 'back up' in other places ... and that place is Mars."

### contention 4 – china

#### US development in space is key to prevent advances in A2/AD ---there’s still time to maintain our dominance, otherwise that makes it impossible to hold the Pacific

Cordesman and Kendall, 16

Anthony H. Cordesman holds the Arleigh A. Burke Chair in Strategy at CSIS. His current projects include ongoing analysis of the security situation in the Gulf, U.S. strategic competition with Iran, the conflicts in Syria and Iraq, a net assessment of the Indian Ocean region, Chinese military developments and U.S. and Asian assessments of these developments, changes in the nature of modern war, and assessments of U.S. defense strategy, programs, and budgets. Joseph Kendall at the Center for Strategic and International Studies (CSIS) for the Burke Chair in Strategy. “How China Plans to Utilize Space for A2/AD in the Pacific.” National Interest. August 17, 2016. <https://nationalinterest.org/blog/the-buzz/how-china-plans-utilize-space-a2-ad-the-pacific-17383?page=0%2C2>

--Being able to have dominance is key – they need to be able to deny us freedom of access in space and have total informational superiority – otherwise we can undermine A2/AD from space

For many watchers of the Asia-Pacific, anti-access/area-denial (A2/AD) is the most serious challenge the U.S. faces in shaping its forces for the region. Anti-access/area-denial (A2/AD) is a Chinese strategy based around restricting enemy access to a certain strategic location, while it exerts forceful control over a territorial asset like Taiwan or a disputed maritime claim. It is designed to “ [deter, dissuade or defeat](http://www.defense.gov/Portals/1/Documents/pubs/2016%20China%20Military%20Power%20Report.pdf)” the involvement of a third party in a confrontation or conflict over such issues, and is targeted at the United States or any of its Pacific allies that might intervene.

At the same time, the actual implementation of A2/AD is immensely complicated. Both China and the United States need to be careful in assessing what China can and cannot do, and what its strategic impact is in both the competition and risk of conflict between them.

A2/AD requires advanced intelligence, surveillance, and reconnaissance (ISR), as well as advanced targeting, communications, naval, air, missile defense, and cyber capabilities. China has spent a “ [generation](http://www.mitpressjournals.org/doi/pdf/10.1162/ISEC_a_00249)” attempting to develop the technological capabilities necessary, and it still remains debatable if they are capable of A2/AD implementation. If China is to successfully develop A2/AD capability, it will owe much credit to its rapidly advancing space capability and satellite infrastructure.

At its simplest, A2/AD is centered on conventional counterforce targeting. In order to deny access, China must be able to execute a [kill-chain](http://www.mitpressjournals.org/doi/pdf/10.1162/ISEC_a_00249) starting with, “target detection and including munition delivery, weapon guidance, damage assessment, and potential restrike” of its opponent’s battleships, aircraft carriers, fighter jets, submarines, information hubs, and missile positions at long distances.

This requires significant tracking and C4ISR ability, much of which can only be provided by space-based assets. Further necessitating advanced space-based tracking capabilities is the fact that the Pacific Ocean is a massive battlefield. China has roughly 875,000 [nautical square miles](http://www.oni.navy.mil/Portals/12/Intel%20agencies/China_Media/2015_PLA_NAVY_PUB_Print.pdf?ver=2015-12-02-081247-687)in its near seas area to monitor and control—expanding to another 1.5 million if the strategically important Philippine Sea becomes involved. Additionally, the seas lanes near China’s coast are some of worlds most trafficked by civilian ships making tracking and identification even more difficult.

China must also build the integrated system necessary for the substantial tracking needed for A2/AD. This [requires](http://www.andrewerickson.com/wp-content/uploads/2014/02/China-Air-Space-Based-ISR_Chinas-Near-Seas-Combat-Capabilities_CMS11_201402.pdf), “high-quality real-time satellite imagery and target locating data and fusion, as well as of reliable indigenous satellite positioning, navigation, and timing (PNT)”. Accordingly, China has undergone a substantial expansion of its satellite program. In 2000, China [possessed](http://origin.www.uscc.gov/sites/default/files/Annual_Report/Chapters/Chapter%202%2C%20Section%202%20-%20China%27s%20Space%20and%20Counterspace%20Programs.pdf) only 10 satellites, that [number](http://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.V7Ifhk0rLct) now stands at 181. For comparison, the United States and Russia have 576 and 140, respectively. China shows no signs of slowing down, having launched a Gaofen 3 satellite on August 10th, with a Chinese official [noting](http://www.nytimes.com/reuters/2016/08/10/world/asia/10reuters-southchinasea-china-satellite.html?_r=0), “Gaofen 3 will be very

China has also now deployed satellites with an array of capabilities such as [electro-optical](http://www.space.com/8013-china-launches-military-reconnaissance-satellite.html) (EO), [synthetic aperture radar](http://news.xinhuanet.com/english/2016-08/10/c_135582857.htm)(SAR), and [electronic reconnaissance](https://project2049.net/documents/china_electronic_intelligence_elint_satellite_developments_easton_stokes.pdf)(ELINT). Different satellites have various weaknesses like tracking during poor weather conditions, functioning at nighttime, and image quality. Thus, it is of paramount importance to maintain an array of satellite technology for tracking moving targets.

Next, China’s A2/AD strategy requires space capabilities for missile guidance. To this end China has spent years developing its own version of Global Positioning System (GPS) entitled Beidou. Currently, [Beidou](http://origin.www.uscc.gov/sites/default/files/Annual_Report/Chapters/Chapter%202%2C%20Section%202%20-%20China%27s%20Space%20and%20Counterspace%20Programs.pdf" \t "_blank) has 19 operational satellites and is deployed regionally by the PLA with plans to expand to worldwide coverage by 2020 following expansion to 35 total satellites.

Most missiles utilize some sort of GPS or similar technology for targeting. This is a lesson that China learned in a particularly shocking way during the 1995-1996 Taiwan Strait Crisis. In the midst of the crisis, China was “testing” missiles by launching them in the vicinity of Taiwan. However, in the midst of these tests the PLA was unable to track a number of the launched missiles.

This was attributed by the PLA to GPS interference—which is owned and run by the United States government. A retired Chinese colonel [noted](http://www.scmp.com/article/698161/unforgettable-humiliation-led-development-gps-equivalent), “It was a great shame for the PLA ... an unforgettable humiliation. That's how we made up our mind to develop our own global [satellite] navigation and positioning system, no matter how huge the cost, Beidou is a must for us. We learned it the hard way.”

Missile development has been a substantial focus of Chinese military modernization. The National Air and Space Intelligence Center has [stated](http://fas.org/programs/ssp/nukes/nuclearweapons/NASIC2013_050813.pdf) that, “China has the most active and diverse ballistic missile development program in the world”. In the mid-1990s China possessed only about 30-50 short-range ballistic missiles (SRBMs) with the capability to reach Taiwan.

According to the [Pentagon](http://www.defense.gov/Portals/1/Documents/pubs/2016%20China%20Military%20Power%20Report.pdf), China now possesses roughly 1,200 SRBMs and an additional 400 land-attack cruise missiles (LACMs). These potentially can hold targets in the first and second island chain—like US bases in Japan, Korea, and Guam—at risk. In an A2/AD situation, PLA strategists envision launching multi-axis salvos including an array of ballistic and cruise missiles in order to overpower and confuse the opposition’s missile defense. China’s massive missile and satellite proliferation are tied together as space capabilities are necessary to ensure the long-range precision capability of the advanced missiles.

China’s production of the [DF-21D](http://missilethreat.com/missiles/df-21-21a-21b-21c-21d-css-5/?country=china#china) and [DF-26](http://nationalinterest.org/blog/the-buzz/chinas-df-26-anti-ship-ballistic-missile-what-does-the-16260), the world’s first anti-ship ballistic missiles (ASBM), were also developed with A2/AD in mind. The implications of ASBMs are so significant that it has even led to [debates](http://warontherocks.com/2016/07/the-threat-is-here-its-just-distributed-unevenly-a2ad-and-the-aircraft-carrier/) regarding the future efficacy of the aircraft carrier. The ability to legitimately threaten U.S. forward deployed aircraft carriers and battleships in the Pacific makes A2/AD look plausible.

However, ASBMs are not a new concept. In the 1970’s the [Soviets](http://www.andrewerickson.com/2016/03/my-latest-assessment-of-chinese-and-foreign-anti-ship-ballistic-missile-asbm-development-now-available-in-janes-navy-international/) invested substantial time and energy into an ASBM before failing due to problems regarding tracking and targeting. Indeed, Andrew S. Erickson [notes](http://www.andrewerickson.com/2013/05/chinese-anti-ship-ballistic-missile-development-drivers-trajectories-and-strategic-implications/) regarding current Chinese capabilities, “C4ISR technologies probably still lag behind the requirement to identify and track a U.S. aircraft carrier in real time under wartime conditions.” These problems can be mitigated to some degree in a near seas situation with over-the-horizon radar, sea-based radar, and UAV ISR. However, effective space-based C4ISR capable of providing faster processing, more imagery, and data fusion is necessary for the ASBM to reach its full potential for targeting across the Asia-Pacific.

This makes China’s continuing aggressive space expansion absolutely critical to its A2/AD efforts.

China plans not only to utilize it own space capabilities in an A2/AD scenario, it also plans to deny it opponent’s capability, with the goal of achieving “information superiority”. Due to the high level of reliance the US has placed on its space capabilities, PLA strategists see it as a weakness that can be exploited.

To this end, China has developed an array of anti-satellite weapons (ASATs) including: [direct-ascent](https://www.fas.org/sgp/crs/row/RS22652.pdf), co-orbital, directed-energy, and cyber ASAT weapons. This is particularly important because deterrence in space now lacks the equivalent of the  “strategic stability” that exists in nuclear deterrence.

There is broad [concern](https://www.files.ethz.ch/isn/170907/Anti-satellite_Weapons.pdf) that a successful first strike in space is likely to disproportionately favor the weaker party. Furthermore, a first strike could severely inhibit the attacked party’s ability to react to any form of asymmetric, conventional, or nuclear attack. The ability to respond to an attack is key to deterrence, and today, this ability is uncertain. This helps explain the PLA’s development and testing of ASAT weapons, and make it likely that the PLA envisions a scenario in which it launches a preemptive ASAT attack. This would potentially allow the PLA to take the initiative and establish information dominance in an A2/AD situation.

#### Expansion into the SCS causes extinction

Wong, 18 – Reporter with the South China Morning Post, where she focuses on China’s diplomacy and defense policy; she is citing Aaron Rabena, programme convenor at the Manila-based Asia-Pacific Pathways to Progress Foundation

Catherine Wong, “China’s rising challenge to US raises risk of South China Sea conflict, Philippines warns.” South China Morning Post. February 20, 2018. https://www.scmp.com/news/china/diplomacy-defence/article/2133864/chinas-rising-challenge-us-raises-risk-south-china-sea

The risk of “miscalculation” and armed conflict in the South China Sea is rising as China starts to challenge US dominance in the disputed waters, according to the Philippines’ envoy to Beijing. The assessment comes as Beijing appears to have expanded its communications links and other facilities on artificial islands in the area. At a forum in Manila on Monday, ambassador Chito Sta. Romana said the balance of power in the region was shifting as the two global powers vied for control of the waters. He added that the Philippines should not become entangled in the tense maritime rivalry. “Whereas before the South China Sea was dominated by the US 7th Fleet, now the Chinese navy is starting to challenge the dominance,” Sta. Romana said. “I think we will see a shift in the balance of power.” But he also said the South China Sea had not become “a Chinese lake”. “Look at the US aircraft carrier, it’s still going through the South China Sea,” he added, referring to the USS Carl Vinson, which has patrolled the disputed waters and is on a visit to the Philippines. He compared the two powers to elephants fighting and trampling on the grass, saying: “What we don’t want is for us to be the grass.” The Carl Vinson, with a fleet of about 40 fighter jets and roughly 5,000 American sailors, arrived in Manila this week in a display of American presence in the Philippines. The United States is also poised to send an aircraft carrier to Vietnam in March, the first time in more than four decades. But the presence of the warship would not change China’s established advantage in the region, according to Xu Liping, a researcher on Asian-Pacific studies at the Chinese Academy of Social Sciences. “The aircraft carriers’ visits are only symbolic – to show that America still has a military presence in the region and that it is still a hegemon,” Xu said. “But with the military construction programme on the three major islands in the South China Sea, China has built an effective network of intelligence gathering and defence abilities.” In a US congressional hearing last week, Admiral Harry Harris, head of the US Pacific Command, said Beijing had unilaterally built seven new military bases in the South China Sea, with new facilities including “aircraft hangers, barracks facilities, radar facilities, weapon emplacements [and] 10,000-foot runways”. US think tank CSIS Asia Maritime Transparency Initiative also said last week that the northeastern corner of Fiery Cross Reef, known as Yongshu Reef in China, had been equipped with a communications or sensor array bigger than those found on other artificial islands in the Spratlys chain. It said the facility could potentially serve as a signals intelligence or communications hub for Chinese forces in the area. Aaron Rabena, programme convenor at the Manila-based Asia-Pacific Pathways to Progress Foundation, described China’s reclamation activities in the South China Sea as a “real game-changer” that challenged the US’ prior dominance in the region. “Strategic advantage and balance of power draws from both geography and capability – China now has both in the South China Sea,” he said. And, as a defence treaty ally of the US and a smaller regional player, Manila could be caught in the crossfire. “An armed conflict in the South China Sea could mean a full-blown great power war between Beijing and Washington,” Rabena said. “The Philippines might get entangled and be drawn into a conflict.”

### nc – aliens

#### Aliens don’t exist

Redd, 18—Space.com contributor, citing Anders Sandberg, philosopher at the University of Oxford (Nolan Taylor, “Alien Life May Be Rare in Our Galaxy Today,” <https://www.space.com/41080-alien-life-may-be-rare-today.html>, dml)

The hunt for E.T. may have gotten more difficult. New research suggests that alien life may not be as widespread as we had hoped.

When it comes to hunting for alien civilizations, a key question is how plentiful intelligent extraterrestrials are in the universe — but the answer to that question depends on a lot of knowledge scientists don't have yet.

In 1960, Frank Drake, an astronomer and hunter of extraterrestrial intelligence, devised an equation to calculate the probability of hearing from an intelligent, communicating alien civilization. The Drake equation relies on the values of several constants to determine how widespread such civilizations might be, how likely they are to evolve and how likely they are to have broadcast when we were able to detect. While some of the numbers, such as how many stars have planets around them, are fairly well-known, others, such as the fraction of those worlds with life, remain uncertain. [The Father of SETI: Q&A with Astronomer Frank Drake]

Over the years, scientists have attempted to "solve" the Drake equation. But the uncertain quantities required estimation. Optimists tended to put in numbers that would reflect their thoughts — life on other planets is plentiful! Civilizations last for millions of years! Pessimists skew their results the other way, assuming life is rare and civilizations quickly burn out.

Searching for a more accurate answer to the question 'Are we alone?' the new study's researchers have included the uncertainties of the numbers — how confident scientists are in them. Rather than giving each component a hard-and-fast amount, they attempted to gauge the strength of the research into these questions. "We can show that, given current scientific uncertainty, we get a distribution that could make both the optimists and pessimists happy at the same time: a fair chance of several alien civilizations, but also a fair chance of no aliens within the visible universe," Anders Sandberg told Space.com by email. Sandberg, a philosopher at the University of Oxford, is the lead author on the new research. "The uncertain sky should not be surprising given our level of uncertainty," Sandberg said. The study, which is available on the preprint site Arxiv, has been submitted to the journal Royal Society of London A. Alone in the universe? In 1950, Italian-American physicist Enrico Fermi looked to the skies and asked, "Where are they?" If the universe is filled with alien civilizations, why have none of them contacted Earth? The question, referred to as the Fermi paradox, provided the fuel for the Drake equation. The Drake equation has never sought a definite number. Instead, it has been used to make a rough estimate of the number of detectable civilizations in the Milky Way (N). According to the equation, N = RfpncflfifcL That number is based on the rate of star formation per year (R), the fraction of stars with planets (fp), the number of habitable planets per system of planets (nc), the fraction of those planets with life (fl), the fraction of life that is intelligent (fi), the fraction of intelligent civilizations that are detectable (fc), and the average lifetime of such civilizations in years (L). Observations of distant stars, with instruments such as NASA's Kepler telescope, have revealed that planets are plentiful around stars, and habitable worlds are spread across the galaxy. All the other variables remain up in the air. [The Most Intriguing Alien Planet Discoveries of 2017]

Sandberg and his colleagues decided to change the inputs for the unknown parts of the equation. Rather than estimating a single number, they included the range. For instance, saying that there is a 1/100 chance for life to evolve doesn't make it clear whether the odds are exactly 1 out of 100, between 1/1000 and 1/10, or between one and one in a googol (10^100), Sandberg said.

"One of the features that differs in [the new research] from previous Fermi paradox analyses is that the current authors tackle the problem of order-of-magnitude uncertainties in each component of Drake's equation in a less-biased, more robust way," Ian Jordan, an astronomer and engineer at the Space Telescope Science Institute in Baltimore, told Space.com in an email. Jordan is not part of the new research.

By factoring in the scientific uncertainty for components like how often life evolves, the researchers determined that the odds that we are the only intelligent life in the Milky Way range between 53 and 99.6 percent. The odds get a bit better when they include the observable universe — the chance that humanity is alone ranges between 39 and 85 percent. The research was published on the journal preprint server arXiv.

The new numbers mean there's a good chance humanity is the only detectable intelligent civilization around. Sandberg doesn't necessarily think that's a bad thing.

### nc – global south

#### c/a mcaffee – problems will improve as capitalism grows and gets better

#### No extinction – mortality can’t be 100%

Caldwell 3 (Joseph George, Ph.D., “The End of the World, and the New World Order”, 3-6, http://www.foundation.bw/TheEndOfTheWorld.htm)

Disease could wipe out mankind.  It is clear that HIV/**AIDS will not accomplish this** – it is not even having a significant impact on slowing the population explosion in Africa, where prevalence rates reach over thirty percent in some countries.  But a real killer plague could certainly wipe out mankind.  The interesting thing about plagues, however, is that they never seem to kill everyone – historically, the mortality rate is **never 100 per cent** (from disease alone).  Based on historical evidence, it would appear that, while plagues may certainly reduce human population, they are **not likely** to wipe it out entirely.  This notwithstanding, the gross intermingling of human beings and other species that accompanies globalization nevertheless increases the likelihood of global diseases to high levels.

### nc – ilaw

#### No impact --- ilaw doesn’t apply to new warfare and rogue actors

**Sunga 15** --- Head of the Rule of Law program at the Hague Institute for Global Justice in The Netherlands, and Visiting Professor at the Raoul Wallenberg Institute for Human Rights and Humanitarian Law (Lyal S. Sunga, 11-14-2015, "Can international law meet the challenges of today's conflicts?" Guardian, 7-21-2016, https://www.theguardian.com/global-development-professionals-network/2015/nov/14/international-law-yemen-syria-isis-conflict)//jonah

People have been puzzling over whether it makes sense to afford Geneva conventions protection to opposing forces that show complete disregard for the laws of war. Isis, Boko Haram, Al-Qaida and others, use such outrages as hostage-taking, beheadings, sexual enslavement, bombings, attacks on civilian aircraft, political assassinations and destruction of cultural property, to maximise casualties and shock civilians and governments into submission. Even before the Blackman case, prosecutors, judges, government officials and national human rights commission staff have thrown similar questions at me in the dozens of countries I have worked in over the last 25 years. Can the Geneva conventions, adopted in 1949 mainly to limit cruelty in wars fought by regular soldiers, possibly apply to today’s terrorist groups who carry out attacks such as the events in Paris last night, who don’t wear uniforms, don’t necessarily follow a regular military command structure, and don’t have any intention to apply international humanitarian law? Is it not impractical, and in fact dangerously naive, to treat captured insurgents humanely, when those same individuals would not hesitate to execute you if you were captured, and terrorize you in your own countries? Why not use ‘enhanced interrogation techniques’ in exceptional circumstances if it could yield information that saves the lives of hundreds if not thousands of soldiers and civilians? Today’s terrorist groups do seem qualitatively different from the kinds of groups that loomed large in past decades; such as Action Directe, Brigate Rosse, Baader-Meinhof, Front de Libération du Québec, Basque Separatists, IRA, Farc, Lord’s Resistance Army, or Shining Path. These and countless other groups all targeted the political independence of a single State through operations mainly in one country with fairly limited cross border links and foreign support. Domestic civilian and military law enforcement authorities could fight them, sometimes with great difficulty, by targeting them basically as organised crime syndicates. In contrast, certain groups like Al-Qaida and Isis display ambitions reaching beyond a single country towards establishing a grand caliphate to be governed by the harshest interpretations of Shari’a to which everyone must submit. Some of today’s terrorist groups demonstrate a tenacious capacity to control territory, secure steady and ample financing and supply chains, spread slick propaganda that attracts thousands of fresh recruits, and employ operations and tactics that repel even the most technically sophisticated of the world’s armed forces. Ordinary criminal law enforcement cannot do the job, but at the same time, some of today’s terrorist operations approximate full-scale war and the Geneva conventions remain ill-suited to asymmetric conflict where one party simply refuses to play by the rules. Unfortunately, many of the more powerful States that have always called for full respect for the Geneva conventions, have themselves been resorting more and more to covert operations with rules of engagement that accord scant regard for them. Use of hybrid warfare strategies further complicate matters to the extent that States increasingly use non-uniformed personnel, proxy forces and agents, private security companies and mercenaries who frequently seem to consider themselves beyond reach of law, military discipline and criminal responsibility. The use of certain new warfare technologies such as drones also raise troubling questions of accountability.

#### US-led international law causes Middle East instability – Pakistan proves

Daniel Abebe 7, Lecturer in Law @ Univ of Chicago Law School, 29 Mich. J. Int'l L. 1 '7, ""ARTICLE: NOT JUST DOCTRINE: THE TRUE MOTIVATION FOR FEDERAL INCORPORATION AND INTERNATIONAL HUMAN RIGHTS LITIGATION" l/n

For example, it is highly questionable that international human rights litigation or the promotion of democracy in Jordan, Egypt, or Saudi Arabia will result in regimes that will embrace normative human rights practices. In fact, it may actually worsen the situation and will likely produce anti-U.S. regimes - Hamas's victory in the Palestinian elections, for example - that challenge both the United States' strategic and normative interests. The key is to recognize that there are costs to binding the United States to a normative position when, at times, national security or strategic interests may require expediency. Consider the complicated situation in Pakistan. The military government of Pervez Musharraf was, for the most part, an ally of the United States during the War on Terror. n104 At the same time, Pakistan engaged in a number of practices that violate human rights law. Human Rights Watch notes: President Pervez Musharraf's military-backed government did little in 2006 to address a rapidly deteriorating human rights situation. Ongoing concerns include arbitrary detention, lack of due process, and the mistreatment, torture, and "disappearance" of terrorism suspects and political opponents; harassment and intimidation of the media; and legal discrimination against and mistreatment of women and religious minorities. n105 Arbitrary detention and the disappearance of individuals, for example, are violations of CIL and would likely be actionable claims under the post-Sosa international human rights litigation regime. While no person would condone these practices, the United States has to weigh the benefits of encouraging democracy and normative human rights [\*30] practices against the costs of failing to achieve national security and strategic interests in determining the appropriate policies toward Pakistan. First, Pakistan assists the United States in achieving national security goals: the elimination of terrorist training camps in Afghanistan and the destruction of Al-Qaeda and its affiliated groups. Second, Pakistan is a nuclear power with a divided security apparatus and unclear command and control procedures over its nuclear arsenal. Destabilizing the regime may threaten to jeopardize control of Pakistani nuclear weapons and materiel. Third, and most important, the United States wants stability in Pakistan. For many American policymakers, a democracy led by the late Benazhir Bhutto would have been preferable; however, a pro-U.S. government is the priority. To the extent that strategic interests reinforce normative and strategic goals, policy decisions are easier. But, given the complex political situation within Pakistan, the results of recent elections, and the United States' strategic interests, it is still unclear if regime change will produce a government that will support the United States' strategic interests and embrace its normative human rights concerns. n106 The same difficult balance applies to other countries. For example, the United States' interest in promoting democracy and human rights in Egypt, Saudi Arabia, n107 or the Central Asian Republics, among many others, has been subordinated to the United States' strategic interest in maintaining pro-U.S. regimes in these States. Focusing on Egypt: In 2006 [the United States] provided approximately US$ 1.3 billion in military aid and US$ 490 million in economic assistance [to Egypt]. In June 2006, the US Congress defeated a proposed amendment that would have cut $ 100 million from the US aid package in response to Egypt's poor human rights record. n108 During various Republican and Democratic administrations, the United States has weighed the normative importance of improving human rights practices in Egypt against the cost of compromising strategic or national security interests. Most recently, the United States determined that "facing [\*31] chaos in Iraq, rising Iranian influence and the destabilizing Israeli-Palestinian conflict ... stability, not democracy, was its priority." n109

#### Extinction

Nassar 02 (Bahig, Arab Co-ordinating Centre of Non-Governmental Organizations, and Afro-Asian People's Solidary Organization, 11/25, keynote paper for Cordoba Dialogue on Peace and Human Rights in Europe and the Middle East,http://www.inesglobal.org/BahigNassar.htm)

Wars in the Middle East are of a new type. Formerly, the possession of nuclear weapons by the United States and the Soviet Union had prevented them, under the balance of the nuclear terror, from launching war against each other. In the Middle East, the possession of nuclear weapons and other weapons of mass destruction leads to military clashes and wars. Instead of eliminating weapons of mass destruction, the United States and Israel are using military force to prevent others from acquiring them, while they insist on maintaining their own weapons to pose deadly threats to other nations. But the production, proliferation and threat or use of weapons of mass destruction (nuclear chemical and biological) are among the major global problems which could lead, if left unchecked, to the extinction of life on earth. Different from the limited character of former wars, the current wars in the Middle East manipulate global problems and escalate their dangers instead of solving them.

### nc – debris

#### Squo debris thumps

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Earth orbit is getting more and more crowded as the years go by. Humanity has launched about 12,170 satellites since the dawn of the space age in 1957, [according to the European Space Agency](https://www.esa.int/Safety_Security/Space_Debris/Space_debris_by_the_numbers) (ESA), and 7,630 of them remain in orbit today — but only about 4,700 are still operational. That means there are nearly 3,000 defunct spacecraft zooming around Earth at tremendous speeds, along with other big, dangerous pieces of debris like upper-stage rocket bodies. For example, orbital velocity at 250 miles (400 kilometers) up, the altitude at which the ISS flies, is about 17,100 mph (27,500 kph). At such speeds, even a tiny shard of debris can do serious damage to a spacecraft — and there are huge numbers of such fragmentary bullets zipping around our planet. ESA estimates that Earth orbit harbors at least 36,500 debris objects that are more than 4 inches (10 centimeters) wide, 1 million between 0.4 inches and 4 inches (1 to 10 cm) across, and a staggering 330 million that are smaller than 0.4 inches (1 cm) but bigger than 0.04 inches (1 millimeter). These objects pose more than just a hypothetical threat. From 1999 to May 2021, for example, the ISS conducted 29 debris-avoiding maneuvers, including three in 2020 alone, [according to NASA officials](https://www.nasa.gov/mission_pages/station/news/orbital_debris.html). And that number continues to grow; the station performed [another such move in November 2021](https://www.space.com/space-station-dodging-chinese-space-junk-spacex-crew-3), for example. Many of the smaller pieces of space junk were spawned by the explosion of spent rocket bodies in orbit, but others were more actively emplaced. In January 2007, for instance, China intentionally destroyed one of its defunct weather satellites in a much-criticized test of anti-satellite technology that generated [more than 3,000 tracked debris objects](https://swfound.org/media/9550/chinese_asat_fact_sheet_updated_2012.pdf) and perhaps 32,000 others too small to be detected. The vast majority of that junk remains in orbit today, experts say. Spacecraft have also collided with each other on orbit. The most famous such incident occurred in February 2009, when Russia's defunct Kosmos 2251 satellite slammed into the operational communications craft Iridium 33, producing [nearly 2,000 pieces of debris](https://swfound.org/media/6575/swf_iridium_cosmos_collision_fact_sheet_updated_2012.pdf) bigger than a softball. That 2009 smashup might be evidence that the Kessler Syndrome is already upon us, though a cataclysm of "Gravity" proportions is still a long way off. "The cascade process can be more accurately thought of as continuous and as already started, where each collision or explosion in orbit slowly results in an increase in the frequency of future collisions," [Kessler told Space Safety Magazine in 2012](http://www.spacesafetymagazine.com/space-debris/kessler-syndrome/don-kessler-envisat-kessler-syndrome/).

#### No debris cascades, but even a worst case is confined to low LEO with no impact

Daniel Von Fange 17, Web Application Engineer, Founder and Owner of LeanCoder, Full Stack, Polyglot Web Developer, “Kessler Syndrome is Over Hyped”, 5/21/2017, http://braino.org/essays/kessler\_syndrome\_is\_over\_hyped/

Kessler Syndrome is overhyped. A chorus of online commenters great any news of upcoming low earth orbit satellites with worry that humanity will to lose access to space. I now think they are wrong.

What is Kessler Syndrome?

Here’s the popular view on Kessler Syndrome. Every once in a while, a piece of junk in space hits a satellite. This single impact destroys the satellite, and breaks off several thousand additional pieces. These new pieces now fly around space looking for other satellites to hit, and so exponentially multiply themselves over time, like a nuclear reaction, until a sphere of man-made debris surrounds the earth, and humanity no longer has access to space nor the benefits of satellites.

It is a dark picture.

Is Kessler Syndrome likely to happen?

I had to stop everything and spend an afternoon doing back-of-the-napkin math to know how big the threat is. To estimate, we need to know where the stuff in space is, how much mass is there, and how long it would take to deorbit.

The orbital area around earth can be broken down into four regions.

Low LEO - Up to about 400km. Things that orbit here burn up in the earth’s atmosphere quickly - between a few months to two years. The space station operates at the high end of this range. It loses about a kilometer of altitude a month and if not pushed higher every few months, would soon burn up. For all practical purposes, Low LEO doesn’t matter for Kessler Syndrome. If Low LEO was ever full of space junk, we’d just wait a year and a half, and the problem would be over.

High LEO - 400km to 2000km. This where most heavy satellites and most space junk orbits. The air is thin enough here that satellites only go down slowly, and they have a much farther distance to fall. It can take 50 years for stuff here to get down. This is where Kessler Syndrome could be an issue.

Mid Orbit - GPS satellites and other navigation satellites travel here in lonely, long lives. The volume of space is so huge, and the number of satellites so few, that we don’t need to worry about Kessler here.

GEO - If you put a satellite far enough out from earth, the speed that the satellite travels around the earth will match the speed of the surface of the earth rotating under it. From the ground, the satellite will appear to hang motionless. Usually the geostationary orbit is used by big weather satellites and big TV broadcasting satellites. (This apparent motionlessness is why satellite TV dishes can be mounted pointing in a fixed direction. You can find approximate south just by looking around at the dishes in your northern hemisphere neighborhood.) For Kessler purposes, GEO orbit is roughly a ring 384,400 km around. However, all the satellites here are moving the same direction at the same speed - debris doesn’t get free velocity from the speed of the satellites. Also, it’s quite expensive to get a satellite here, and so there aren’t many, only about one satellite per 1000km of the ring. Kessler is not a problem here.

How bad could Kessler Syndrome in High LEO be?

Let’s imagine a worst case scenario.

An evil alien intelligence chops up everything in High LEO, turning it into 1cm cubes of death orbiting at 1000km, spread as evenly across the surface of this sphere as orbital mechanics would allow. Is humanity cut off from space?

I’m guessing the world has launched about 10,000 tons of satellites total. For guessing purposes, I’ll assume 2,500 tons of satellites and junk currently in High LEO. If satellites are made of aluminum, with a density of 2.70 g/cm3, then that’s 839,985,870 1cm cubes. A sphere for an orbit of 1,000km has a surface area of 682,752,000 square KM. So there would be one cube of junk per .81 square KM. If a rocket traveled through that, its odds of hitting that cube are tiny - less than 1 in 10,000.

So even in the worst case, we don’t lose access to space.

Now though you can travel through the debris, you couldn’t keep a satellite alive for long in this orbit of death. Kessler Syndrome at its worst just prevents us from putting satellites in certain orbits.

In real life, there’s a lot of factors that make Kessler syndrome even less of a problem than our worst case though experiment.

* Debris would be spread over a volume of space, not a single orbital surface, making collisions orders of magnitudes less likely.
* Most impact debris will have a slower orbital velocity than either of its original pieces - this makes it deorbit much sooner.
* Any collision will create large and small objects. Small objects are much more affected by atmospheric drag and deorbit faster, even in a few months from high LEO. Larger objects can be tracked by earth based radar and avoided.
* The planned big new constellations are not in High LEO, but in Low LEO for faster communications with the earth. They aren’t an issue for Kessler.
* Most importantly, all new satellite launches since the 1990’s are required to include a plan to get rid of the satellite at the end of its useful life (usually by deorbiting)

So the realistic worst case is that insurance premiums on satellites go up a bit. Given the current trend toward much smaller, cheaper micro satellites, this wouldn’t even have a huge effect.

I’m removing Kessler Syndrome from my list of things to worry about.

### nc – space war!!

#### No prolif – tech, money, deterrence, incentives, and non-prolif efforts.

Robinson ’16 (Todd C.; 7/25/2016; Stanton Nuclear Security Fellow at the nonprofit, nonpartisan RAND Corporation; “The End of Nuclear Proliferation?” <http://nationalinterest.org/blog/the-buzz/the-end-nuclear-proliferation-17104?page=2>; Date Accessed: 10/14/2016)

The principal reasons that there are likely to be **no more cases of** nuclear **proliferation** are that all those states that have the correct combination of political will and at least some components of a nuclear weapons program have either successfully acquired nuclear weapons (the latest being North Korea); attempted to acquire nuclear weapons but ultimately **decided to abandon their pursuit** and are **not likely** to go down the path of proliferation again (South Korea during the 1970s); and/or become firmly embedded in the non-proliferation regime (Japan, South Korea, Saudi Arabia, and Iran). To pursue nuclear weapons today, a state would either have to engage in diversionary/clandestine proliferation or would have to **withdraw from the NPT** prior to their production of nuclear weapons, both of which would incur substantial **political cost**. And while North Korea both illustrated that withdrawal from the non-proliferation regime could be accomplished and provided a roadmap other states could follow, it is **difficult to imagine** another state arising with the same **unique combination** of attributes (diplomatic isolation, technological wherewithal, nuclear-armed adversaries, despotic regime, etc.), such that the benefits of engaging in nuclear proliferation might be perceived by a regime as **outweighing its costs**. Furthermore, the North Korean case illustrates that the perceived benefits that might have been gained from engaging in nuclear proliferation in the past, such as using the threat of nuclear weapons as a means of forcing diplomatic engagement, are **no longer valid**. Further decreasing the likelihood of future cases of proliferation, the United States and the international community have become much **more sensitive** to the importation and exportation of nuclear weapons-related (often called dual-use) technologies; due to such events as the discovery of the A.Q. Khan network in 2004. This increased sensitivity led, at least in part, to the creation of the Proliferation Security Initiative (2003) and the passage of United Nations Security Council Resolution 1540 (2004), both of which have been **remarkably successful at preventing** the **acquisition of nuclear technologies** by both states and non-state actors. States have not only become **more sensitive to the spread** of nuclear weapons-related technologies and more adept at preventing it, they have also become much more **capable of discouraging others** from engaging in nuclear proliferation. Iran, for example, had one of the most significant and advanced nuclear infrastructures and a strong motivation to acquire nuclear weapons, but ultimately ended its pursuit because the United States and others were able to both **cut off** existing avenues of acquisition and **alter the decision-calculus** within the leadership of the Islamic state by imposing economic sanctions, severing formal diplomatic ties and taking other steps that made nuclear weapons less desirable..