# 1

#### Interpretation: Topical affirmatives must defend the appropriation of outer space

#### Low earth orbit isn’t space

**Stanley 20** – Stanley, Sabine, “Low Earth Orbit: Troposphere and Stratosphere,” The Great Courses Daily, Sabine Stanley has a PhD from Johns Hopkins University, https://www.thegreatcoursesdaily.com/low-earth-orbit-troposphere-and-stratosphere/#:~:text=Q%3A%20Can%20you%20go%20above,many%20satellites%20go%20above%20that. [Harker KB]

Q: Can you go above low Earth orbit? [Low Earth orbit](http://www.thegreatcoursesdaily.com/?p=73288) is about 2000 kilometers, which is not very high by space and orbit standards. In fact, the end of the low orbit somehow marks the beginning of space. The International Space Station orbits 400 kilometers above the Earth’s surface, and many satellites go above that. All the explorers sent to other planets pass the low Earth orbit at an early stage in their trip.

#### Violation: they explicitly defend only LEO

#### Vote neg:

#### 1] Limits – the aff is about “space” not “outer space” which justifies affs about any private practice they think is bad like fracking, defense companies, the concept of private property – incentivizes a race to the margins that shift away from core topic lit

#### 2] Preditability – they can read any number of unpredictable affs which makes it impossible to be neg – independently, incentivizes 1-and-done affs that destroy depth

#### 2] Ground – the NSDA vets the topic to be fair for both sides but theres no assurance that their aff divides ground equally which means the neg is at a structural disadvantages

#### Use competing interps - Topicality is a binary question, you can’t be reasonably topical and it invites a race to the bottom of intervention

#### No RVIS illogical it’s your burden to be topical, makes every T debate forced into theory, and incentivizes theory baiting

# 2

#### Cyber attacks on critical infrastructure are coming now

Underwood 20 [Kimberly Underwood is a reporter on emerging communication technologies, cyberwarfare, the intelligence community, military command operations and weaponry research. “China is Retooling, and Russia Seeks Harm to Critical Infrastructure.” June 24, 2020. https://www.afcea.org/content/china-retooling-and-russia-seeks-harm-critical-infrastructure]

Intelligence leader warns of the mounting threats of cyber espionage, digital attacks and influence operations from adversaries. U.S. adversaries are trying to take control of cyberspace as a medium, resulting in implications to our freedom of maneuver and access in cyberspace, says Brig. Gen. Gregory Gagnon, USAF, director of Intelligence (A2), Headquarters Air Combat Command (ACC), Joint Base Langley-Eustis. Increasing cyberspace activity is coming from China, Russia, Iran and North Korea. “We are seeing it not just in volume, but we are seeing an expansion in the ways that they use cyberspace, whether it is to steal information, whether it is to directly influence our citizens or whether it is to disrupt critical infrastructure,” Gen. Gagnon reports. The general spoke at the AFCEA Tidewater chapter’s recent monthly virtual luncheon. China and Russia continue to pose the greatest espionage and cyber attack threats to the United States, but the intelligence leader anticipates that other adversaries and strategic competitors will also build and integrate cyber espionage, cyber attacks and influence operations into how they conduct business. “Our strategic competitors will increasingly use cyber space capabilities including cyber espionage, cyber attack and continued influence operations to seek political, economic and military advantage over the United States, our allies and our partners,” he said. “This is not an ‘if,’ it is a yes. They are doing it and they will continue.” Gen. Gagnon warned that China in particular is using cyber espionage to collect intelligence, target critical infrastructure and steal intellectual property. It is all part of China’s plan to move from being a regional actor to being seen as a global power. The shift also means a greater role for the adversary’s military. The Chinese military is in the process of transitioning from a defensive, inflexible ground-based force charged with domestic and peripheral security to a joint, highly agile, expeditionary and power projecting arm of Chinese foreign policy, he noted. “What is going on in China is a dynamic revectoring of the objectives and goals of the People's Liberation Army,” Gen. Gagnon said. “This is not a small change. This is a major change in course and direction. They're doing it to be a power projection arm of a Chinese foreign policy that engages both in military diplomacy and operations around the globe, but also in predatory economic activity.” Moreover, China’s military spending in 2018 exceeded $200 billion, an increase of about 300% since 2002, the general stated. And while it is not the $750 billion that the United States government spends every year on military defense, the Chinese funding does not reflect the same level of investment in manpower or healthcare. A good portion of their $200 billion directly funds technology and capabilities. “A big chunk of our budget is not buying kit,” Gen. Gagnon explained. “If you're the CCP [Chinese Communist Party], you don't have the same extensive retirement programs that you have to pay for,” he said. “You don't have this extensive healthcare which you have to provide. So, when you think about $200 billion, think about that buying kit and buying operations. That is significant.” To the industry, Gen. Gagnon warned companies that Beijing will authorize Chinese espionage against key U.S technologies. “Many of your corporations hold this technology,” he stressed. “They are trying to undercut your ability to be profitable by developing those same technologies in China. They are competing against us in the international market. I will tell you that China's persistent cyber espionage threat and their growing tech threat to our core military and critical infrastructure will continue to be persistent. China remains the most active strategic competitor responsible for cyber espionage against corporations and allies.” China, like Russia, is also increasing its information warfare against the United States. “They are becoming more adept at using social media to deliver messages directly to the U.S. population that alter the way we think, the way we behave and the way we decide,” the general observed. The improvement of their cyber attack capabilities and ways to alter information online is intended to shape views inside China, shift the mindset of Chinese people around the world, as well as to try to shape the world’s view, not just of China, but also of the United States. “You are seeing that play out in the pandemic, how people view us around the world,” he offered. “We're also concerned about Chinese intelligence and security services,” the A2 continued. “They use Chinese information technology firms as routine and systemic espionage platforms against the United States and against our allies. Many of you are tracking what is in the news about 5G and Huawei, and that's what we're talking about.” As for Russia, their highly capable operations of cyber espionage, influence and cyber attacks continue to target the United States and its allies. In particular, Russia’s form of integrating cyber espionage attacks and influence operations, or information confrontation, is very effective, Gen. Gagnon emphasized. “If you think about it, they’re generally playing with the weaker hand, so they have been rather brilliant on the international stage in achieving their foreign policy objectives,” he said. In addition, Moscow is staging cyberattack assets to disrupt or damage U.S. military or civilian information systems during the COVID-19 pandemic. “There is activity that they undertake on a day-to-day basis to try to gain a decisive military intelligence,” he stated. “Their security services continue to target our systems, both for U.S. information systems and critical infrastructure, as well as the networks of our NATO and Five-Eye partners. They do it for positional advantage in cyberspace to be able to do the five Ds: deceive, deny, disrupt, degrade and destroy our assets, but also to gain intelligence on how systems are established and set up so that they can maintain attack vectors.” Russia also is targeting U.S. critical infrastructure, the general cautioned. “Russia has the ability to execute cyber attacks in the United States that can generate localized temporary disruptive effects on critical infrastructure, such as disrupting electric distribution networks for at least a few hours.” In fact, he warned, Moscow is mapping out critical infrastructure with the long-term goal of being able to cause “substantial damage.”

#### Megaconstellations function as critical infrastructure that increase resiliency and protect against cyberattacks

Hallex and Cottom 20 [Matthew A. Hallex is a Research Staff Member at the Institute for Defense Analyses. Travis S. Cottom is a Research Associate at the Institute for Defense Analyses. “Proliferated Commercial Satellite Constellations: Implications for National Security.” 2020. https://ndupress.ndu.edu/Portals/68/Documents/jfq/jfq-97/jfq-97\_20-29\_Hallex-Cottom.pdf?ver=2020-03-31-130614-940]

While potentially threatening the sustainability of safe orbital operations, new proliferated constellations also offer opportunities for the United States to increase the resilience of its national security space architectures. Increasing the resilience of U.S. national security space architectures has strategic implications beyond the space domain. Adversaries such as China and Russia see U.S. dependence on space as a key vulnerability to exploit during a conflict. Resilient, proliferated satellite constellations support deterrence by denying adversaries the space superiority they believe is necessary to initiate and win a war against the United States.28 Should deterrence fail, these constellations could provide assured space support to U.S. forces in the face of adversary counterspace threats while imposing costs on competitors by rendering their investments in counterspace systems irrelevant. Proliferated constellations can support these goals in four main ways. First, the extreme degree of disaggregation inherent in government and commercial proliferated constellations could make them more resilient to attacks by many adversary counterspace systems. A constellation composed of hundreds or thousands of satellites could withstand losing a relatively large number of them before losing significant capability. Conducting such an attack with kinetic antisatellite weapons—like those China and Russia are developing—would require hundreds of costly weapons to destroy satellites that would be relatively inexpensive to replace. Second, proliferated constellations would be more resilient to adversary electronic warfare. Satellites in LEO can emit signals 1,280 times more powerful than signals from satellites in GEO.29 They JFQ 97, 2nd Quarter 2020 Hallex and Cottom 25 also are faster in the sky than satellites in more distant orbits, which, combined with the planned use of small spot beams for communications proliferated constellations, would shrink the geographic area in which an adversary ground-based jammer could effectively operate, making jammers less effective and easier to geolocate and eliminate.30 Third, even if the United States chooses not to deploy national security proliferated constellations during peacetime, industrial capacity for mass-producing proliferated constellation satellites could be repurposed during a conflict. Just as Ford production lines shifted from automobiles to tanks and aircraft during World War II, one can easily imagine commercial satellite factories building military reconnaissance or communications satellites during a conflict. Fourth, deploying and maintaining constellations of hundreds or thousands of satellites will drive the development of low-cost launches to a much higher rate than is available today. Inexpensive, high-cadence space launch could provide a commercial solution to operationally responsive launch needs of the U.S. Government. In a future where space launches occur weekly or less, the launch capacity needed to augment national security space systems during a crisis or to replace systems lost during a conflict in space would be readily available.31

#### Cyberattacks cause extinction---false warnings, stealing nukes, and introducing vulnerability

Ernest J. Moniz et al. 18, Ernest J. Moniz is the CEO of the Nuclear Threat Initiative, served as the thirteenth United States Secretary of Energy from 2013 to January 2017. Sam Nunn, and Des Browne, September 2018, “Nuclear Weapons in the New Cyber Age,” https://media.nti.org/documents/Cyber\_report\_finalsmall.pdf

The Cyber Threat to Nuclear Weapons and Related Systems

Cyber-based threats target all sectors of society—from the financial sector to the entertainment industry, from department stores to insurance companies. Governments face an even more critical challenge when it comes to cyberattacks on their most critical systems. Attacks on critical infrastructure could have extraordinary consequences, but a successful cyberattack3 on a nuclear weapon or related system—a nuclear weapon, a delivery system, or the related Nuclear Command, Control, and Communications (NC3) systems—could have existential consequences. Cyberattacks could lead to false warnings of attack, interrupt critical communications or access to information, compromise nuclear planning or delivery systems, or even allow an adversary to take control of a nuclear weapon.

Given the level of digitization of U.S. systems and the pace of the evolving cyber threat, one cannot assume that systems with digital components—including nuclear weapons systems—are not or will not be compromised. Among the reasons: nuclear weapons and delivery systems are periodically upgraded, which may include the incorporation of new digital systems or components. Malware could be introduced into digital systems during fabrication, much of which is not performed in secure foundries. In addition, there are a range of external dependencies, such as connections to the electric grid, that are outside the control of defense officials but directly affect nuclear systems. Finally, the possibility always exists that an insider, either purposefully or accidentally, could enable a cybersecurity lapse by introducing malware into a critical system.

Increased use of digital systems may also adversely affect the survivability of nuclear systems. New technologies can enhance reliability and performance, but they can also lead to new vulnerabilities in traditionally survivable systems, such as submarines or mobile missile launchers.4

# 3

#### Build Back Better passes now – Biden remarks give it momentum

**Frazin 1/23** – Staff Writer for The Hill (Rachel, “ Biden comments add momentum to spending bill's climate measures,” *The Hill*, 1-23-22, <https://thehill.com/policy/healthcare/590871-biden-comments-add-momentum-to-spending-bills-climate-measures>)

President Biden’s remarks at a Wednesday press conference are giving momentum to the climate portions of his spending agenda as lawmakers call for Congress to pass the parts of the Build Back Better legislation that are achievable. Biden expressed confidence that lawmakers can pass **upward of $500 billion in energy and environmental spending** — a number close to the amount the White House proposed spending on climate and clean energy in October. And after months of negotiations, weary lawmakers are now pushing to get climate action across the finish line. “The climate and clean energy provisions in Build Back Better have been largely worked through and financed, so let’s start there and add any of the other important provisions to support working families that can meet the 50-vote threshold,” Sen. Ed Markey (D-Mass.) said in a statement. Markey is far from alone. Sen. Tina Smith (D-Minn.), who has been a vocal proponent of the legislation’s climate change measures, expressed a similar sentiment in an interview with The Hill. “We need to figure out what we have agreement on and we need to do that,” Smith said. “Based on where we have been and comments that Sen. Manchin has made about the climate provisions that we have been negotiating up until the end of last year, it seems like **those sections of the old Build Back Better bill should be in pretty good shape,**” she added. Manchin is the West Virginia Democrat who stopped the Build Back Better bill in its tracks when he announced his opposition in December. Democrats need all of their 50 caucus members to back the legislation for it to get to Biden’s desk. Manchin has **expressed support for the environmental provisions**, but moving ahead would mean cuts to other programs, including an expanded child tax credit, to win his vote. But Smith said it’s important to be practical and get as much as possible out of the negotiations. “I’m a progressive in the caucus but I’m also practical, and I think this is the practical, commonsense way of moving forward to accomplish the best that we can,” she said. Democrats in Congress have historically failed to move major climate change legislation forward and have suffered from high-profile failures like the Obama-era Waxman-Markey bill. Democrats have limited options for getting this type of spending across, give the budgetary rules that allow them to avoid a filibuster that would allow the GOP to block their measure. It’s unlikely that 10 Republicans would join Democrats on many of their climate provisions. The New York Times recently asked all 50 Republicans if they would support the climate provisions as a standalone and **none of them said that they would.** Senate Finance Committee Chairman Ron Wyden (D-Ore.) told reporters Thursday that he saw Biden’s latest remarks as **establishing a way forward** for some provisions like climate. “What the president did last night, and he and I talked about this a number of times, is he created a path for a handful of provisions where we've got a lot of strong support, and it starts with climate. It starts with health care,” he said. Biden, during his Wednesday press conference said, “I think we can break the package up,” “Get as much as we can now and fight for the rest later,” he added. The president also said that he believes Democrats can pass more than $500 billion in energy and environment spending, a figure close to the White House’s proposed $555 billion of climate and clean energy spending from October. Manchin earlier this month said that climate is an area “we probably can come to an agreement much easier than anything else” and **specifically touted clean energy tax credits.**

#### Large President-led national space policies incite immense partisan backlash that spills over to kill the entire political agenda

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

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

#### BBB climate provisions k2 methane emissions and leak detection

**Casten 1/21** - a member of the House of Representatives, representing the Sixth District of Illinois (Sean, “To Fully Mitigate Climate Change, We Need to Curb Methane Emissions,” *Scientific American*, 1-21-22, <https://www.scientificamerican.com/article/to-fully-mitigate-climate-change-we-need-to-curb-methane-emissions/>)

To Fully Mitigate Climate Change, We Need to Curb Methane Emissions It’s been more than two months since the House of Representatives passed the Build Back Better Act—a bill that would make desperately needed and decades-overdue strides toward the U.S. meeting its moral responsibility to combat the climate crisis. But instead of moving into a new year on the hope that would come with the Senate passing and President Biden signing this historic legislation into law, I’m terrified—and furious—that **we’re tripping at the finish line.** Ahead of COP26, the United Nations climate change conference in November, President Joe Biden committed the U.S. to reducing our greenhouse gas emissions by half by 2030. Having run for Congress on a climate platform after spending two decades combating climate change in the private sector, I know that reducing our greenhouse gas emissions is what’s right for our environment—and for our wallets. If we want to have a shot at meeting that goal, we must find a way to implement the provisions in the House version of the Build Back Better Act that science tells us will reduce emissions quickly, cheaply and most dramatically. One of the most critical and expedient moves we can make is to reduce methane emissions. Methane is a rapidly accelerating part of the climate problem. It is the primary component of natural gas, and it warms the planet more than 80 times as quickly as a comparable volume of atmospheric CO2 over a comparable amount of time. On the one hand, while burning natural gas produces about half the CO2 emissions as burning coal, methane leaking into the atmosphere **more than eliminates those environmental benefits.** Moreover, methane pollution, which is a primary component of ground-level ozone and emitted alongside toxic chemicals such as benzene, has been linked to heart disease, birth defects, asthma and other adverse health impacts. These affect frontline and fenceline communities, the majority of whom are people of color, the hardest. Eliminating those leaks is perhaps the biggest “bang for the buck” action we can take, and the Build Back Better legislation has built within it a program that pairs grants to natural gas companies to help monitor and reduce methane pollution at oil and gas operations with fines on companies who instead break the rules. The program ties into the Global Methane Pledge that President Biden created at COP26. More than 100 countries signed on to a 30 percent reduction of methane levels by 2030. Reducing methane pollution could also reduce adverse health for those in the immediate vicinity of polluters. To meet this goal, we can use existing technology to monitor for and prevent leaks at oil and gas drilling, production, and transmission sites, and prohibit routine venting and flaring of methane gas. This one set of actions would get us most of the way to that goal and is exactly why the Build Back Better Act is so critical. President Biden understands we have a golden opportunity at a critical moment. His administration has already taken a number of important executive actions to eliminate methane emissions at the source: on the same day he and climate envoy John Kerry announced the Global Methane Pledge, the Environmental Protection Agency and the Departments of the Interior and Transportation rolled out new or strengthened rules to tackle methane emissions from oil and gas operations, landfills, pipelines and agriculture. But we can’t get there on executive action alone. While eliminating methane emissions is essential to our fight against climate change building the leak monitoring system that Build Back Better currently calls for would create tens of thousands of jobs in the manufacturing and service sectors and spur hundreds of billions in economic growth.

**Methane emissions lock in irreversible warming**

**Howarth 14** [Robert Howarth, PhD, Director, Agriculture, Energy & Environment Program, Chair, International SCOPE Biofuels Program, David R. Atkinson Professor of Ecology and Environmental Biology – Cornell, “A bridge to nowhere: methane emissions and the greenhouse gas footprint of natural gas,” Energy Science & Engineering, Volume 2, Issue 2, June, 2014]

The GWP of Methane While methane is far more **effective** as a greenhouse gas than carbon dioxide, methane has an atmospheric lifetime of only 12 years or so, while carbon dioxide has an effective influence on atmospheric chemistry for a century or longer [34]. The time frame over which we compare the two gases is therefore **critical**, with methane becoming relatively less important than carbon dioxide as the timescale increases. Of the major papers on methane and the GHG for conventional natural gas published before our analysis for shale gas, one modeled the relative radiative forcing by methane compared to carbon dioxide continuously over a 100-year time period following emission [2], and two used the global warming approach (GWP) which compares how much larger the integrated global warming from a given mass of methane is over a specified period of time compared to the same mass of carbon dioxide. Of the two that used the GWP approach, one showed both 20-year and 100-year GWP analyses [3] while another used only a 100-year GWP time frame [4]. Both used GWP values from the Intergovernmental Panel on Climate Change (IPCC) synthesis report from 1996 [35], the **most reliable estimates** at the time their papers were published. In subsequent reports from the IPCC in 2007 [36] and 2013 [34] and in a paper in Science by workers at the NASA Goddard Space Institute [37], these GWP values have been **substantially increased**, in part, to account for the **indirect effects** of methane on other **radiatively active substances** in the atmosphere such as ozone (Table 2). In Howarth et al. [8], we used the GWP approach and closely followed the work of Lelieveld and colleagues [3] in presenting both integrated 20 and 100 year periods, and in giving equal credence and interpretation to both timescales. We upgraded the approach by using the most recently published values for GWP at that time [37]. These more recent GWP values **increased** the relative warming of methane compared to carbon dioxide by 1.9-fold for the 20-year time period (GWP of 105 vs. 56) and by 1.6-fold for the 100-year time period (GWP of 33 vs. 21; Table 2). Our conclusion was that for the 20-year time period, **shale gas had a larger GHG than coal or oil** even at our low-end estimates for methane emission (Fig. 1); conventional gas also had a larger GHG than coal or oil at our mean or high-end methane emission estimates, but not at the very low-end range for methane emission (the best-case, low-emission scenario). At the 100-year timescale, the influence of methane was much diminished, yet at our high-end methane emissions, the GHG of both shale gas and conventional gas still exceeded that of coal and oil (Fig. 1). Of nine new reports on methane and natural gas published in 9 months after our April 2011 paper [8], six only considered the 100-year time frame for GWP, two used both a 20- and 100-year time frame, and one used a continuous modeling of radiative forcing over the 0–100 time period (Table 2). Of the six papers that only examined the 100-year time frame, all used the **lower GWP value of** 25 from the 2007 IPCC report rather than the higher value of 33 published by Shindell and colleagues in 2009 that we had used; this higher value better accounts for the indirect effects of methane on global warming. Many of these six papers implied that the IPCC dictated a focus on the 100-year time period, **which is simply not the case**: the IPCC report from 2007 [36] presented both 20- and 100-year GWP values for methane. And two of these six papers criticized our inclusion of the 20-year time period as inappropriate [14, 17]. I strongly disagree with this criticism. In the time since April 2011 I have come increasingly to believe that it is essential to consider the role of methane on timescales that are **much shorter than 100 years**, in part, due to **new science on methane** and global warming presented since then [34, 41, 42], briefly summarized below. The **most recent synthesis** report from the IPCC in 2013 on the physical science basis of global warming highlights the **role of methane** in global warming at **multiple timescales**, using GWP values for 10 years in addition to 20 and 100 years (GWP of 108, 86, and 34, respectively) in their analysis [34]. The report states that “there is no scientific argument for selecting 100 years compared with other choices,” and that “the choice of time horizon …. depends on the relative weight assigned to the effects at different times” [34]. The IPCC further concludes that at the 10-year timescale, the current global release of methane from all anthropogenic sources **exceeds** (slightly) **all anthropogenic carbon dioxide emissions** as agents of global warming; that is, **methane emissions are more important** (slightly) **than carbon dioxide** emissions for driving the **current rate** of global warming. At the 20-year timescale, total global emissions of methane are equivalent to over 80% of global carbon dioxide emissions. And at the 100-year timescale, current global methane emissions are equivalent to slightly less than 30% of carbon dioxide emissions [34] (Fig. 3). This difference in the time sensitivity of the climate system to methane and carbon dioxide **is critical**, and **not widely appreciated** by the policy community and even some climate scientists. While some note how the long-term momentum of the climate system is driven by carbon dioxide [15], the climate system is **far more immediately responsive** to changes in methane (and other short-lived radiatively active materials in the atmosphere, such as black carbon) [41]. The model published in 2012 by Shindell and colleagues [41] and adopted by the United Nations [42] predicts that unless emissions of methane and black carbon are reduced **immediately**, the Earth's average surface temperature will warm by 1.5°C by about 2030 and by 2.0°C by 2045 to 2050 **whether or not carbon dioxide emissions are reduced**. Reducing methane and black carbon emissions, even if carbon dioxide is not controlled, **would significantly slow the rate of global warming and postpone reaching the 1.5°C and 2.0°C marks by 15–20 years**. Controlling carbon dioxide as well as methane and black carbon emissions further slows the rate of global warming after 2045, through at least 2070 [41, 42] (Fig. 4). Why should we care about this warming over the next few decades? At temperatures of 1.5–2.0°C above the 1890–1910 baseline, the risk of a fundamental change in the Earth's climate system becomes **much greater** [41-43], possibly leading to **runaway feedbacks** and **even more global warming**. Such a result **would dwarf any possible benefit from reductions in carbon dioxide emissions** over the next few decades (e.g., switching from coal to natural gas, which does reduce carbon dioxide but also increases methane emissions). One of many mechanisms for such catastrophic change is the melting of methane clathrates in the oceans or melting of permafrost in the Arctic. Hansen and his colleagues [43, 44] have suggested that warming of the Earth by 1.8°C may trigger a large and rapid increase in the release of such methane. While there is a wide range in both the magnitude and timing of projected carbon release from thawing permafrost and melting clathrates in the literature [45], warming consistently leads to greater release. This release can in turn cause a feedback of accelerated global warming [46]. To state the converse of the argument: the influence of today's emissions on global warming 200 or 300 years into the future will largely reflect carbon dioxide, and not methane, unless the emissions of methane lead to tipping points and a fundamental change in the climate system. **And that could happen as early as within the next two to three decades.** An **increasing body of science** is developing **rapidly that emphasizes** the need to consider methane's influence over the decadal timescale, and the need to reduce methane emissions. Unfortunately, some recent guidance for life cycle assessments specify only the 100-year time frame [47, 48], and the EPA in 2014 still uses the GWP values from the IPCC 1996 assessment and only considers the 100-year time period when assessing methane emissions [49]. In doing so, they underestimate the global warming significance of methane by 1.6-fold compared to more recent values for the 100-year time frame and by four to fivefold compared to the 10- to 20-year time frames [34, 37].

#### Extinction

Sprat 19 [David Spratt is a Research Director for Breakthrough National Centre for Climate Restoration, Melbourne, and co-author of Climate Code Red: The case for emergency action, and Ian T. Dunlop is a member of the Club of Rome, formerly an international oil, gas and coal industry executive, chairman of the Australian Coal Association, chief executive of the Australian Institute of Company Directors, and chair of the Australian Greenhouse Office Experts Group on Emissions Trading, “Existential climate-related security risk: A scenario approach,” BT Policy Paper, September 5, May 2019-2020, <https://docs.wixstatic.com/ugd/148cb0_90dc2a2637f348edae45943a88da04d4.pdf>]

By 2050, there is broad scientific acceptance that system **tipping-points** for the West Antarctic Ice Sheet and a sea-ice-free Arctic summer were passed well before 1.5°Cof warming, for the Greenland Ice Sheet well before 2°C, and for widespread **permafrost loss and large-scale Amazon drought** and dieback by 2.5°C. The “hothouse Earth” scenario has been realised, and Earth is headed for another degree or more of warming, especially since human greenhouse emissions are still significant.20 While sea levels have risen 0.5 metres by 2050, the increase may be 2–3 metres by 2100, and it is understood from historical analogues that seas may eventually rise by more than 25 metres. Thirty-five percent of the global land area, and 55 percent of the **global population**, are **subject to** more than 20 days a year of **lethal heat conditions**, beyond the threshold of human survivability. The destabilisation of the Jet Stream has very significantly affected the intensity and geographical distribution of the Asian and West African monsoons and, together with the further slowing of the Gulf Stream, is impinging on life support systems in Europe. North America suffers from **devastating weather extremes** including wildfires, heatwaves, drought and inundation. The summer monsoons in China have failed, and water flows into the great rivers of Asia are severely reduced by the loss of more than one-third of the Himalayan ice sheet. **Glacial loss reaches 70 percent** in the Andes, and rainfall in Mexico and central America falls by half. Semi-permanent El Nino conditions prevail. Aridification emerges over more than 30 percent of the world’s land surface. **Desertification is severe** in southern Africa, the southern Mediterranean, west Asia, the Middle East, inland Australia and across the south-western United States. Impacts: **A number of ecosystems collapse**, including coral reef systems, the Amazon rainforest and in the Arctic. Some poorer nations and regions, which lack capacity to provide artificially-cooled environments for their populations, become unviable. **Deadly heat conditions persist** for more than 100 days per year in West Africa, tropical South America, the Middle East and South-East Asia, which together with land degradation21 and rising sea levels contributes to perhaps **a billion people being displaced.** Water availability decreases sharply in the most affected regions at lower latitudes (dry tropics and subtropics), affecting about two billion people worldwide. **Agriculture becomes nonviable** in the dry subtropics. Most regions in the world see a significant drop in food production and increasing numbers of extreme weather events, **including heat waves, floods and storms**. Food production is inadequate to feed the global population and **food prices skyrocket**, as a consequence of a one-fifth decline in crop yields, a decline in the nutrition content of food crops, a catastrophic decline in insect populations, desertification, monsoon failure and chronic water shortages, and conditions too hot for human habitation in significant food-growing regions. The lower reaches of the agriculturally-important river deltas such as the Mekong, Ganges and Nile are inundated, and significant sectors of some of the world’s most populous cities — including Chennai, Mumbai, Jakarta, Guangzhou, Tianjin, Hong Kong, Ho Chi Minh City, Shanghai, Lagos, Bangkok and Manila — are abandoned. Some small islands become uninhabitable. Ten percent of Bangladesh is inundated, displacing 15 million people. According to the Global Challenges Foundation’s Global Catastrophic Risks 2018 report, even for 2°C of warming, more than a billion people may need to be relocated due to sea-level rise, and In high-end scenarios “**the scale of destruction is beyond our capacity to model**, with a high likelihood of human civilisation coming to an end”.22 National security consequences: For pragmatic reasons associated with providing only a sketch of this scenario, we take the conclusion of the ​Age of Consequences ‘Severe’ 3°C scenario developed by a group of senior US national-security figures in 2007 as appropriate for our scenario too: Massive nonlinear events in the global environment give rise to ​massive nonlinear societal events​. In this scenario, nations around the world **will be ​overwhelmed** by the scale of change and pernicious challenges, **such as pandemic disease**. The **internal cohesion** of nations **will be under great stress**, including in the United States, both as a result of a dramatic rise in migration and changes in agricultural patterns and water availability. The **flooding** of coastal communities **around the world**, especially in the Netherlands, the United States, South Asia, and China, has the potential to challenge regional and even national identities.​ **Armed conflict between nations over resources**, such as the Nile and its tributaries, **is likely and nuclear war is possible**. The social consequences range from increased religious fervor to ​outright chaos​. In this scenario, climate change provokes ​a permanent shift in the relationship of humankind to nature​’.23 (emphasis added)

# Case

### Debris

#### Their entire link ev is about a particular megaconstellation – starlink, so im just gonna read defense to that

#### Starlink ACA systems and de-orbiting solves any debris impact – Russian ASAT test proves and also non-uniques their impact

Kan 21 – [Michael, “Starlink Satellite Orbits Changed to Avoid Debris After Russia's Missile Test,” PC Mag, 12/1/2021, https://www.pcmag.com/news/starlink-satellite-orbits-changed-to-avoid-debris-after-russias-missile]

SpaceX has altered the orbits for its Starlink satellites, likely to prevent them from colliding with debris from Russia’s anti-satellite missile test.

On Tuesday, SpaceX CEO Elon Musk mentioned the issue after NASA abruptly delayed a spacewalk on the International Space Station due to the threat of space debris. In his tweet, Musk said: “We had to shift some Starlink satellite orbits to reduce probability of collision. Not great, but not terrible either.”

Musk didn’t explicitly blame the space debris on Russia’s anti-satellite missile test. Nevertheless, the “Not great, but not terrible” quote may be a subtle jab at the Russian government. The same line is used in the HBO series Chernobyl, which dramatizes the 1986 nuclear plant disaster in the Soviet Union. (In the show, a nuclear plant worker utters the line “Not great, but not terrible,” when in reality the conditions at the facility are catastrophic.)

Last month, the US was quick to condemn Russia’s anti-satellite missile test, which involved the Kremlin sending up a missile to destroy one of its own defunct satellites. The ensuing impact caused hundreds of thousands of pieces of debris to spill out into orbit, according to the US.

Because space debris can travel up to 17,500 miles per hour, even a small artifact can cause serious damage if strikes a spacecraft or an astronaut. "Russia's dangerous and irresponsible behavior jeopardizes the long-term sustainability of outer space,” the US State Department said at the time.

However, Russia claims the resulting debris poses no danger to any space activity. The Kremlin also points out other countries have embarked on their own anti-satellite missile tests too.

To avoid space debris, SpaceX has equipped each Starlink satellite with an “autonomous collision avoidance” system. The same satellites will eventually descend and burn up in Earth’s atmosphere within one to five years if the propulsion system on board ever fails.

In his tweet, Musk added that the International Space Station and SpaceX’s own Dragon craft possess “micrometeorite shields,” which can withstand high-velocity impacts. However, spacesuits lack such protection, hence the need for NASA to cancel the spacewalk.

#### Low altitude orbits zeroes risk of collision and doesn’t contribute to overall debris in dense areas – even if satellites fail no impact

Grush 18 – [Loren, “SpaceX wants to fly some internet satellites closer to Earth to cut down on space trash,” 10/9/2018, <https://www.theverge.com/2018/11/9/18016962/spacex-internet-satellites-space-debris-trash-orbit-closer-earth-distance-atmosphere>]

SpaceX is revising its satellite internet initiative, Starlink, and it now hopes to operate some of its spacecraft at a lower altitude than originally planned. In a new filing to the Federal Communications Commission (FCC), SpaceX is asking the agency to modify its license so that more than 1,500 Starlink satellites can operate at an altitude 600 kilometers lower than the company originally requested. SpaceX argues that this change will make the space environment safer, as it will be easier to get rid of these satellites at this new altitude when they run low on fuel or can no longer function properly in orbit. This update could also explain the unexpected behavior of two of SpaceX’s test satellites for Starlink, which have remained in lower orbits than expected. Back in March, the FCC approved SpaceX’s license for the first phase of its ambitious Starlink initiative — the company’s long-term plan to launch nearly 12,000 satellites into orbit to beam internet coverage down to Earth. Initially, SpaceX asked the FCC for permission to launch 4,425 satellites into orbits ranging between 1,110 to 1,325 kilometers high. But with this new filing, SpaceX is requesting that 1,584 of those satellites, which were supposed to operate at 1,110 kilometers, be allowed to operate at 550 kilometers instead. SpaceX says moving the satellites to a lower altitude means it can do more with less. Originally, the company said it needed 1,600 satellites to operate at the 1,110-kilometer altitude, but moving them lower means the company can get the same results with 16 fewer spacecraft. And the lower altitude makes it easy to dispose of these satellites once they’re done in space. At this height, particles from Earth’s atmosphere bombard the spacecraft more rapidly, pushing them out of orbit and dragging them down to the planet. And on the way down, they burn up in the atmosphere. Making sure these spacecraft come out of orbit in a timely manner is crucial because of the vast number of vehicles that SpaceX wants to put into orbit. A constellation the size of Starlink could dramatically increase the number of operational satellites in space, raising the risk of in-space collisions. A recent NASA study argued that 99 percent of these satellites will need to be taken out of orbit, reliably, within five years of launch, or the risk of satellite collisions goes up quite a bit. De-orbiting a satellite typically entails bringing the vehicle to a low enough altitude with thrusters where Earth’s air particles and gravity drag the probe down so that it burns up. Now, with this new filing, SpaceX won’t have to significantly move 1,584 of its satellites to get rid of them. The atmosphere at 550 kilometers should do the job within a few years. That’s also helpful in case the spacecraft fails in orbit. Satellites that fail in higher altitudes could turn into unoperational space debris that stay in orbit for long periods of time. At lower altitudes, they can still fail, and the atmosphere will still swallow them up in a timely manner.

#### Collisions are unlikely because all debris is moving in the same direction, at the same speed

Michael McClennen 18, Research Informaticist in the Department of Geoscience at the University of Wisconsin-Madison, “With So Many Satellites and Space Junk Floating Around the Earth, How Is It That There Are Not Very Many of Them Colliding With One Another or Crashing Into The Space Station or Even New Ships Sent Into Space?”, Quora, 10/10/2018, https://www.quora.com/With-so-many-satellites-and-space-junk-floating-around-the-earth-how-is-it-that-there-are-not-very-many-of-them-colliding-with-one-another-or-crashing-into-the-space-station-or-even-new-ships-sent-into-space

In addition to the other answers, there is another very important factor. A large majority of the orbiting objects (both satellites and debris) are all going in roughly the same direction around Earth, in the same direction as Earth’s rotation with an orbital inclination of between 0º and 22º with respect to the equator. This is due primarily to the fact that launching due East is more efficient than launching in any other direction, and allows you to use the least amount of fuel in getting your payload to orbit. In addition, the laws of physics mandate that all of the objects at a given orbital altitude are moving at roughly the same speed. These basic facts substantially lower the chances of collision. As these objects all move around the globe, they are roughly keeping station with respect to most of the other objects at the same altitude. There is, of course, another group of satellites and debris that are moving in polar orbits, which are roughly perpendicular to the the mostly-equatorial orbits I discussed in the previous paragraph. These satellites and most of their associated debris were deliberately placed into orbit at a different range of altitudes from the equatorially-orbiting satellites, specifically so that the two populations of objects would not crash into each other. So it is not the case that the tracks of orbiting objects randomly cross in all directions. Rather the ones at any given altitude are (mostly) moving in the same direction and at roughly the same speed. This has helped quite a bit to keep the orbital-debris situation tolerable so far.

#### Kessler revised predictions – it would be a century long process – they read Kessler so no getting out of this

Kurt 15 [Joseph Kurt, JD- William & Mary School of Law, BA-Marquette University, NOTE: TRIUMPH OF THE SPACE COMMONS: ADDRESSING THE IMPENDING SPACE DEBRIS CRISIS WITHOUT AN INTERNATIONAL TREATY, 40 Wm. & Mary Envtl. L. & Pol'y Rev. 305 (2015)]

A. Practical Considerations: Feasible Solutions to the Space Debris Problem Are on Their Way One key question in assessing whether an international treaty is a requisite for solving the space debris problem is just how difficult it will be to fashion a remedy. The more complex and costly are feasible solutions, the more likely it is that a comprehensive regime is necessary to bind the various actors together. 93Link to the text of the note A good place to begin is to determine just how imminent is the onset of the cascade of exponentially more frequent debris-creating collisions, known as the Kessler Syndrome. 94Link to the text of the note To be certain, no one can be sure--this phenomenon being subject to highly complex probabilities. 95Link to the text of the note Indeed, experts' estimates of when such a cascade will become irreversible vary [\*316] widely. 96Link to the text of the note The National Research Council produced a report in 2011 that suggested that "space might be just 10 or 20 years away from severe problems." 97Link to the text of the note In fact, the cascading effect has already begun, albeit at a modest pace. 98Link to the text of the note However, Donald Kessler, who first described the eponymous effect in 1978, has significantly recalibrated his own outlook over the years. 99Link to the text of the note Originally, Kessler predicted that catastrophe would result by the year 2000. 100Link to the text of the note That date long passed, Kessler now speaks of a century-long process that "we have time to deal with." 101Link to the text of the note

#### No one’s going to war over a downed satellite

Bowen 18 [Bleddyn Bowen, Lecturer in International Relations at the University of Leicester. The Art of Space Deterrence. February 20, 2018. https://www.europeanleadershipnetwork.org/commentary/the-art-of-space-deterrence/]

Space is often an afterthought or a miscellaneous ancillary in the grand strategic views of top-level decision-makers. A president may not care that one satellite may be lost or go dark; it may cause panic and Twitter-based hysteria for the space community, of course. But the terrestrial context and consequences, as well as the political stakes and symbolism of any exchange of hostilities in space matters more. The political and media dimension can magnify or minimise the perceived consequences of losing specific satellites out of all proportion to their actual strategic effect.

#### No retal- no one mourns a satellite- only terrestrial alt causes trigger the impact because lives aren’t lost in space

Karlik, 19 **–** US House of Representatives defense fellow

[Evan – Lieutenant commander in US Navy, “US-China Tensions: Unmanned Military Craft Raise Risk of War,” 8-12-19, <https://www.maritime-executive.com/editorials/us-china-tensions-unmanned-military-craft-raise-risk-of-war>, accessed 8-22-19]

If China dispatched a billion-dollar U.S. destroyer and a portion of its crew to the bottom of the Taiwan Strait, a war declaration from Washington and mobilization to the region would undoubtedly follow. But should a Chinese missile suddenly destroy an orbiting, billion-dollar U.S. intelligence satellite, the White House and the U.S. Congress might opt to avoid immediate escalation.

"Satellites have no mothers," quip space policy experts, and the same is true for airborne drones and unmanned ships. Their demise does not call for pallbearers, headstones, or memorial statues.

#### No impact to disease

Owen Cotton-Barratt 17, et al, PhD in Pure Mathematics, Oxford, Lecturer in Mathematics at Oxford, Research Associate at the Future of Humanity Institute, 2/3/2017, Existential Risk: Diplomacy and Governance, <https://www.fhi.ox.ac.uk/wp-content/uploads/Existential-Risks-2017-01-23.pdf>

For most of human history, natural pandemics have posed the greatest risk of mass global fatalities.37 However, there are some reasons to believe that natural pandemics are very unlikely to cause human extinction. Analysis of the International Union for Conservation of Nature (IUCN) red list database has shown that of the 833 recorded plant and animal species extinctions known to have occurred since 1500, less than 4% (31 species) were ascribed to infectious disease.38 None of the mammals and amphibians on this list were globally dispersed, and other factors aside from infectious disease also contributed to their extinction. It therefore seems that our own species, which is very numerous, globally dispersed, and capable of a rational response to problems, is very unlikely to be killed off by a natural pandemic. One underlying explanation for this is that highly lethal pathogens can kill their hosts before they have a chance to spread, so there is a selective pressure for pathogens not to be highly lethal. Therefore, pathogens are likely to co-evolve with their hosts rather than kill all possible hosts.39s

#### Covid disproves their impact – the world was unprepared but nowhere close to extinction

### Ozone

#### Their ev is dishonestly cut – it says extinction of many species, not extinction of humans so no extinction warrant

#### The ozone layer doesn’t matter – empirical ozone holes solve

**Ridley 14** [Matt, DPhil from Oxford, Fellow of the Academy of Medical Sciences, The Times, September 15, 2014, “The ozone hole isn’t fixed. But that’s no worry,” http://www.thetimes.co.uk/tto/opinion/columnists/article4206440.ece]

How much damage did the ozone hole ever threaten to do anyway? It is fascinating to go back and read what the usual hyperventilating eco-exaggerators said about ozone thinning in the 1980s. As a result of the extra ultraviolet light coming through the Antarctic ozone hole, southernmost parts of Patagonia and New Zealand see about 12 per cent more UV light than expected. This means that the weak September sunshine, **though it feels much the same**, has the power to cause sunburn more like that of latitudes a few hundred miles north. **Hardly Armageddon**. The New York Times reported “an increase in Twilight Zone-type reports of sheep and rabbits with cataracts” in southern Chile. Not to be outdone, Al Gore wrote that “hunters now report finding blind rabbits; fisherman catch blind salmon”. Zoologists briefly blamed the near extinction of many amphibian species on thin ozone. Melanoma in people was also said to be on the rise as a result. **This was nonsense**. Frogs were dying out because of a fungal disease spread from Africa — nothing to do with ozone. Rabbits and fish blinded by a little extra sunlight proved to be as mythical as unicorns. An eye disease in Chilean sheep was happening outside the ozone-depleted zone and was caused by an infection called pinkeye — nothing to do with UV light. And melanoma incidence in people actually levelled out during the period when the ozone got thinner. Then remember that the ozone hole appears when the sky is dark all day, and over an uninhabited continent. **Even if it persists into the Antarctic spring and spills north briefly, the hole allows 50 times less ultraviolet light through than would hit your skin at the equator at sea level** (let alone at a high altitude) in the tropics. So it would be bonkers to worry about UV as you sailed round Cape Horn in spring, say, but not when you stopped at the Galapagos: the skin cancer risk is 50 times higher in the latter place.

#### No ozone impact

**Ridley 14** -- Matthew White Ridley, 5th Viscount Ridley DL FRSL FMedSci, known commonly as Matt Ridley, is a British journalist, businessman and author of popular science books. Since 2013 Ridley has been a Conservative hereditary peer in the House of Lords. “THE OZONE HOLE WAS EXAGGERATED AS A PROBLEM” http://www.rationaloptimist.com/blog/the-ozone-hole-was-exaggerated-as-a-problem.aspx

Serial hyperbole does the environmental movement no favours My recent Times column argued that the alleged healing of the ozone layer is exaggerated, but so was the impact of the ozone hole over Antarctica: The ozone layer is healing. Or so said the news last week. Thanks to a treaty signed in Montreal in 1989 to get rid of refrigerant chemicals called chlorofluorocarbons (CFCs), the planet’s stratospheric sunscreen has at last begun thickening again. Planetary disaster has been averted by politics. For reasons I will explain, this news deserves to be taken with a large pinch of salt. You do not have to dig far to find evidence that the ozone hole was never nearly as dangerous as some people said, that it is not necessarily healing yet and that it might not have been caused mainly by CFCs anyway. The timing of the announcement was plainly political: it came on the 25th anniversary of the treaty, and just before a big United Nations climate conference in New York, the aim of which is to push for a climate treaty modelled on the ozone one. Here’s what was actually announced last week, in the words of a Nasa scientist, Paul Newman: “From 2000 to 2013, ozone levels climbed 4 per cent in the key mid-northern latitudes.” That’s a pretty small change and it is in the wrong place. The ozone thinning that worried everybody in the 1980s was over Antarctica. Over northern latitudes, ozone concentration has been falling by about 4 per cent each March before recovering. Over Antarctica, since 1980, the ozone concentration has fallen by 40 or 50 per cent each September before the sun rebuilds it. So what’s happening to the Antarctic ozone hole? Thanks to a diligent blogger named Anthony Watts, I came across a press release also from Nasa about nine months ago, which said: “ Two new studies show that signs of recovery are not yet present, and that temperature and winds are still driving any annual changes in ozone hole size.” As recently as 2006, Nasa announced, quoting Paul Newman again, that the Antarctic ozone hole that year was “the largest ever recorded”. The following year a paper in Nature magazine from Markus Rex, a German scientist, presented new evidence that suggested CFCs may be responsible for less than 40 per cent of ozone destruction anyway. Besides, nobody knows for sure how big the ozone hole was each spring before CFCs were invented. All we know is that it varies from year to year. How much damage did the ozone hole ever threaten to do anyway? It is fascinating to go back and read what the usual hyperventilating eco-exaggerators said about ozone thinning in the 1980s. As a result of the extra ultraviolet light coming through the Antarctic ozone hole, southernmost parts of Patagonia and New Zealand see about 12 per cent more UV light than expected. This means that the weak September sunshine, though it feels much the same, has the power to cause sunburn more like that of latitudes a few hundred miles north. Hardly Armageddon. The New York Times reported “an increase in Twilight Zone-type reports of sheep and rabbits with cataracts” in southern Chile. Not to be outdone, Al Gore wrote that “hunters now report finding blind rabbits; fisherman catch blind salmon”. Zoologists briefly blamed the near extinction of many amphibian species on thin ozone. Melanoma in people was also said to be on the rise as a result. This was nonsense. Frogs were dying out because of a fungal disease spread from Africa — nothing to do with ozone. Rabbits and fish blinded by a little extra sunlight proved to be as mythical as unicorns. An eye disease in Chilean sheep was happening outside the ozone-depleted zone and was caused by an infection called pinkeye — nothing to do with UV light. And melanoma incidence in people actually levelled out during the period when the ozone got thinner. Then remember that the ozone hole appears when the sky is dark all day, and over an uninhabited continent. Even if it persists into the Antarctic spring and spills north briefly, the hole allows 50 times less ultraviolet light through than would hit your skin at the equator at sea level (let alone at a high altitude) in the tropics. So it would be bonkers to worry about UV as you sailed round Cape Horn in spring, say, but not when you stopped at the Galapagos: the skin cancer risk is 50 times higher in the latter place. This kind of eco-exaggeration has been going on for 50 years. In the 1960s Rachel Carson said there was an epidemic of childhood cancer caused by DDT; it was not true — DDT had environmental effects but did not cause human cancers.’

#### 250million year old empirics don’t count