### 1NC – New Affs Bad – General

#### New, un-disclosed affs are a voting issue –

#### Testing – they make it impossible to adequately test the aff without adequate pre-round prep – favors newness over engagement – disclosure solves their offense – you can break new affs, you just have to disclose the plan text personally or disclose it on the wiki before round

#### Negative ground – they make negative ground concessionary to the goodwill of the aff and results in extremist generics that heavily skew ground in favor of the aff

#### The implication is that whatever we do in this 1NC is theoretically legitimate – no prep time, lack of research, etc means all “unfair” positions are justified

### 1NC – Long

#### Interpretation – affirmative teams must defend legal action by a government

John Bouvier 56 [The Free Dictionary, “Unjust”] [DS] [https://legal-dictionary.thefreedictionary.com/Unjust#:~:text=UNJUST.,test%20of%20right%20and%20wrong.]

Unjust Also found in: Dictionary, Thesaurus, Wikipedia. Related to Unjust: Unjust enrichment UNJUST. That which is done against the perfect rights of another; that which is against the established law; that which is opposed to a law which is the test of right and wrong.

#### This is clear

Black’s Law Dictionary ND [DS] [https://thelawdictionary.org/unjust/]

UNJUST Contrary to right and justice, or to the enjoyment of his rights by another, or to the standards of conduct furnished by the laws.

#### “Resolved” means enactment of a law.

Words and Phrases 64 Words and Phrases Permanent Edition (Multi-volume set of judicial definitions). “Resolved”. 1964.

Definition of the word “resolve,” given by Webster is “to express an opinion or determination by resolution or vote; as ‘it was resolved by the legislature;” It is of similar force to the word “enact,” which is defined by Bouvier as meaning “to establish by law”.

#### Violation – the aff fiats private self-restriction, which is not a method of correcting injustice nor an enactment of a law.

#### Ground – generics on this topic must be tied to the actor, not the action, because each space appropriation is unique. A topic where the unifying thesis is countries legislating restrictions on space appropriation is much better than one about private actors self-restricting – their interp skirts multilat good/bad, K’s of IR and global governance, and CP’s to reform the OST – there are no unifying DA’s to different private companies around the world signing binding internal memos to restrict a type of space appropriation.

#### Predictability and Limits – there are infinite private entities that could appropriate space but only a small amount of spacefaring nations – legal limits are necessary when the topic doesn’t have the word “substantial” in it.

#### Topicality is an issue of competing interpretations – it prevents arbitrary judge intervention and a race to the top that favors no one. The standards debate above also proves they aren’t reasonable. DTD on topicality because DTA is functionally drop the aff and it irreparable skewed our strategy

#### No RVIs – they’re illogical, create a chilling effect on setting theory norms, and destroy substantive education.

### 1NC - Moon

#### CP: Upon the discovery of a novel disease, the institution of mandatory lockdowns

#### until there is no more than one new case per day per 100,000 people after which local officials will modulate lockdown levels based on local case numbers is just.

#### Only the lockdown solves- it curbs spread

Osterholm, 20 -- Regents Professor and Director of the Center for Infectious Disease Research and Policy at the University of Minnesota

[Michael T. and Mark Olshaker, writer and documentary filmmaker, "America Needs to Lock Down Again," Foreign Affairs, 9-16-20, https://www.foreignaffairs.com/articles/united-states/2020-09-16/coronavirus-america-needs-lock-down-again, accessed 10-29-20]

In our essay “Chronicle of a Pandemic Foretold,” for the July/August issue of Foreign Affairs, we described the struggle against COVID-19 in terms of a baseball game and estimated that the United States was in about the third inning of a nine-inning contest. At this point, however, it may be more helpful to shift to an altogether different analogy. The unfolding story of the pandemic is a three-act play, in which the country is now midway through the second act.

The first act saw the disease spread from China to the rest of the world and to a woefully unprepared United States. The second witnessed Americans tire of restrictions and effectively surrender to the pandemic. Infection rates across the country soared during the summer and will likely rise again in the autumn as schools and universities reopen. To truly get the novel coronavirus under control, the United States must do what it has not done so far: impose real and stringent lockdowns across the country for roughly two months. Controlling the spread of the disease in this way will save lives ahead of the eventual end of this drama in the pandemic’s final act—the arrival of a safe, effective vaccine.

THE CURTAIN RISES

Act I opened in late 2019 with the emergence in China of a novel coronavirus that spread throughout much of the world with breathtaking speed and effect. Nations and regions faced the challenge in different ways and with varying levels of success. After a horrendous start, for example, Italy managed to get transmission substantially under control by imposing a near-complete shutdown of the northern part of the country. In the United States, both New York City and New York State saw catastrophic levels of infection that overwhelmed the entire health-care system. It is difficult to forget the images of refrigerated trailers sitting outside hospital emergency rooms to accommodate the dead. But under the leadership of Governor Andrew Cuomo—and thanks to a coordinated state public health response—New York locked down to get the number of cases to a manageable level and then maintain the low numbers, turning a disaster into a model for the rest of the United States.

The issue of testing loomed over Act I. Some Asian nations that had experience with SARS began widespread testing of possible cases early and therefore were able to do contact tracing and largely control viral transmission. The United States did not do that. The White House denied the potential seriousness of the coronavirus (allegedly in a bid to prevent “panic”), while the Centers for Disease Control and Prevention (CDC) developed a test for national use that was faulty, leaving the virus difficult to track and making case isolation and contact tracing ineffective as a means to control transmission. That forced the country onto a much more disruptive path: an attempt to control and mitigate the virus’s effects through a national lockdown of all nonessential personnel.

The price was steep, with millions of jobs lost, schools closed, and all public events and gatherings officially canceled. In mid-April, the United States was seeing 32,000 new cases a day. But a month later, that figure had dropped to 22,000 and Americans felt they had turned a corner, that the pandemic was subsiding and the battle was won.

THE DISTANT PEAK

Act II of this drama began around Memorial Day weekend in late May. Pandemic fatigue had set in. Americans seemed to collectively declare, “We’re done,” taking any decrease in daily case counts or deaths as a sign that the virus had been curtailed. The warm-weather months drew people into social settings, and the White House and a host of pundits encouraged this natural yearning to get back to business—and leisure—as usual. The administration and its allies posited a zero-sum choice between continuing to slow transmission of the disease and saving the economy. In fact, the country had the fire only under limited control, and if you stop fighting a fire at that point, it will naturally flare up again and continue to burn.

By July 20, with people resuming socializing in large groups, the country’s daily new case count shot up to more than 66,000. It should be noted that the many protests that followed the death of George Floyd in late May did not contribute much to the spread since the demonstrations occurred outdoors, where the virus rapidly dissipates in the air. The spring weekend beach gatherings of young people, by contrast, led to more serious transmissions because revelers often ended up indoors, particularly in close and crowded confines such as bars and houses.

The rate of daily new cases dipped to a little over 42,000 by the end of August, largely because of major containment efforts in California, Florida, Georgia, and Texas. As encouraging as that was on the face of it, the United States was still seeing about 1,000 COVID-19-related deaths per day, hardly a victory by any standard. Americans can expect these crests and troughs in new infections to continue, with each successive peak higher than the one before, until either an effective vaccine becomes widely available or herd immunity is established in the population through person-to-person transmission.

Herd immunity is often discussed but widely misunderstood. Each infectious disease has a different threshold for what percentage of a given population must be immune before the rate of transmission begins to drop. For a highly infectious agent transmitted through the air, such as measles, that percentage can be as high as 95 percent. For COVID-19, most public health infectious disease experts estimate it to be between 50 and 70 percent. One theory holds that the best way to approach the virus is to try to achieve herd immunity as quickly as possible through natural infection so everything can get back to normal, while protecting the older and most vulnerable people. This is the method seemingly employed by Sweden. Its transmission and mortality rates were significantly higher than those of neighboring Denmark and Norway, but the country does not appear to be substantially closer to reaching herd immunity than its Scandinavian neighbors, all of which are still far short of the threshold. Moreover, there is emerging evidence that exposure to the virus may confer only temporary immunity, possibly as brief as several months. And achieving herd immunity—if that is even possible—would only slow transmission, not halt it.

By the most liberal estimates, only about ten to 12 percent of the U.S. population has been infected thus far and, as Sweden’s experience has shown, reaching the threshold will be a long-drawn-out process that could result in the deaths of more than two million Americans. As it is, with about four percent of the world’s population, the United States has racked up about a quarter of all confirmed COVID-19 fatalities. The country failed to protect vulnerable populations, as witnessed in the many outbreaks in nursing homes and extended-care facilities. The virus has also taken a toll on young and healthy individuals; even some with mild or asymptomatic variants of the disease have become “long haulers,” who experience a range of symptoms, including chronic fatigue and cardiac and respiratory issues, weeks or months after getting infected.

SHUT IT DOWN

Herd immunity is a distant and unrealistic prospect, but Americans still have the opportunity to mitigate the suffering and death caused by the disease. The reality is that the only way for the United States to get through Act II with low levels of morbidity and mortality is through more complete lockdowns than were previously implemented in areas with high incidence of infection. Currently, the upper Midwest is the “hottest” area in the country for community-wide transmission, but other areas will see increasing case totals deeper into the fall. The aim at this point, quite simply, should be to cut transmission of the virus as much as possible until the creation and distribution of an effective vaccine.

Such lockdowns should last six to eight weeks with a goal of reaching no more than one new case per day per 100,000 people. This low rate is necessary for testing and contact tracing to have any meaningful effect. Once that rate is achieved, however, local officials will be able to adjust lockdown measures more accurately and with the flexibility the pandemic demands. If the White House and federal government will not lead, which is unfortunately likely under the current administration, the governors of each state, in coordination with their neighboring states, must take the initiative themselves. Some might think this is unrealistic, but New York has been able to maintain this low rate of new infections for the past three months.

Stringent lockdowns, of course, would depend on the continued labor of essential workers, a category we estimate to be no more than 35 percent of the workforce and possibly less. What about other workers? As part of its broader anti-COVID-19 strategy, the federal and state governments should compensate both individual workers and small businesses that suffer substantial or irreparable economic loss as a result of lockdowns. Such support negates the false choice between public and economic health. If carried out successfully, the near-complete shutdowns would be not open-ended but limited in time. And the government has the means to prop up adversely affected workers and businesses. As Minneapolis Federal Reserve Bank President Neel Kashkari outlined in an op-ed in The New York Times cowritten with one of us (Osterholm), this fiscal obligation could be covered by the money most Americans who have not lost income are saving by not spending as much during the pandemic—the personal savings rate of Americans has grown from eight percent in January to 20 percent in August. Domestic savings can fund investment in the national economy, a concept that should work equally well in other developed nations. Banks, whose holdings have been boosted by the additional savings, could loan the money necessary for protecting jobs and businesses; Americans would essentially be repaying themselves rather than taking the more traditional route of incurring foreign debt. We believe many people would support a more robust lockdown if they understood that they would not suffer financially. Such a subsidy will actually save money in the long term by preserving jobs and small businesses.

The alternatives to serious lockdowns are insufficient. In areas where the disease is still rampant, masks and physical distancing alone will not get the job done. Business as usual for another six to eight months—until an effective vaccine is widely available—will send current rates of transmission even higher, especially as schools and colleges reopen. By the middle of September, some universities had already canceled in-person classes owing to widespread transmission on campus. Consider how much pain, suffering, and death Americans have endured so far, with no more than ten to 12 percent of the population infected. The next phase could be overwhelming and make Americans look back with nostalgia at the time when new infection rates were still under 100,000 per day.

A DIFFICULT DENOUEMENT

The final act will begin when—and if—one vaccine or more becomes broadly available. A vaccine will eventually bring this long drama to an end, but it will raise a whole new set of questions. Will enough Americans be willing to take it, given our national schizophrenic view of vaccines and science in general? How effective will a vaccine be, and how long will it confer immunity? What will the rules be for approving the vaccine, in the United States and the rest of the world? Who should, or will, get it first? There has been little official or public discussion about answers to these important questions.

It would be dangerous if a possible vaccine became politicized, either to achieve power, prestige, and influence for the country that produces it or to gain partisan advantage within the United States. Many in the public health sphere are afraid that a vaccine will be made available for use before it has been demonstrated to be safe and effective. Never before has the authority and confidence in U.S. government scientific institutions been so undermined by real or perceived political pressure from the White House. At the beginning of September, the CDC directed localities to prepare for the distribution of a vaccine in two months, at the beginning of November, right around the time of the presidential election. One possible mechanism for this expedited rollout would require the president to direct the Food and Drug Administration or the secretary of the Department of Health and Human Services to grant Emergency Use Authorization for a vaccine candidate that looks promising but has not been through the entire validating process.

There is indeed an inescapable tension between wanting a vaccine as soon as possible to prevent further transmission of the disease (and the resulting illnesses and deaths) and taking the necessary time to produce a safe vaccine, whose efficacy and effects on people of various ages and health situations are well understood. But public health and political officials should be extremely wary of any attempt to grant Emergency Use Authorization to a vaccine that hasn’t completed phase three trials, the final and most rigorous stage in which the product is tested over a broad range of thousands of subjects. In most instances in which such authorization is granted, it is for extremely sick or even dying patients. In this case, it would be granted to administer a vaccine to healthy people before the formula is perfected and before any potential negative effects have been documented. In 1955, one company’s production of the original Salk polio vaccine turned out to be defective, causing 40,000 cases of polio. Ten children died. In 1976, a rush to produce a vaccine against a perceived threat of swine flu left approximately 450 recipients with Guillain-Barré Syndrome paralysis.

One of the key reasons for a full phase three review, which includes at least 30,000 test subjects in a double-blind administration (meaning neither the subject nor the administrator knows who has been given the vaccine and who has been given a placebo), is to determine the vaccine’s impact and effects, positive and negative, on a range of different risk groups. What might be safe and effective for young adults, for example, might be ineffective or even harmful for seniors or those with certain underlying conditions. It is also possible that the effect on children could be different or unpredictable. These results will probably take months to sort out. Even more troubling, present plans do not call for either children or the elderly to be included in the phase three test group. Moreover, the first vaccines for this virus probably won’t be home runs (to go back to baseball analogies for a moment) like the smallpox, polio, and measles vaccines. They are more likely to be singles and doubles like the annual influenza vaccine, which in a good year is about 50 percent effective. Americans won’t be going back to the “old normal” anytime soon.

The best outcome in Act III will be the development and distribution of the vaccine as quickly and widely as possible, without shortcuts on safety or testing for effectiveness. The U.S. government should establish and publicize the criteria by which a vaccine will be considered ready for wide-scale public use as well as make clear which groups of people will receive the vaccine first. A proven safe and effective vaccine should first be given to physicians, hospital personnel, and first responders; then to essential workers with underlying risks for serious disease; and after that, to children so that they can stay in school.

But right now, the United States should just be trying to get through the rest of Act II—the coronavirus winter—and hold out until the arrival of a vaccine-enabled spring. It must impose severe lockdowns to truly curb the spread of the disease. New York has shown it can be done. It remains to be seen whether the rest of the country possesses the collective grit and determination to follow suit. A happy ending to this drama will very much be determined by how Americans decide to craft the rest of this current act.

### 1NC – CP

#### CP: Private entities should tell alien species that they will never, under any circumstance, aid an attack on their homeland, be a threat to the security or peace of their civilization, or wage war against them.

#### Dropping the debater on theory creates perverse incentives to collapse to theory crowding out substantive debate which turns deterrence since theory over-proliferates which kills substance and the reason for theory being good. Shortness doesn’t matte

### Case – Warming

#### They said they solve warming – they didn’t read an impact terminal in the 1AC, they don’t get to in the 1AR

#### Warming unlocks Siberian ag productivity, creating a breadbasket for East Asia.

Parnell ’19 [Maarten; 2019; Founder and Managing Director of Vosbor; The Diplomat, “The Dormant Breadbasket of the Asia-Pacific,” <https://thediplomat.com/2019/02/the-dormant-breadbasket-of-the-asia-pacific/>]

Although some Siberian farmers in the south are anticipated to face production declines due to climate change, the perspectives will improve significantly for the rest of Siberia. With the growing seasons becoming longer and warmer, crop yields are anticipated to improve substantially. Moreover, abandoned cropland and forest areas further north are becoming more attractive for cultivation, with April-July temperatures now on average 1.3 to 2 degrees Celsius higher than in 1960. Nonetheless, (re)cultivation of these lands could release significant amounts of carbon stored in the soil and plants and aggravate climate change. Sustainable intensification of current agricultural lands should therefore have priority over cropland expansion. Substitution of summer fallows, efficient no-till crop rotation schemes, increased water-use-efficiency, and equipment sharing programs are the most cost-effective approaches to a sustainable intensification strategy in Siberia.

The logical destination for Siberian crop surplus is East and Southeast Asia, due to their proximity and large demand. However, in 20 17 only 3.3 percent of all Russian grain exports went to East Asia and 7.8 percent to Southeast Asia. The Russian government is acutely aware of the potential for increased Siberian agricultural exports and has actively pursued foreign policy, regulation and the development of infrastructure to that end. In 2015 it created a free-port zone in Primorsky Krai, the administrative region that borders the Pacific in the east and the Chinese border in the west. Named the Free Port of Vladivostok, its benefits include a free-customs regime for resident companies, lower corporate taxes, fast-track VAT reimbursement, and a simplified visa process for foreigners.

Vladivostok is directly linked to the Trans-Siberian Railway network, connecting the Western Siberian grain belt with the free port over more than 5,000 kilometers. This railway, however, has limited capacity and although there are plans to increase its capacity, the infrastructure network has yet to expand to accommodate this growth. The Free Port zone, which handles mainly energy, metals and mining commodities alongside containers, is also not equipped to efficiently load bulk grain and oilseed. To remedy this, a relatively minor fishing port called Zarubino, at the southern tip of the Free Port zone, was designated to become home to the first grain terminal on the Pacific coast of Russia. The project is largely supported by Chinese investors, who are interested in creating port access for the neighboring Chinese provinces Jilin and Heilongjiang, the country’s largest corn and soybean production areas. Currently, crops from these provinces need to be transported up to 1,000 km by a congested railway to the nearest Chinese port in the Bohai Bay, while Zarubino is a mere 50 km from the border with China. The terminal was to be completed by 2020 and initially slated to have an annual capacity of 40 million tonnes. Due to various setbacks, the project has yet to get off the ground.

Besides infrastructural issues, sparsely populated Siberia also suffers from a lack of skilled labor. To counter this the Russian government has actively supported foreign investment in the region. Last year for example, it has made 1 million hectares of arable land in the Far Eastern Federal District available to foreign buyers, who are normally only eligible for leasehold. Although most of the land is located in remote regions with low productivity, many Chinese buyers indicated interest. Wealthy farmers from China have been moving into the eastern part of Siberia ever since the collapse of the USSR, as centrally planned local economies imploded and agricultural subsidies disappeared. As crop production in some regions of China becomes more difficult in the face of climate change, more Chinese farmers may look north of the border for better opportunities.

Agricultural (land) investments are also attractive to institutional investors, in particular long-term investors like pension funds or sovereign wealth funds, as these investments have historically delivered stable returns, increased diversification, and outpaced inflation. Various institutional investors have committed to Russian agriculture recently, mostly through shareholdings in foreign listed groups focused on farmland acquisition and agribusiness. Among the major funds that invested in Russian farming are Sweden’s AP2 pension fund ($38 billion assets under management or AUM), Dutch pension fund PFZW ($234 billion AUM), California’s CalPERS pension fund ($365.5 billion AUM), Nordea Investment Funds, and insurer Swiss Life. Some investors have even acquired Russian farmland directly, such as New York based hedge fund Och-Ziff Capital and Harvard University’s endowment fund. The most active foreign investors are the large commodity traders and food processors, who invest not only in land and farming, but also in infrastructure (storage and export terminals) and processing (grain milling or oilseed crushing).

Investment risks remain substantial however, as reflected in the overall level of foreign investment in Russia. The risks are not specific to agriculture, but inherent to investing in Russia. Unstable regulation, red tape, corruption, and geopolitical uncertainty are some of the key concerns. More supportive economic policies and a better regulatory framework, as well as public spending on infrastructure would go a long way in improving investment climate in Russia, regardless of economic sanctions.

As surpluses in other growing regions are anticipated to decline, countries will compete for food supplies and put pressure on global prices, which will negatively affect food security worldwide. The underperforming agricultural sector of Siberia has great potential to support the growing demand of Russia’s neighbors in the Asia-Pacific. Local crop production can be increased significantly, especially through sustainable intensification. The existing infrastructure, albeit aging and insufficient for cost-competitive handling of agricultural bulk, has the potential to facilitate large agricultural exports eastward. Like Catherina the Great and her grandson Alexander I, who both successfully promoted the immigration of vast numbers of German farmers to areas that were sparsely populated and transformed them to what remain today the most productive agricultural regions of Russia and Ukraine, the current Russian government should consider policies that will make it more attractive for (foreign) investors to settle in Siberia if it earnestly wants to unlock the agricultural potential of the region. Siberia could become the breadbasket of the Asia-Pacific and boost global food security in the process.

#### Increasing Asian food supply prevents crises that escalate to World War III.

Heneghan ’15 [Carolyn; 2015; Contributing Editor at Food Dive, BA in Communication and Journalism from Tulane University, Citing UN Experts; Global Harvest Initiative Report – Food Dive, “Where Food Crises and Global Conflict Could Collide,” http://www.fooddive.com/news/where-food-crises-and-global-conflict-could-collide/350837/]

World War III is unimaginable for many, but some experts believe that not only is this degree of global conflict imminent, but it may be instigated not by military tensions, oil and gas, or nuclear threats, but instead by, of all things, food.

As it stands, countries across the globe are enduring food crises, and the U.N.’s Food & Agriculture Organization (FAO) estimates that about 840 million people in the world are undernourished, including the one in four children under the age of 5 who is stunted because of malnutrition.

Assistant director-general of U.N. FAO Asia-Pacific Hiroyuki Konuma told Reuters that social and political unrest, civil wars, and terrorism could all be possible results of food crises, and “world security as a whole might be affected.” Such consequences could happen unless the world increases its output of food production 60% by mid-century. This includes maintaining a stable growth rate at about 1% to have an even theoretical opportunity to circumvent severe shortages. These needs are due to the growing global population, which is expected to reach 9 billion by 2050 while demand for food will rise rapidly.

Where the problems lie

Exacerbating this issue is the fact that the world is spending less on agricultural research, to the dismay of scientists who believe global food production may not sustain the increased demand. According to American Boondoggle, “The pace of investment growth has slowed from 3.63 percent per year (after inflation) during 1950–69, to 1.79 percent during 1970–89, to 0.94 percent during 1990– 2009.” Decreased growth in agricultural research and development spending has slowed across the world as a whole, but it is even slower in high-income countries.

Water scarcity is another problem, including in major food-producing nations like China, as well as climate change. Extreme weather events are having a severe effect on crops, which have been devastated in countries like Australia, Canada, China, Russia, and the U.S., namely due to floods and droughts. An Intergovernmental Panel on Climate change recently warned that climate change may result in “a 2% drop each decade of this century,” according to RT.

Rising food costs also contribute to poor food security across the world as prices remain high and volatile. Higher food costs inhibit lower socioeconomic people’s access to food, which contributes to the FAO’s disturbing figure of global malnutrition. In addition to an inability for people to feed themselves, poverty can also reduce food production, such as some African farmers being unable to afford irrigation and fertilizers to provide their regions with food.

Still another issue for decreased food production is the fact that many farmers are turning crops like soy, corn, and sugar into sources for biofuel rather than edible consumption, which means these foods are taken away from people to eat.

Could these shortages lead to a major global conflict?

Studies suggest that the food crisis could begin as early as 2030, just a short 15 years from now, particularly in areas such as East Asia and Sub-Saharan Africa. Both regions have significant problems with domestic food production.

Some experts believe that, to secure enough food resources for their populations, countries may go to war over the increasingly scarce food supply. This could be due in part to warring parties blocking aid and commercial food deliveries to areas supporting their enemies, despite the fact that such a practice breaks international humanitarian law.

#### Negative feedback loops check for warmiing

[Singer](https://www.heartland.org/sites/default/files/12-04-15_why_scientists_disagree.pdf) et al 15. (Dr. Siegfried Fred Singer is an Austrian-born American physicist and emeritus professor of environmental science at the University of Virginia. Dr. Robert Merlin Carter was an English palaeontologist, stratigrapher and marine geologist. Dr. Craig D. Idso is the founder, former president and current chairman of the board of the Center for the Study of Carbon Dioxide and Global Change. Why Scientists Disagree About Global Warming. December 4, 2015. https://www.heartland.org/sites/default/files/12-04-15\_why\_scientists\_disagree.pdf)

A doubling of CO2 from pre-industrial levels (from 280 to 560 ppm) would likely produce a temperature forcing of 3.7 Wm-2 in the lower atmosphere, for about ~1°C of prima facie warming. # IPCC models stress the importance of positive feedback from increasing water vapor and thereby project warming of ~3–6°C, whereas empirical data indicate an order of magnitude less warming of ~0.3–1.0°C. # In ice core samples, changes in temperature precede parallel changes in atmospheric CO2 by several hundred years; also, temperature and CO2 are uncoupled through lengthy portions of the historical and geological records; therefore CO2 cannot be the primary forcing agent for most temperature changes. Atmospheric methane (CH4) levels for the past two decades fall well below the values projected by IPCC in its assessment reports. IPCC’s temperature projections incorporate these inflated CH4 estimates and need downward revision accordingly. # The thawing of permafrost or submarine gas hydrates is not likely to emit dangerous amounts of methane at current rates of warming. # Nitrous oxide (N2O) emissions are expected to fall as CO2 concentrations and temperatures rise, indicating it acts as a negative climate feedback. # Other negative feedbacks on climate sensitivity that are either discounted or underestimated by IPCC include increases in low-level clouds in response to enhanced atmospheric water vapor, increases in ocean emissions of dimethyl sulfide (DMS), and the presence and total cooling effect of both natural and industrial aerosols.

#### Adaptation is guaranteed, zeroing the impact.

Lomborg ’21 [Dr. Bjorn; 2021; President of the Copenhagen Consensus Center, Former Director of the Danish Government's Environmental Assessment Institute, PhD in Political Science at the University of Copenhagen, M.A. in Political Science at the University of Aarhus, BA from the University of Georgia; Wall Street Journal, “Climate Change Calls for Adaptation, Not Panic,” https://www.wsj.com/articles/climate-change-adaptation-panic-exaggerating-disaster-11634760376]

It’s easy to construct climate disasters. You just find a current, disconcerting trend and project it into the future, while ignoring everything humanity could do to adapt. For instance, one widely reported study found that heat waves could kill thousands more Americans by the end of the century if global warming continues apace—but only if you assume people won’t use more air conditioning. Yes, the climate is likely to change, but so is human behavior in response.

Adaptation doesn’t make the cost of global warming go away entirely, but it does reduce it dramatically. Higher temperatures will shrink harvests if farmers keep growing the same crops, but they’re likely to adapt by growing other varieties or different plants altogether. Corn production in North America has shifted away from the Southeast toward the Upper Midwest, where farmers take advantage of longer growing seasons and less-frequent extreme heat. When sea levels rise, governments build defenses—like the levees, flood walls and drainage systems that protected New Orleans from much of Hurricane Ida’s ferocity this year.

Nonetheless, many in the media push unrealistic projections of climate catastrophes, while ignoring adaptation. A new study documents how the biggest bias in studies on the rise of sea levels is their tendency to ignore human adaptation, exaggerating flood risks in 2100 by as much as 1,300 times. It is also evident in the breathless tone of most reporting: The Washington Post frets that sea level rise could “make 187 million people homeless,” CNN fears an “underwater future,” and USA Today agonizes over tens of trillions of dollars in projected annual flood damage. All three rely on studies that implausibly assume no society across the world will make any adaptation whatever for the rest of the century. This isn’t reporting but scaremongering.

You can see how far from reality these sorts of projections are in one heavily cited study, depicted in the graph nearby If you assume no society will adapt to any sea-level rise between now and 2100, you’ll find that vast areas of the world will be routinely flooded, causing $55 trillion in damage annually in 2100 (expressed in 2005 dollars), or about 5% of global gross domestic product. But as the study emphasizes, “in reality, societies are likely to adapt.”

By raising the height of dikes, the study shows that humanity can negate almost all that terrible projected damage by 2100. Only 15,000 people would be flooded every year, which is a remarkable improvement compared with the 3.4 million people flooded in 2000. The total cost of damage, investments in new dikes, and maintenance costs of existing dikes will fall sixfold between now and 2100 to 0.008% of world GDP.

Adaptation is much more effective than climate regulations at staving off flood risks. Compare the two types of policies in isolation. Without any climate mitigation to help, dikes would still safeguard more than 99.99% of the flood victims you’d see if global warming continued on current trends. Instead of 187 million people flooded in 2100, there would be only 15,000. Climate policy achieves much less on its own. Without adaptation, even stringent regulations that keep the global temperature rise below 2 degrees Celsius would reduce the number of flood victims only down to 85 million a year by the end of the century.

Stringent climate policy still has only a mild effect when used in concert with dikes: Instead of the 15,000 flood victims you’d get with only adaptation, you’d have 10,000. And getting there would cost hundreds of trillions of dollars, which is hardly mitigated by the $40 billion drop in total flood damage and dike costs climate regulations would achieve. As I’ve explained in these pages before, this kind of policy has a high human cost: the tens of millions of people pricey climate regulations relegate to poverty.

You don’t have to portend doom to take climate change seriously. Ignoring the benefits of adaptation may make for better headlines, but it badly misinforms readers.

#### Islands mean no extinction from warming

Alexey Turchin 19, Researcher at the Foundation Science for Life Extension in Moscow, Brian P. Green, director of technology ethics at the Markkula Center for Applied Ethics at Santa Clara University, 3/11/19, “Islands as refuges for surviving global catastrophes,” https://www.emerald.com/insight/content/doi/10.1108/FS-04-2018-0031/full/html

Different types of possible catastrophes suggest different scenarios for how survival could happen on an island. What is important is that the island should have properties which protect against the specific dangers of particular global catastrophic risks. Specifically different islands will provide protection against different risks, and their natural diversity will contribute to a higher total level of protection:

- Quarantined island survives pandemic. An island could impose effective quarantine if it is sufficiently remote and simultaneously able to protect itself, possibly using military ships and air defense.

- Far northern aboriginal people survive an ice age. Many far northern people have adapted to survive in extremely cold and dangerous environments, and under the right circumstances could potentially survive the return of an ice age. However, their cultures are endangered by globalization. If these people become dependent on the products of modern civilization, such as rifles and motor boats, and lose their native survival skills, then their likelihood of surviving the collapse of the outside world would decrease. Therefore, preservation of their survival skills may be important as a defense against the risks connected with extreme cooling.

- Remote polar island with high mountains survives brief global warming of median surface temperatures, up to 50˚C. There is a theory that the climates of planets similar to the Earth could have several semi-stable temperature levels (Popp et al., 2016). If so, because of climate change, the Earth could transition to a second semi-stable state with a median global temperature of around 330 K, about 60˚C, or about 45˚C above current global mean temperatures. But even in this climate, some regions of Earth could still be survivable for humans, such as the Himalayan plateau at elevations above 4,000 m, but below 6,000 (where oxygen deficiency becomes a problem), or on polar islands with mountains (however, global warming affects polar regions more than equatorial regions, and northern island will experience more effects of climate change, including thawing permafrost and possible landslides because of wetter weather). In the tropics, the combination of increased humidity and temperature may increase the wet bulb temperature above 36˚C, especially on islands, where sea moisture is readily available. In such conditions, proper human perspiration becomes impossible (Sherwood and Huber, 2010), and there will likely be increased mortality and morbidity because of tropical diseases. If temperatures later returned to normal – either naturally or through climate engineering – the rest of the Earth could be repopulated.

### Case – Space Col

#### Investing in space exploration solves econ

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

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

#### Economic decline causes extinction.

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

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

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

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

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

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

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

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

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

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

#### Colony wars – wrong

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

War (Geopolitical Malefic)

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

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

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

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

#### Alien Generation – wrong

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

Ubermensch (Alien Generation)

Argument: As humanity spreads throughout the solar system, some branches of homo sapiens may eventually evolve into new species, with or without genetic engineering, nanotechnology implants, artificial superintelligence, and/or other cybernetics. One or more of these “Ubermensch” societies may wish to colonize Earth, Mars, or other worlds with little care for the people living there. Earth may be considered particularly valuable as it is uniquely well suited to life. That may make it a target for powerful groups of free space settlements. Assuming the Ubermensch really are superior, at least in warfare, this could lead to homo sapiens’ extinction.

Counter-argument:

Speciation takes a long time. Trying to predict so far into the future is a dicey business.

Except for speciation, cybernetic and nanotech modification could happen even if humanity were to stay only on Earth, although keeping it hidden would be harder than in a society consisting of hundreds or thousands of orbital habitats.

The problems that may come from genetic engineering or cyborg development are likely to arise on Earth well before large-scale space settlement.

A sudden attack on Earth by Ubermensch living on Earth would be harder to counter than an aggressive force working its way in from, say, the Kuiper Belt, which could take years and be seen well before they posed a direct threat to Earth.

Comparison with no space settlement: With space settlement, genetic engineering, cyborg, and nanotech research can be extremely well controlled. Research facilities can be isolated from all other life by thousands of kilometers of vacuum and the entire facility obliterated if things get really out of hand. While possible without settlement, creating a dangerous new species would be much easier for a space settling civilization as the work could be tucked away in one or a few settlements.

#### Group their weapons stuff – no extinction warrant – never explained how “sun guns” or whatever kill everyone- but if humanity is spread out even if a single colony goes down the species survives

#### Asteroid weapons – they suck and are wrong

**Wall 11** (Mike, Ph.D. in evolutionary biology, Senior writer for Space.com, 11/4/11, Why Asteroids Make Lousy Space Weapons, accessed 1/15/20, https://www.space.com/13515-asteroid-deflection-space-weapons.html, RAW)

If you lie awake at night worrying about some supervillain steering giant asteroids toward your hometown, you really should relax, experts say. It's not going to happen anytime soon. Humanity does indeed have the technical skills to move space rocks around, and we may employ this know-how at some point to avoid a catastrophic impact like the one that killed the dinosaurs 65 million years ago. But the odds of any rogue state using asteroids to rain death down on its enemies are minuscule, experts say. "**It's a lousy weapon**," said former astronaut Rusty Schweickart, chairman of the B612 Foundation, a group dedicated to predicting and preventing cataclysmic asteroid impacts on Earth. "**You get a chance to use one once every several hundred years**," Schweickart said during a recent panel discussion called "Moving an Asteroid" at the California Institute of Technology in Pasadena. "And **even then, you can only deflect it to hit someplace along** a sort of **arbitrary** **line** across the Earth." [Top 10 Space Weapons] Serious spaceflight skills Changing the orbit of a massive asteroid hurtling through deep space sounds like a daunting task, but our species knows how to do it. For example, we could launch a spacecraft that would rendezvous with an asteroid, then travel alongside it for months or years. Over time, the probe's modest gravity would tug on the space rock, pulling it into a different orbit, Schweickart said. Given enough time to act, this so-called "gravity tractor" method could work in quite precise and predictable ways. And we've demonstrated the skills necessary to make it happen. Multiple missions have met up with asteroids in deep space. For example, NASA's Dawn spacecraft is currently in orbit around Vesta, the second-largest object in the main asteroid belt between Mars and Jupiter. And in 2005, Japan's Hayabusa probe rendezvoused with a space rock called Itokawa. The craft even scraped some samples off Itokawa and sent them back to Earth for analysis. It's a good thing we possess these potential asteroid-moving skills, Schweickart said, for they may save our bacon someday. Earth has been pummeled by many dangerous asteroids throughout its history, and there's no reason to think the barrage will stop in the future. Space rocks big enough to cause major damage and disruption to the global economy and society (were they to strike a populated area today) have hit Earth, on average, every 200 or 300 years, Schweickart said. Firing a weapon once every 300 years That bombardment rate is scarily frequent to anyone worried about the long-term survival of human civilization. But it's not nearly frequent enough to make asteroids good weapons of mass destruction, according to Schweickart. [5 Reasons to Care About Asteroids] "You're going to have an opportunity once every two or three hundred years to go up and have a weapon to hit Baghdad," Schweickart said. "Of course, the problem is that by that time, the Zambian space program is the world's premier space program, and Baghdad is a buddy of yours." Potential asteroid wranglers also wouldn't be able to direct a space rock just anywhere on Earth, he added. For the foreseeable future, we'll be able only to speed up or slow down an asteroid, moving it in an "east-west" direction along its trajectory. Moving it in the "north-south" plane is not an option. "If you do anything other than speed up or slow down the asteroid, it has almost no effect," Schweickart said. "You've got to go along that line; it's the only way physics lets you do it." So anyone wishing to asteroid-bomb the United States would have to manipulate a space rock whose trajectory already crossed American territory. The trick would be tweaking its velocity enough to ensure an impact on American soil. In practice, therefore, **the wait for a suitable asteroid weapon could be considerably longer** **than 200 or 300 years.** Protecting Earth Schweickart and other panelists argued that humanity will need to deflect a killer asteroid away from Earth someday. It would be a shame, they said, if unfounded fears about possible nefarious uses of asteroid-moving technology impeded its development. "The public perception of asteroids can be pretty scary," Schweickart said. "There's going to be a lot of scare stuff. It's already out there, it's going to get worse and that is going to be a very serious challenge that we on the technical side will have to deal with." People worried about death from above should focus their anxiety elsewhere, fellow panelist Bill Nye said. There are plenty of much more viable space weapons than asteroids already up there. "Space is already pretty weaponized," said Nye, executive director of the Planetary Society and former host of the science-themed TV show "Bill Nye the Science Guy." "The global positioning system that we all know and love was designed to guide weapons. So using an asteroid as a weapon is sort of coming late to the party."

#### Rods from God – wrong

**Armagh** **15**, Armagh Observatory and Planetarium, published 9-27-2010 but updated as of 2015, "Rods from god: a terrifying space weapon? – Astronotes," https://armaghplanet.com/rods-from-god-a-terrifying-space-weapon.html)SEM

There are undeniable links between the spaceflight and military communities but apart from a few tests of anti-satellite weapons, the odd armed space station and laser battlestation there have been mercifully few weapons in space. Yet **the idea of bombarding the Earth from orbit** keeps coming up again and again. **Thankfully it** **is ridiculous**. I believe the idea is that having weapons hovering menacingly overhead will persuade your enemies to behave themselves. However this idea is stupid- I cannot think of a better word. Anyone who suggests such an idea must have learned their science from Tom Clancy books or Steven Seagal movies. The current version of this mad scheme is the kinetic energy weapon and is usually described as scores, possibly hundreds, of tungsten (chosen for its high melting temperature and hardness) projectiles orbiting the Earth in formation or attached to a satellite ‘bus’. These could be either relatively small darts (weighing about 100kg) or large ‘phone poles’ (about 8000 kg each). When required these projectiles can be commanded to dive, singly or en masse, at targets on the Earth’s surface, smashing into the victim at orbital speed. As the projectile’s kinetic energy is released, the blast would be equivalent to a large conventional bomb (a 100kg projectile traveling at 7km/s would release about 2.5 gigajoules of kinetic energy, a tonne of TNT releases about 4.2 gigajoules). This would be a non-nuclear precision weapon, essentially a smart bomb that can target anywhere in the world. It is further claimed that the darts would be capable of penetrating deeply into the Earth’s surface enabling non-nuclear attacks on installations deep underground. This idea is said to have originated in 1964 (but was revised and updated in 1975) in the mind of Jerry Pournelle, engineer, writer and consultant to the US Air Force. He originally named the concept “Thor” after the hammer-wielding Norse god of thunder. Pournelle said each projectile was …an orbiting element some 20 to 40 feet long. It requires a GPS receiver to locate itself; a means of taking it out of orbit; an atmospheric guidance system, such as a means of changing its center of gravity (moving weights, small fins, etc.), and a communication system to give it a target and activate the system…Achievable accuracy has been estimated at ten to twenty feet CEP (Circular Error of Probability) Pournelle assumed extremely cheap fully reusable single stage to orbit launch vehicles were just around the corner and would enable his concept to be quickly deployed, sadly no such craft have yet been built. Moving further into fantasy, Pournelle later had a smaller but more accurate optically guided variant of the weapon described as “crowbars” used by invading alien space elephants (really) to devastate the US military in Footfall (1985), a novel he co-wrote with Larry Niven. In this book, Niven and Pournelle introduced the concept You take a big iron bar. Give it a rudimentary sensor, and a steerable vane for guidance. Put bundles of them in orbit. To use it, call it down from orbit, aimed at the area you’re working on. It has a simple brain, just smart enough to recognize what a tank looks like from overhead. When it sees a tank silhouette, it steers toward it. Drop ten or twenty thousand of those over an armored division, and what happens? Subsequently similar weapons have appeared in other fictional works where they always work perfectly! A recent example is the movie GI Joe: Retaliation (2013) which is dissected in this video: This artificial meteorite concept is often nicknamed ‘the rods from God’ even by its supporters, who usually claim it would be relatively cheap to set up (indeed some claim it already exists). They give the impression that at the press of a button, these rods will just fall from the sky on their victims. However it is not that easy. As each rod circles the Earth it is moving at least 7 km/s, to make the rod fall from orbit under gravity, we need to **adjust its orbit** to intersect the Earth’s surface. To do this each rod therefore needs to be attached to a rocket motor and its fuel tanks (or solid propellant), suddenly each cheap 100kg rod has **ballooned into a multi-tonne vehicle**, perhaps the size of a Soyuz spacecraft. At least it does not need a heatshield, a tungsten projectile could reasonably be expected to survive the expected heat of re-entry. The ground-penetrating effects of such projectiles is **grossly** **over-stated** too- do falling meteorites of this sort of size always bury themselves hundreds of metres under the ground? Laboratory experiments show that **objects striking the surface** at speeds greater than 1 km/s **are melted by their own kinetic energy** before they penetrate the ground, effectively **liquefying** **on** impact. Rather than slamming into the target at 20 times the speed of sound, the rods may need to be slowed down to fast aircraft speeds to prevent them disintegrating on impact. The problems of guiding each rod is usually dismissed with handwaving references to GPS, although some armchair space marshals also follow Pournelle’s fictional lead to suggest each rod would have its own imaging sensor to find and steer onto moving targets like tanks or warships. I have no doubt that the electronics are feasible but the rod now needs control surfaces hooked to its guidance system and sounds more like a missile than a cheap metal rod. Do these now complex projectiles require maintenance in orbit? Finally, it is said that the rods can hit any target on Earth minutes after the KILL button is pressed. Once again, this doesn’t seem properly thought out. The rods can only hit targets on or near their orbital track, **for weeks** **at a time** **some parts of the world would be invulnerable** as their potential attackers would never come within hundreds of kilometers from their positions. The only way around this limitation is to have hundred of rods waiting ready in multiple orbits, **requiring a** **ludicrous number of launches**. Even if the target is directly under the rod’s orbital track, the attack **may not be instantaneous**, as those who order the attack wait perhaps 90 minutes for the rods to move around the Earth into position. Even the Joint Chiefs of Staff cannot overrule Sir Isaac Newton. A rods from god bombardment would probably look a lot like this test of the re-entry vehicles of a LGM-118A Peacekeeper ICBM. The projectiles are highly visible; it would be obvious that an attack was taking place, so this would not be a weapon for covert strikes. Each reentry vehicle here is a large and complex piece of hardware, not a simple “crowbar” or “telephone pole”. (Image credit: USAF via fas.org) The number of launches needed to deploy even a few dozen individually weighty weapons is glossed over by Rods enthusiasts. Assuming they are deployed, every rod (or their carrier satellite) will move around the Earth on a regular and predictable orbit where they will be observable from the surface by radar and optical sensors, so potential enemies will always know where they are. “Dropping” the projectiles from orbit is no actual advantage by the way, by the time they reach the surface they will have no more kinetic energy than was imparted to them by their original launch vehicle. After considering all this, to be honest, it would make more sense to launch each rod from the Earth’s surface directly to the target. To make them less vulnerable to preemptive attacks, perhaps the rods should be based in hardened underground silos or hidden in submerged submarines. Congratulations, we have just reinvented the ICBM! The most recent unclassified mention of the concept is in a USAF document called The US Air Force Transformative Flight Plan (2003) which talks of “hyper­ve­lo­city rod bundles” as a potential weapon in the post 2015 period. Note this mention in an official document does not mean the US military can magic this weapon into existence. There is a history among militaries world-wide of wasting billions on R&D into projects which are hopelessly impractical or even completely ungrounded in reality (see hafnium excimer bomb, atomic-powered aircraft, camouflage uniforms which make the wearer more conspicuous and using ESP for espionage). As of 2015 no kinetic-energy orbital bombardment system has officially been proposed or tested, never mind deployed. The older version of the concept is the idea of putting nuclear bombs in geostationary orbit over a potential enemy country is still brought up from time to time. This is even more ill-conceived than the Rods from God. When you think about it, it is obvious that a geostationary orbit must be above the Earth’s equator. Now there are only thirteen nations on the equator and it hard to see why any would want to suspend a bomb over say, the Maldives or Gabon. Even though they are sometimes put forward by apparently sensible people or organizations, “Rods from God” and other schemes for bombing the Earth from space are half-baked science fiction concepts. The cost of developing an orbital bombardment system would make the F-35 project look cheap in comparison. They are militarily pointless and hopelessly implausible. Similar damage could be inflicted more cheaply and easily by conventional ground-based weapons. A cynic would say that clever diplomacy would avoid the need for the weapons altogether.

#### Group their “universe destroying superweapons stuff” – only mechanism is false vacuum, which is fake

**Cottrell 12** [Seth Cottrell, professor of mathematics at NYU.] “Q: What is the “False Vacuum” and are we living in it?” 15 July 2012 (https://www.askamathematician.com/2012/07/q-what-is-the-false-vacuum-and-are-we-living-in-it/) – MZhu

The “danger” of living in a false vacuum is that, under the proper circumstances the false vacuum can drop into the true vacuum. The cause is usually described as a sufficient burst of energy to get the appropriate fields “over the hump” (picture above). If the difference in energy between the false vacuum and true vacuum is large enough, then the surrounding space can likewise be tipped into the lower state. In theory, a “false vacuum collapse” would expand at light speed (or about light speed) from the originating event, and destroy the heck out of everything in the affected, and ever-expanding, region.

It’s worth mentioning that **the idea of a false vacuum is wild speculation** and that there is **no indication, not even a little**, that the vacuum of the universe is a false vacuum and not the true ground state. **There’s a** **long** **history of spectacular bursts of energy in the universe, and none of them have tripped a collapse**. The ground state of the universe is kinda like a septuagenarian’s testicle; if it hasn’t dropped by now, it probably won’t.

#### Turn – space col solves universe extinction through quantum immortality

Turchin 19 (Alexey Turchin an author of several books and articles on the topics of existential risks and life extension, and was published in "Futures", "Acta Astronatutica", "Informatica", "AI & Society" journals. He graduated in Moscow State University where he studied Physics and Art History (1997). He translated into Russian around 20 main articles about existential risks by Bostrom, Yudkowsky, Circovich, Kent, Hanson. From 2010 he works in the "Science for Life Extension Foundation" on various topics about life extension and risks prevention. He is a contributing author on IEET. He is the founder of the Digital Immortality Now startup. He is a member of the advisory boards of IEET, Open Longevity, AI agents, Arch Mission. In 2018 he won one of the prizes in AI Global Challenge race with his article on global solutions on AI safety, ”How to Survive the End of the Universe.” Version 2, Uploaded: 2019-11-28, Available at https://philpapers.org/rec/TURHTS-2, HKR-cjh)

1. Introduction Based on some optimistic models, we could start a wave of colonization of the universe using von Neumann probes moving at near-light speed a few hundred years from now (Stuart Armstrong & Sandberg, 2013), leveraging technology such as nanotech replicators connected to laser-powered sails. Communication and coordination between different parts of such a wave would be difficult. But to prevent some scenarios of the end of the universe, a form of large-scale coordination may be needed. This may take, for example, the form of an aggregation of large masses of matter to build massive astroengineering structures, as described by (Hooper, 2018), who suggested that an advanced civilization will send stars to its central region and increase mass of available matter after expansion of the universe will make these stars inaccessible. (Hooper expected that it may help to increase the available mass by 1000 x, but Loeb wrote that it may be cheaper to migrate to a dense cluster of galaxies (Loeb, 2018)). Bostrom suggested idea of astronomical waste (Bostrom, 2003), a huge opportunity cost which could come into play if we delay our exploration of the universe—as many new stars become permanently inaccessible every day because of the expansion of the universe. He also states that human endowment could be to reach all our opportunities and become everything which we could be. This assumes that we should use remaining time and matter of the universe in the most effective way to get as much human-values-related utility as possible. However, there is another alternative: use all the time and matter available to use to find the ways to survive the end of the universe, as the possible prize could be very large: in other words, this enterprise is a form of Pascal’s wager. Moreover, before the decision about how to fight the end of the universe is made (or at least before we know how much time we actually have left), we need a perfect knowledge of high-energy physics—as we need to know for sure how and when the universe will end and what can be done to prevent it. Gaining such knowledge may require creation of large-scale particle accelerators or long-term observations of changes in dark energy. Sabina Hossenfelder has said that new physics become apparent only by studying energies many orders of magnitude higher than those achievable on Cern’s Large Hadron Collider (LHC), and for example, to study quantum gravity, an accelerator the size of the Milky Way Galaxy is needed (Hossenfelder, 2019). Several authors have explored the possibility of reaching immortality and surviving “the end of the universe.” Tipler suggested that we will use the energy of the collapsing universe to perform an infinite number of computations in Omega point (Tipler, 1997), but this idea was criticized by (Ellis & Coule, 1994). Many predictions made by Tipler now seem to be obsolete: for example, the mass of the Higgs boson turned to be different than that required by Tipler’s Omega theory, as well as Hubble’s constant. Notably, Tipler wrote his book The physics of Immortality before the discovery of dark energy. Egan suggested—in fictional form—migration into an eternal mathematical universe as the ultimate form of escape in his novel Permutation City (Egan, 2010). Dvorsky explored several ideas about surviving the end of the universe (Dvorsky, 2015). Cirncovich and Bostrom suggested the possibility that a mind could travel between old and new universes via singularities (Ćirković & Bostrom, 2000). There have also been suggestions about how to extend our existence as long as possible in the case of a Big Freeze. For example, Sandberg et al. suggested an “aestivation hypothesis” (Sandberg, Armstrong, & Cirkovic, 2017), in which civilizations might wait until very cold times to perform computations more effectively. However, such “civilizational life extension” is not a form of true immortality. Along similar lines, Freeman Dyson explored how to survive for a very long time in a slowly freezing universe (Dyson, 1979). Preventing the end of the universe could be also regarded as a cause prioritization area for effective altruism, because if we prevent (or survive) some short-term forms of the end of the universe, like false vacuum decay or a Big Rip soon, we could increase amount of good we can create by many orders of magnitude. We could also act effectively in this direction by preventing collider accidents (Kent, 2004) or other potentially dangerous experiments, and by including the goal of surviving the end of the universe in the goal system of future superintelligent AI (Bostrom, 2014). By exploring survival strategies for the universe, we may help establish existential optimism for people who are living now, support life extension research, and gain more information from fundamental studies of physics. Another purpose of the discussion about surviving the end of the universe is to show that actual immortality is possible: that we have the opportunity to live not just billions and trillions of years, but for an unlimited duration. My hope is that recognizing the possibility to survive the end of the universe will encourage us to invest more in life extension and prevention of global catastrophic risks. Our life could be eternal and thus have meaning forever. The end of the observable universe is not an absolute end: it's just one more problem the future human race will be able to address. And even at the limited level of knowledge about the universe that we have today, we are still able to offer several dozen more ideas on how to prevent its end. In the distant future, we can find more ideas, choose the best, validate them, and prepare for their implementation.

#### That solves vacuum decay

Turchin 19 (Alexey Turchin an author of several books and articles on the topics of existential risks and life extension, and was published in "Futures", "Acta Astronatutica", "Informatica", "AI & Society" journals. He graduated in Moscow State University where he studied Physics and Art History (1997). He translated into Russian around 20 main articles about existential risks by Bostrom, Yudkowsky, Circovich, Kent, Hanson. From 2010 he works in the "Science for Life Extension Foundation" on various topics about life extension and risks prevention. He is a contributing author on IEET. He is the founder of the Digital Immortality Now startup. He is a member of the advisory boards of IEET, Open Longevity, AI agents, Arch Mission. In 2018 he won one of the prizes in AI Global Challenge race with his article on global solutions on AI safety, ”How to Survive the End of the Universe.” Version 2, Uploaded: 2019-11-28, Available at https://philpapers.org/rec/TURHTS-2, HKR-cjh)

4.6. Prevent accidental universe destruction There is a very small probability that we could destroy universe even now by starting false vacuum decay. Small black holes could be nucleation points of new vacuum, and such small black holes could theoretically appear during experiments in a hadron collider. The recently discovered Higgs boson’s mass range renders the vacuum decay hypothesis more probable; also, true vacuum will not be like ordinary vacuum, but will itself gravitationally collapse (Elias-Miro et al., 2012; Mack, 2015). Objections often refer to the fact that much more intensive collisions are happening in the universe all the time; however, there are small differences between collider experiments and natural collisions: the products of LHC collisions have a small relative speed to the Earth as opposite beams collide (Kent, 2004). As a result, it is possible small black holes could have the opportunity to catch surrounding atoms before evaporating via Hawking radiation and could start to grow. Such a growing black hole would eventually consume the Earth (as in David Brin’s novel Earth), but not immediately, as the accretion rate initially could be very slow on the early stages. It may take years before any observable effects became obvious (as the accretion rate could become stable on some lower level and the whole black hole will be just the size of a few atoms, surrounded by a pocket of hot gas and sitting somewhere in the center of the Earth). However, such a small black hole could exist long enough to make the random event of the false vacuum decay more probable (or maybe two such small black holes would need to collide) (Burda et al., 2015; Villatoro, 2015). 5. Survival strategies in relation to other ideas 5.1. Order of implementation Preventing the end of the universe should concentrate on different risks at different times. 1. False vacuum. We need to minimise the risk of false vacuum decay, while simultaneously getting more information about the nature of the universe and reducing our cosmological uncertainty. We should conduct experiments about the nature of the universe carefully, as they themselves may trigger false vacuum decay or have other unintended consequences. Also, if everything possible actually exists, false vacuum decay may be exactly compensated for by quantum immortality, and thus will be an unobservable and inconsequential event. However, if the speed of the false vacuum bubble is a little bit below the speed of light, we could observe the incoming bubble. For example, if the bubble originates 1 billion light-years from us and has the speed of 99.9 per cent of the speed of light, we would observe, and may be even be destroyed by the radiation of its domain walls. Bostrom and Tegmark estimated that such type of catastrophes has a probability below one percent in a billion years based on some observation selection effects: if they occurred more often, we should find ourselves earlier in the timeline of our universe (Tegmark & Bostrom, 2005). 2. Big Rip. This risk could arise relatively soon, but not very soon: even in the case of very implausible values of dark energy, it is still 20 billion years from now. 3. Heat death is the most remote risk, and we have plenty of time to prepare for it.