## 1

### OFF

#### Interpretation – Debaters must disclose all constructive positions in cite boxes on the 2021-22 NDCA LD wiki. To clarify, they can’t say check open source, and if cites don’t work, they should type a basic summary of the position.

#### Violation – they don’t

Graphical user interface, text, application, email

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Scatter chart

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#### 1] Wiki rules and accessibility – inclusion is a voter because you can’t debate if you can’t participate

**Wiki Admin** [Administrator, "NDCA LD 2021-2022," No Publication, [https://hsld.debatecoaches.org/Main //](https://hsld.debatecoaches.org/Main%20//) JB]

When possible, **complete citations** should be **provided**. If citations are **not available, basic information** about the arguments made is still very helpful. For affirmatives, a **summary of** the **plan and advantages** as well as information about **major 2AC add-ons** or responses would be appreciated. For negatives, information about the arguments made in the **1NC** as well as information about the **2NR strategies** that the team has settled upon are ideal.

It is our hope that squads will **contribute all of the information** that they gather about other teams' arguments. **Hoarding intelligence** to gain a strategic advantage **undermines** the overall **quality of** the **information available** to all squads and is **antithetical** to the spirit of **clash** inherent in contest round debating. **Democratizing** the **process** of intelligence gathering distributes the burden onto a much greater number of people, enabling **students and teachers** to spend more time **generating** and discussing **arguments** and **less time chasing** down **citations**.

#### 2] Wiki also warns you before you disclose which means no reasonability on this shell

A screenshot of a cell phone

Description automatically generated

#### I’ll preempt “wiki doesn’t work” – 1] The interp solves, yes the wiki sometimes doesn’t post wikify versions but you can still post a summary of arguments which is what the wiki asks you to do 2] Asking doesn’t solve because it’s a question of the norm you posit and some people don’t know you 3] Verifiability flows neg – you know they didn’t disclose but you don’t know if they’re lying. Either way, most debaters follow my interp which means risk of offense negates.

#### 3] Preround Prep – prep becomes atrocious when you make people sift through 20 word docs to figure out which links you’re reading and which impacts to prep. Discourages tricks—you can just hide a bunch of blippy arguments. Also key for inclusion since disadvantaged people have computers more prone to lag and even 3 or 4 can crash the program for them—outweighs accessibility is a multiplier for their impacts. Disclosing in cite boxes solves—people can quickly get a summary of your position and go to open source if they need more information

#### Wiki rules is a voter – 1] You reap the benefits of it from other disclosure but you think you’re special – links to fairness which is a voter you can’t tell who won if the layer was skewed 2] It’s run by volunteers so you’re just freeriding on a volunteer website that does great things – internal link to being a better person

#### Fairness – a) debate is a game which requires fairness b) it’s jurisdictional of the judge’s role

#### DTD – a) deterrence b) rectify time loss c) it affected the entire round ie. the strat skew is irreversible

#### CI>Reasonability – a) it’s arbitrary so there is no norm set b) collapses because you’re defending your model of debate which is your counterinterp just with no offense c) causes a race to the bottom because everything is seen as reasonable so we don’t find better norms

#### No RVIs on NC theory – a) norming because neg’s will be afraid to read theory against the aff that always has the 2ar for new responses and new implications that means neg never wins b) they have 2 speeches to recontextualize answers that I could never respond to because I don’t have a 3NR which means good affs will always win their norm

## 2

### OFF

#### CP Text: Space faring nations should establish a multilateral agreement that restricts asteroid mining done by private entities except for on asteroid Kamo’oalewa.

#### Kamo’oalewa is NEO asteroid comprised of lunar material

Devlin 21 [Hannah Devlin is the Guardian's science correspondent, having previously been science editor of the Times. “Near-Earth asteroid is a fragment from the moon, say scientists.” November 11, 2021. https://www.theguardian.com/science/2021/nov/11/near-earth-asteroid-is-a-fragment-from-the-moon-say-scientists]

Scientists have identified what appears to be a small chunk of the moon that is tracking the Earth’s orbit around the Sun. The asteroid, named Kamo`oalewa, was discovered in 2016 but until now relatively little has been known about it. New observations suggest it could be a fragment from the moon that was thrown into space by an ancient lunar collision. Kamo`oalewa is one of Earth’s quasi-satellites, a category of asteroid that orbits the Sun, but remains relatively close to the planet – in this case about 9m miles away. Despite being close in astronomical terms, the asteroid is about the size of a ferris wheel and about 4m times fainter than the faintest star that can be seen with the naked eye. Consequently, the Earth’s most powerful telescopes are needed to make observations. Using the Large Binocular Telescope on Mount Graham in southern Arizona, astronomers found the spectrum of reflected light from Kamo`oalewa closely matched lunar rocks from Nasa’s Apollo missions, suggesting it originated from the moon. They had initially compared the light with that reflected off other near-Earth asteroids, but drawn a blank. “I looked through every near-Earth asteroid spectrum we had access to, and nothing matched,” said Ben Sharkey, a PhD student at the University of Arizona and the paper’s lead author. After missing the chance to observe Kamo`oalewa in April 2020 owing to a shutdown of the telescope during the coronavirus pandemic, the team found the final piece of the puzzle in 2021. “This spring, we got much needed follow-up observations and went, ‘Wow it is real,’” Sharkey said. “It’s easier to explain with the moon than other ideas.”

#### Space based solar power is being developed and transitions to 100% clean energy, but lunar regolith is key

O’Neill 13 [Ian O'Neill is a media relations specialist at NASA's Jet Propulsion Laboratory (JPL) in Southern California. Prior to joining JPL, he served as editor for the Astronomical Society of the Pacific‘s Mercury magazine and Mercury Online and contributed articles to a number of other publications, including Space.com, Space.com, Live Science, HISTORY.com, Scientific American. Ian holds a Ph.D in solar physics and a master's degree in planetary and space physics. “How to Turn the Moon Into a Giant Space Solar Power Hub.” December 3, 2013. https://www.space.com/23810-moon-luna-belt-solar-power-idea.html]

When it comes to space and energy, we need to think big. That's what one Japanese company is doing — and they're reaching for the moon, literally. The best thing about the moon is that one lunar hemisphere is constantly bathed in sunlight (except for the occasional eclipse), so using solar arrays to generate power may not seem like such a stretch. Take China's recently-launched Chang'e 3 Yutu rover for example, it's solar powered. Also, Apollo astronauts set up solar-powered experiments on the lunar regolith. But how about wrapping the moon's equator in a 250 mile wide band of solar panels and beaming the power generated back to Earth? That's exactly what Shimizu Corporation is proposing and they reckon their concept could harness a steady stream of 13,000 terawatts of power. According to Business Insider, "the total installed electricity generation summer capacity in the United States was 1,050.9 gigawatts." Such a vast energy resource could be transformative for our civilization. As Obi-Wan might say: "That's no moon. It's a space (solar power) station." "A shift from economical use of limited resources to the unlimited use of clean energy is the ultimate dream of all mankind," says the company's website. "The LUNA RING, our lunar solar power generation concept, translates this dream into reality through ingenious ideas coupled with advanced space technologies." Indeed, advanced space technologies will be needed, not only to harvest solar energy and efficiently beam it back to Earth, but its very construction will require several leaps in robotic technology development. Also, this mother of all engineering tasks will need to see some significant changes in international space treaties before it sees light of day. Resembling a moon born from science fiction, the LUNA RING is just that, a ring around the moon. The ring, stretching 6,800 miles around the moon's circumference, will be constructed by robots that will "perform various tasks on the lunar surface, including ground leveling and excavation of hard bottom strata." The entire project will be overseen by a team of humans while the bulk of the robotic tasks can be teleoperated from Earth. [Moon Base Visions: How to Build a Lunar Colony (Photos)] It’s all very well building a huge array of solar panels around the moon, but how would the power be sent to Earth? As our atmosphere is virtually transparent to microwaves and lasers, Shimizu envisages solar energy being fed through microwave/laser transmitters located around the Earth-facing side of the moon. As the moon orbits the Earth and the Earth rotates, international receiving stations will feed electricity grids with plentiful lunar solar power as the moon rises to when it sets. The designers are keen to point out that this is a green energy resource that could benefit the whole of mankind. What's more, when the infrastructure is set up, other resources can be exploited — such as mining for precious minerals and fabricating products from regolith. One could imagine an international consortium of nations and/or companies that buy a stake in the LUNA RING to aid its construction. Each partner would then have rights to construct receiving stations in their geographical location of choice, weaning us off polluting sources of power. Japan, which was hurt by the devastating Fukushima meltdown in 2011, is actively seeking out alternative power resources to wean itself off nuclear energy — it doesn't get more "alternative" than this.

#### Climate change causes extinction.

Specktor 19 [Brandon; writes about the science of everyday life for Live Science, and previously for Reader's Digest magazine, where he served as an editor for five years; "Human Civilization Will Crumble by 2050 If We Don't Stop Climate Change Now, New Paper Claims," livescience, 6/4/19; <https://www.livescience.com/65633-climate-change-dooms-humans-by-2050.html>]

The current climate crisis, they say, is larger and more complex than any humans have ever dealt with before. General climate models — like the one that the [United Nations' Panel on Climate Change](https://www.ipcc.ch/sr15/) (IPCC) used in 2018 to predict that a global temperature increase of 3.6 degrees Fahrenheit (2 degrees Celsius) could put hundreds of millions of people at risk — fail to account for the **sheer complexity of Earth's many interlinked geological processes**; as such, they fail to adequately predict the scale of the potential consequences. The truth, the authors wrote, is probably far worse than any models can fathom. How the world ends What might an accurate worst-case picture of the planet's climate-addled future actually look like, then? The authors provide one particularly grim scenario that begins with world governments "politely ignoring" the advice of scientists and the will of the public to decarbonize the economy (finding alternative energy sources), resulting in a global temperature increase 5.4 F (3 C) by the year 2050. At this point, the world's ice sheets vanish; brutal droughts kill many of the trees in the [Amazon rainforest](https://www.livescience.com/57266-amazon-river.html) (removing one of the world's largest carbon offsets); and the planet plunges into a feedback loop of ever-hotter, ever-deadlier conditions. "Thirty-five percent of the global land area, and **55 percent of the global population, are subject to more than 20 days a year of** [**lethal heat conditions**](https://www.livescience.com/55129-how-heat-waves-kill-so-quickly.html), beyond the threshold of human survivability," the authors hypothesized. Meanwhile, droughts, floods and wildfires regularly ravage the land. Nearly **one-third of the world's land surface turns to desert**. Entire **ecosystems collapse**, beginning with the **planet's coral reefs**, the **rainforest and the Arctic ice sheets.** The world's tropics are hit hardest by these new climate extremes, destroying the region's agriculture and turning more than 1 billion people into refugees. This mass movement of refugees — coupled with [shrinking coastlines](https://www.livescience.com/51990-sea-level-rise-unknowns.html) and severe drops in food and water availability — begin to **stress the fabric of the world's largest nations**, including the United States. Armed conflicts over resources, perhaps culminating in **nuclear war, are likely**. The result, according to the new paper, is "outright chaos" and perhaps "the end of human global civilization as we know it."

## Case

### Case

#### Isolated island populations repopulate.

Turchin and Green 18 [Alexey Turchin – Scientist for the Foundation Science for Life Extension in Moscow, Russia, Founder of Digital Immortality Now, author of several books and articles on the topics of existential risks and life extension. Brian Patrick Green – Director of technology ethics at the Markkula Center for Applied Ethics, teaches AI ethics in the Graduate School of Engineering at Santa Clara University. <MKIM> “Islands as refuges for surviving global catastrophes”. September 2018. DOA: 7/20/19. <https://www.emerald.com/insight/content/doi/10.1108/FS-04-2018-0031/full/html?fullSc=1&mbSc=1&fullSc=1>] Recut Justin

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**. ‘‘Swiss Family Robinsons’’ survive on a tropical island, unnoticed by a military robot ‘‘mutiny’’. Most AI researchers ignore medium-term AI risks, which are neither near-term risks, like unemployment, nor remote risks, like AI superintelligence. But a large drone army – if one were produced – could receive a wrong command or be infected by a computer virus, leading it to attack people indiscriminately. Remote islands without robots could provide protection in this case, allowing survival until such a drone army ran out of batteries, fuel, ammunition or other supplies: Primitive tribe survives civilizational collapse. The inhabitants of **North Sentinel Island**, near the Andaman Islands in the Indian Ocean, are hostile and uncontacted. **The Sentinelese survived the 2004 Indian Ocean tsunami apparently unaffected** (Voanews, 2009), and if the rest of humanity disappear, **they might well continue their existence without change.** Tropical Island survives extreme global nuclear winter and glaciation event. Were a **nuclear**, bolide impactor or volcanic “**winter**” scenario to unfold, these islands would remain surrounded by Warm Ocean, and local volcanism or other energy sources might provide heat, energy and food. Such island refuges may have helped life on Earth survive during the **“Snowball Earth”** event in Earth’s distant past (Hoffman et al., 1998). Remote island base for project “Yellow submarine”. Some catastrophic risks such as a gamma ray burst, a global nuclear war with high radiological contamination or multiple pandemics might be best survived **underwater in nuclear submarines** (Turchin and Green, 2017). However, after a catastrophe, the submarine with survivors would eventually need a place to dock, and an island with some prepared amenities would be a reasonable starting point for rebuilding civilization. Bunker on remote island. For risks which include multiple or complex catastrophes, such as a bolide impact, extreme volcanism, tsunamis, multiple pandemics and nuclear war with radiological contamination, **island refuges could be strengthened with bunkers**. Richard Branson survived hurricane Irma on his own island in 2017 by seeking refuge in his concrete wine cellar (Clifford, 2017). Bunkers on islands would have higher survivability compared to those close to population centers, as they will be neither a military target nor as accessible to looters or unintentionally dangerous (e.g. infected) refugees. These bunkers could potentially be connected to water sources by underwater pipes, and passages could provide cooling, access and even oxygen and food sources.

#### Even nuke winter theorists concede it’s not an existential risk

Shulman 12

Carl Shulman (Research Fellow at the Machine Intelligence Research Institute; Previously, he worked at Clarium Capital Management, a global macro hedge fund, and at the law firm Reed Smith LLP. He attended New York University School of Law and holds a BA in philosophy from Harvard University). “Nuclear winter and human extinction: Q&A with Luke Oman.” Overcoming Bias. 5 November 2012. JDN. http://www.overcomingbias.com/2012/11/nuclear-winter-and-human-extinction-qa-with-luke-oman.html

The most obvious path from nuclear war to human extinction is nuclear winter: past posts on Overcoming Bias have bemoaned neglect of nuclear winter, and high-lighted recent research. **Particularly important is a 2007 paper by** Alan **Robock,** Luke **Oman, and** Georgiy **Stenchikov:** “Nuclear winter revisited with a modern climate model and current nuclear arsenals: Still catastrophic consequences.” Their model shows severe falls in temperature and insolation that would devastate agriculture and humanity’s food supply, with the potential for billions of deaths from famine in addition to the direct damage. **So I asked Luke Oman for his estimate of the risk that nuclear winter would cause human extinction**, in addition to its other terrible effects. **He gave the following estimate: The probability I would estimate for the global human population of zero resulting from the** 150 Tg of black carbon **scenario in our 2007 paper would be in the range of 1 in 10,000 to** 1 in **100,000. I tried to base this estimate on the closest rapid climate change impact analog that I know of, the Toba supervolcanic eruption approximately 70,000 years ago.** There is some suggestion that around the time of Toba there was a population bottleneck in which the global population was severely reduced. Climate anomalies could be similar in magnitude and duration. Biggest population impacts would likely be Northern Hemisphere interior continental regions with relatively smaller impacts possible over Southern Hemisphere island nations like New Zealand. Luke also graciously gave a short Q & A to clarify his reasoning: Q1: What food sources would you expect to sustain surviving human populations with severe nuclear winter? The months of existing grain stocks? Slaughtering livestock herds? Intensive fishing? Electric greenhouse agriculture? Simply less-effective agriculture? A: My thought was that **food sources would be mainly fishing as well as less-effective agriculture**, assuming little or no access to fertilizer or fuel. Q2: If nuclear arsenals become much larger in the future, e.g. 100x as large, damage would presumably scale sublinearly (only so many cities to ignite). Could the detonation of millions of nuclear weapons make a material difference to your estimate? A: Yes it would make a difference but as you state I would definitely think it would scale sublinearly. The largest thing that I would think, more so than the number above a certain point, would be how much the Southern Hemisphere is involved. In the 2007 paper scenario it is assuming largely NH mid-high latitude injection so there is likely large difference in black carbon aerosol amounts in the respective hemispheres. This is one of the largest differences between the 150 Tg of BC scenario and that of Toba, which was a tropical eruption and presumably spread much more evenly over both hemispheres. Q3: Am I right in thinking that **the estimate is based on the reasoning that many Toba-level events must have taken place in the last tens of millions of years, but did not wipe out our** prehuman **ancestors** (even if perhaps eliminating some other lineages of hominids, or bringing human ancestor populations near minimal sustainable size), so the probability per event must be low (plus our access to modern technology)? A: Yes that was my thinking. Q4: 1 in 10,000 to 1 in 100,000 is quite a low probability, although one that could be justified if we were sure that similar events had happened many times. However, it is also low enough for model uncertainty to matter. In particular, how much probability mass can we place in nuclear winter being less or more dangerous than a Toba-level eruption? Should we assign a 1-10% probability in it being materially worse than Toba in terms of human extinction risk? In other words, how fat are the tails of the distribution for nuclear winter climate models? A: Yes there is definitely plenty of model uncertainty when dealing with these kinds of scenarios. This question sort of goes back to my answer to number 2 in that the impacts would likely be different in the respective hemispheres, with the Northern Hemisphere more likely to be Toba-like in climate impacts. My thought for the extinction question was to treat the Southern Hemisphere as the rate limiting step. So, in the scenario we assumed, the NH climate impacts might have a 20-30% chance of being materially worse but the SH maybe around 1-5% chance of being worse. Also, I was thinking of something in the range of 1,000-5,000 as the Minimum Viable Population (MVP) but if it is on the high end it could lower my estimated probability somewhat, but probably not significantly. Probably one of the biggest uncertainties on my end is my climate change estimate for Toba. Papers after ours suggest a smaller climate impact due to different aerosol size assumptions than we used. So if indeed there was a population bottleneck around Toba and the climate anomalies were significantly smaller than we assumed, this would likely significantly raise extinction probabilities. **Q5: There are widespread popular claims that nuclear winter would create a significant chance of human extinction. Could you name other climate scientists who would estimate higher probability** than yourself? A: I haven’t really read any accounts where there was a probability placed on human extinction. I certainly could be offbase with my estimate, it is not something I have done before. **I don’t know** offhand **anyone that would estimate higher** but I am sure there might be people who would. **[I asked two colleagues] who did respond back to me, saying in general terms “very close to 0” and “very low probability.”**

#### Nuke winter’s a Russian conspiracy

**Ridley 18** (Ridley, Matt. “The Russian Role in the Nuclear Winter Theory.” The Rational Optimist, 25 Feb. 2018, [www.rationaloptimist.com/blog/nuclear-winter/](http://www.rationaloptimist.com/blog/nuclear-winter/).) //ZL

Alerted by environmental groups to the paper, Carl Sagan, astronomer turned television star, then convened a conference on the “nuclear winter” hypothesis in October 1983, supported by leading environmental and anti-war pressure groups from Friends of the Earth to the Audubon Society, Planned Parenthood to the Union of Concerned Scientists. Curiously, three Soviet officials joined the conference’s board and a satellite link from the Kremlin was provided. In December 1983, two papers appeared in the prestigious journal Science, one on the physics that became known as [TTAPS](http://science.sciencemag.org/content/222/4630/1283) after the surnames of its authors, S being for Sagan; [the other on the biology](http://www.nytimes.com/1983/12/26/us/specialists-detail-nuclear-winter.html), whose authors included the famous biologists Paul Ehrlich and Stephen Jay Gould as well as Sagan. The conclusion of the second paper was extreme: “Global environmental changes sufficient to cause the extinction of a major fraction of the plant and animal species on Earth are likely. In that event, the possibility of the extinction of Homo sapiens cannot be excluded.” Who started the scare and why? One possibility is that it was fake news from the beginning. When the high-ranking Russian spy Sergei Tretyakov defected in 2000, he said that the KGB was especially proud of the fact “it created the myth of nuclear winter”. He based this on what colleagues told him and on research he did at the Red Banner Institute, the Russian spy school. The Kremlin was certainly spooked by NATO’s threat to deploy medium-range nuclear missiles in Europe if the Warsaw Pact refused to limit its deployment of such missiles. In Darwall’s version, based on Tretyakov, Yuri Andropov, head of the KGB, “ordered the Soviet Academy of Sciences to produce a doomsday report to incite more demonstrations in West Germany”. They applied some older work by a scientist named Kirill Kondratyev on the cooling effect of dust storms in the Karakum Desert to the impact of a nuclear exchange in Germany. Tretyakov said: “I was told the Soviet scientists knew this theory was completely ridiculous. There were no legitimate facts to support it. But it was exactly what Andropov needed to cause terror in the West.” Andropov then supposedly ordered it to be fed to contacts in the western peace and green movement. It certainly helped Soviet propaganda. From the Pope to the Campaign for Nuclear Disarmament to the non-aligned nations, calls for NATO’s nuclear strategy to be rethought because of the nuclear winter theory came thick and fast. A Russian newspaper used the nuclear winter to inveigh against “inhuman aspirations of the US imperialists, who are pushing the world towards nuclear catastrophe”. In his [acceptance speech](https://www.nobelprize.org/nobel_prizes/peace/laureates/1985/physicians-acceptance.html) of the Nobel peace prize in 1985, the prominent Russian doctor Evgeny Chazov cited the Nobel committee's citation: "a considerable service to mankind by spreading authoritative information and by creating an awareness of the catastrophic consequences of atomic warfare". The statement continued: "...this, in turn, contributes to an increase in the pressure of public opposition". “Propagators of the nuclear winter thus acted as dupes in a disinformation exercise scripted by the KGB”, concludes Darwall. We can never be entirely certain of this because Tretyakov’s KGB colleagues may have been exaggerating their role and he is now dead. But that the KGB did its best to fan the flames is not in doubt. It soon became apparent that the nuclear winter hypothesis was plain wrong. As the geophysicist [Russell Seitz pointed out,](http://www.textfiles.com/survival/nkwrmelt.txt) “soot in the TTAPS simulation is not up there as an observed consequence of nuclear explosions but because the authors told a programmer to put it there”. He added: “The model dealt with such complications as geography, winds, sunrise, sunset and patchy clouds in a stunningly elegant manner — they were ignored.” The physicist [Steven Schneider concluded](https://myslide.es/documents/nuclear-winter-5883ea09d94d9.html) that “the global apocalyptic conclusions of the initial nuclear winter hypothesis can now be relegated to a vanishingly low level of probability”. The physicists Freeman Dyson and Fred Singer, who would end up on the opposite side of the global-warming debate from Schneider and Seitz, calculated that any effects would be patchy and short-lived, and that while dry soot could generate cooling, any kind of dampness risked turning a nuclear smog into a warming factor and a short-lived one at that. By 1986 the theory was [effectively dead](http://www.nytimes.com/1990/01/23/science/nuclear-winter-theorists-pull-back.html?pagewanted=all), and so it has remained. A nuclear war would have devastating consequences, but the impact on the climate would be the least of our worries. The stakes were higher in the Cold War than today. The Soviet peace offensive secured the support of many western intellectuals and much of the media, and very nearly prevailed.

#### Even the creators of nuclear winter theory acknowledge that it could never wipe out everyone.

Robock ’10 [ROBOCK 2010 (Alan, Department of Environmental Sciences, Rutgers University, “Nuclear Winter,” WIREs Climate Change, May/June, Wiley Online Library via University of Michigan Libraries)]

While it is important to point out the consequences of nuclear winter, it is also important to point out what will not be the consequences. Although extinction of our species was not ruled out in initial studies by biologists, it now seems that this would not take place. Especially in Australia and New Zealand, humans would have a better chance to survive. Also, Earth will not be plunged into an ice age. Ice sheets, which covered North America and Europe only 18,000 years ago and were more than 3-km thick, take many thousands of years to build up from annual snow layers, and the climatic disruptions would not last long enough to produce them. The oxygen consumption by the fires would be inconsequential, as would the effect on the atmospheric greenhouse by carbon dioxide production. The consequences of nuclear winter are extreme enough without these additional effects, however.

#### Even the worst possible nuclear war would leave 90% of the world’s population unhurt—huge areas would not be affected.

Martin ’82 [MARTIN 1982 (Dr Brian Martin is a physicist whose research interests include stratospheric modelling. He is a research associate in the Dept. of Mathematics, Faculty of Science, Australian National University, Journal of Peace Research, No 4, http://www.uow.edu.au/arts/sts/bmartin/pubs/82jpr.html)]

To summarise the above points, a major global nuclear war in which population centres in the US, Soviet Union, Europe and China ware targeted, with no effective civil defence measures taken, could kill directly perhaps 400 to 450 million people. Induced effects, in particular starvation or epidemics following agricultural failure or economic breakdown, might add up to several hundred million deaths to the total, though this is most uncertain. Such an eventuality would be a catastrophe of enormous proportions, but it is far from extinction. Even in the most extreme case there would remain alive some 4000 million people, about nine-tenths of the world's population, most of them unaffected physically by the nuclear war. The following areas would be relatively unscathed, unless nuclear attacks were made in these regions: South and Central America, Africa, the Middle East, the Indian subcontinent, Southeast Asia, Australasia, Oceania and large parts of China. Even in the mid-latitudes of the northern hemisphere where most of the nuclear weapons would be exploded, areas upwind of nuclear attacks would remain free of heavy radioactive contamination, such as Portugal, Ireland and British Columbia. Many people, perhaps especially in the peace movement, believe that global nuclear war will lead to the death of most or all of the world's population.[12] Yet the available scientific evidence provides no basis for this belief. Furthermore, there seem to be no convincing scientific arguments that nuclear war could cause human extinction.[13] In particular, the idea of 'overkill', if taken to imply the capacity to kill everyone on earth, is highly misleading.[14]

#### Particle accelerators destroy the universe – which outweighs.

Joe Packer 7 – MA in Communication from Wake Forest University, PhD in Communication from the University of Pittsburgh and Professor of Communication at Central Michigan University, Alien Life in Search of Acknowledgment, p. 62-63 Recut Justin

Once we hold alien interests as equal to our own we can begin to revaluate areas previously believed to hold no relevance to life beyond this planet. A diverse group of scholars including Richard Posner, Senior Lecturer in Law at the University of Chicago, Nick Bostrom, philosophy professor at Oxford University, John Leslie philosophy professor at Guelph University and Martin Rees, Britain’s Astronomer Royal, have written on the emerging technologies that threaten life beyond the planet Earth. Particle accelerators labs are colliding matter together, reaching energies that have not been seen since the Big Bang. These experiments threaten a phase transition that would create a bubble of altered space that would expand at the speed of light killing all life in its path. Nanotechnology and other machines may soon reach the ability to self replicate. A mistake in design or programming could unleash an endless quantity of machines converting all matter in the universe into copies of themselves. Despite detailing the potential of these technologies to destroy the entire universe, Posner, Bostrom, Leslie, and Ree’s only mention of alien life in their works is in reference to the threat aliens post to humanity. The rhetorical construction of otherness only in terms of the threats it poses, but never in terms of the threat one poses to it, has been at the center of humanity’s history of genocide, colonization, and environmental destruction. Although humanity certainly has its own interests in reducing the threat of these technologies evaluating them without taking into account the danger they pose to alien life is neither appropriate nor just. It is not appropriate because framing the issue only in terms of human interests will result in priorities designed to minimize the risks and maximize the benefits to humanity, not all life. Even if humanity dealt with the threats effectively without referencing their obligation to aliens, Posner, Bostrom, Leslie, and Ree’s rhetoric would not be “just,” because it arbitrarily declares other life forms unworthy of consideration. A framework of acknowledgement would allow humanity to address the risks of these new technologies, while being cognizant of humanity’s obligations to other life within the universe. Applying the lens of acknowledgment to the issue of existential threats moves the problem from one of self destruction to universal genocide. This may be the most dramatic example of how refusing to extend acknowledgment to potential alien life can mask humanity’s obligations to life beyond this planet.

#### Tech advancements make time travel certain

Elmi 18 Awes Faghi [Contributing Writer at n’world Publications, BS in Forensic Science from London South Bank University, Extended Diploma in Physics with Distinction from Leyton Sixth Form College, Futurist, “Technological Progress Might Make Possible Time Travel And Teleportation”, Medium, 8-13, <https://medium.com/nworld-publications/technological-progress-might-make-possible-time-travel-and-teleportation-45176c3c89bc>] Recut Justin

This is a question that many people ask their-selves. This question has occurred many times. It is said that time travel is possible and in fact it is. The key things needed to travel through time are speed and kinetic energy. Einstein’s theory also known as the theory of relativity can be used ro understand how to deal with travelling to the future. Einstein showed that travelling forward in time is easy. According to Einstein’ theory of relativity, time passes at different rates for people who are moving relative to one another although the effect only becomes large when you get close to the speed of light. Time travel sometime can cause side effects called paradoxes. These paradoxes can occur especially when going back in time. As if only one thing even the minimum of the details can change something big may happen in the future. Another scientist who believes that time travel is possible after Einstein is Brian Cox who as Einstein believes that we are only going to be able to travel in the future. This obviously would happen if having a super-fast machine that allows you to go into the future. Cox also agrees on Einstein’s theory of relativity which states that to travel forward in time, something needs to reach speeds close to the speed of light. As it approaches these speeds, time slows down but only for that specific object. They both think as said, that time travel to the future is possible however travelling back in time is impossible, as something must be really as fast as the speed of light. This however for some scientists can be wrong. They state that with the technology that we have now it could be possible to build some sort of machine who will actually be able to travel in both future and past. A wormhole as shown in the image is a theoretical passage through space-time that could create shortcuts for long journeys across the universe. Wormholes are predicted by the theory of general relativity. However, wormholes bring with them the dangers of sudden collapse, high radiation and dangerous contact with exotic matter. The public knows that time travel is possible but humans at the moment are not able to. However other sources except theories of the past are currently trying to develop a way of time travel. The audience actually cannot wait that this will happen as many media state, such as BBC. Many TV programmes talk about both time travel and teleportation.

#### Collapses the universe.

Bowers 16 Steve – [Control Officer in the United Kingdom, Executive Editor and Moderator of the Orion’s Arm Universe Project, Contributing Author for the Orion’s Arm Novella Collection, “WHY NO TIME TRAVEL IN OA”, 1-1, <https://orionsarm.com/page/77>] Recut Justin

If the universe does allow reverse time travel, usable by sentient/sophont entities, it won't stop at one or two little historical research trips . . . If there is no effective chronological protection mechanism, the universe of today will be overrun with travellers from the future. Even if there is no 'Big Rip' where the Universe tears itself apart through accelerating expansion, hundreds of trillions of years from now the cosmos will be a slowly dying place. Even red dwarf stars will eventually burn out, leaving the inhabitants of the far future only their dying embers to gather energy from, although the creation and merger of black holes could perhaps keep civilisation going for an (admittedly very long) while. Eventually the entities of the far future will be limited to reversible computation to save energy. This means confining themselves to a very limited set of mental processes. This prospect would surely not appeal to the heirs of once-mighty advanced civilisations. If time travel were possible then refugees from the far future would flood back, sometimes in multiple instances. The future sophonts would come back in an exponentiating wave to constantly change the present and the past, and whole galaxies of material particles will begin to exist in space time reference that did not have them before - some? many? most? matter and events may turn out to be acausal, going round and round in closed timelike loops and increasing the total mass of the universe, which may begin to collapse in the distant future, sending chronistic refugees in massive tardises back to our time thus accelerating the collapse; increasing the mass of the present day universe until it collapses. The collapse will get closer to the present day, until it eventually happened yesterday and we will cease to exist . . . believe me, you don't want to go there. For an explanation how under certain circumstances a wormhole can connect different parts of the universe without causing temporal paradoxes see this page.

#### Super lasers are coming and cause universe destruction.

Cartlidge 18 – Edwin Cartlidge, MSc in Science Communication from Imperial College London, MPhy in Physics from Manchester University, News Editor of Physics World and Freelance Science Writer, “Physicists Are Planning To Build Lasers So Powerful They Could Rip Apart Empty Space”, Science Magazine, 1-24, https://www.sciencemag.org/news/2018/01/physicists-are-planning-build-lasers-so-powerful-they-could-rip-apart-empty-space

Inside a cramped laboratory in Shanghai, China, physicist Ruxin Li and colleagues are breaking records with the most powerful pulses of light the world has ever seen. At the heart of their laser, called the Shanghai Superintense Ultrafast Laser Facility (SULF), is a single cylinder of titanium-doped sapphire about the width of a Frisbee. After kindling light in the crystal and shunting it through a system of lenses and mirrors, the SULF distills it into pulses of mind-boggling power. In 2016, it achieved an unprecedented 5.3 million billion watts, or petawatts (PW). The lights in Shanghai do not dim each time the laser fires, however. Although the pulses are extraordinarily powerful, they are also infinitesimally brief, lasting less than a trillionth of a second. The researchers are now upgrading their laser and hope to beat their own record by the end of this year with a 10-PW shot, which would pack more than 1000 times the power of all the world's electrical grids combined.

The group's ambitions don't end there. This year, Li and colleagues intend to start building a 100-PW laser known as the Station of Extreme Light (SEL). By 2023, it could be flinging pulses into a chamber 20 meters underground, subjecting targets to extremes of temperature and pressure not normally found on Earth, a boon to astrophysicists and materials scientists alike. The laser could also power demonstrations of a new way to accelerate particles for use in medicine and high-energy physics. But most alluring, Li says, would be showing that light could tear electrons and their antimatter counterparts, positrons, from empty space—a phenomenon known as "breaking the vacuum." It would be a striking illustration that matter and energy are interchangeable, as Albert Einstein's famous E=mc2 equation states. Although nuclear weapons attest to the conversion of matter into immense amounts of heat and light, doing the reverse is not so easy. But Li says the SEL is up to the task. "That would be very exciting," he says. "It would mean you could generate something from nothing."

The Chinese group is "definitely leading the way" to 100 PW, says Philip Bucksbaum, an atomic physicist at Stanford University in Palo Alto, California. But there is plenty of competition. In the next few years, 10-PW devices should switch on in Romania and the Czech Republic as part of Europe's Extreme Light Infrastructure, although the project recently put off its goal of building a 100-PW-scale device. Physicists in Russia have drawn up a design for a 180-PW laser known as the Exawatt Center for Extreme Light Studies (XCELS), while Japanese researchers have put forward proposals for a 30-PW device.

Largely missing from the fray are U.S. scientists, who have fallen behind in the race to high powers, according to a study published last month by a National Academies of Sciences, Engineering, and Medicine group that was chaired by Bucksbaum. The study calls on the Department of Energy to plan for at least one high-power laser facility, and that gives hope to researchers at the University of Rochester in New York, who are developing plans for a 75-PW laser, the Optical Parametric Amplifier Line (OPAL). It would take advantage of beamlines at OMEGA-EP, one of the country's most powerful lasers. "The [Academies] report is encouraging," says Jonathan Zuegel, who heads the OPAL.

Invented in 1960, lasers use an external "pump," such as a flash lamp, to excite electrons within the atoms of a lasing material—usually a gas, crystal, or semiconductor. When one of these excited electrons falls back to its original state it emits a photon, which in turn stimulates another electron to emit a photon, and so on. Unlike the spreading beams of a flashlight, the photons in a laser emerge in a tightly packed stream at specific wavelengths.

Because power equals energy divided by time, there are basically two ways to maximize it: Either boost the energy of your laser, or shorten the duration of its pulses. In the 1970s, researchers at Lawrence Livermore National Laboratory (LLNL) in California focused on the former, boosting laser energy by routing beams through additional lasing crystals made of glass doped with neodymium. Beams above a certain intensity, however, can damage the amplifiers. To avoid this, LLNL had to make the amplifiers ever larger, many tens of centimeters in diameter. But in 1983, Gerard Mourou, now at the École Polytechnique near Paris, and his colleagues made a breakthrough. He realized that a short laser pulse could be stretched in time—thereby making it less intense—by a diffraction grating that spreads the pulse into its component colors. After being safely amplified to higher energies, the light could be recompressed with a second grating. The end result: a more powerful pulse and an intact amplifier.

This "chirped-pulse amplification" has become a staple of high-power lasers. In 1996, it enabled LLNL researchers to generate the world's first petawatt pulse with the Nova laser. Since then, LLNL has pushed to higher energies in pursuit of laser-driven fusion. The lab's National Ignition Facility (NIF) creates pulses with a mammoth 1.8 megajoules of energy in an effort to heat tiny capsules of hydrogen to fusion temperatures. However, those pulses are comparatively long and they still generate only about 1 PW of power.

To get to higher powers, scientists have turned to the time domain: packing the energy of a pulse into ever-shorter durations. One approach is to amplify the light in titanium-doped sapphire crystals, which produce light with a large spread of frequencies. In a mirrored laser chamber, those pulses bounce back and forth, and the individual frequency components can be made to cancel each other out over most of their pulse length, while reinforcing each other in a fleeting pulse just a few tens of femtoseconds long. Pump those pulses with a few hundred joules of energy and you get 10 PW of peak power. That's how the SULF and other sapphire-based lasers can break power records with equipment that fits in a large room and costs just tens of millions of dollars, whereas NIF costs $3.5 billion and needs a building 10 stories high that covers the area of three U.S. football fields.

Raising pulse power by another order of magnitude, from 10 PW to 100 PW, will require more wizardry. One approach is to boost the energy of the pulse from hundreds to thousands of joules. But titanium-sapphire lasers struggle to achieve those energies because the big crystals needed for damage-free amplification tend to lase at right angles to the beam—thereby sapping energy from the pulses. So scientists at the SEL, XCELS, and OPAL are pinning their hopes on what are known as optical parametric amplifiers. These take a pulse stretched out by an optical grating and send it into an artificial "nonlinear" crystal, in which the energy of a second, "pump" beam can be channeled into the pulse. Recompressing the resulting high-energy pulse raises its power.

To approach 100 PW, one option is to combine several such pulses—four 30-PW pulses in the case of the SEL and a dozen 15-PW pulses at the XCELS. But precisely overlapping pulses just tens of femtoseconds long will be "very, very difficult," says LLNL laser physicist Constantin Haefner. They could be thrown off course by even the smallest vibration or change in temperature, he argues. The OPAL, in contrast, will attempt to generate 75 PW using a single beam.

Mourou envisions a different route to 100 PW: adding a second round of pulse compression. He proposes using thin plastic films to broaden the spectrum of 10-PW laser pulses, then squeezing the pulses to as little as a couple of femtoseconds to boost their power to about 100 PW.

Once the laser builders summon the power, another challenge will loom: bringing the beams to a singularly tight focus. Many scientists care more about intensity—the power per unit area—than the total number of petawatts. Achieve a sharper focus, and the intensity goes up. If a 100-PW pulse can be focused to a spot measuring just 3 micrometers across, as Li is planning for the SEL, the intensity in that tiny area will be an astonishing 1024 watts per square centimeter (W/cm2)—some 25 orders of magnitude, or 10 trillion trillion times, more intense than the sunlight striking Earth.

Those intensities will open the possibility of breaking the vacuum. According to the theory of quantum electrodynamics (QED), which describes how electromagnetic fields interact with matter, the vacuum is not as empty as classical physics would have us believe. Over extremely short time scales, pairs of electrons and positrons, their antimatter counterparts, flicker into existence, born of quantum mechanical uncertainty. Because of their mutual attraction, they annihilate each another almost as soon as they form.

But a very intense laser could, in principle, separate the particles before they collide. Like any electromagnetic wave, a laser beam contains an electric field that whips back and forth. As the beam's intensity rises, so, too, does the strength of its electric field. At intensities around 1024 W/cm2, the field would be strong enough to start to break the mutual attraction between some of the electron-positron pairs, says Alexander Sergeev, former director of the Russian Academy of Sciences's (RAS's) Institute of Applied Physics (IAP) in Nizhny Novgorod and now president of RAS. The laser field would then shake the particles, causing them to emit electromagnetic waves—in this case, gamma rays. The gamma rays would, in turn, generate new electron-positron pairs, and so on, resulting in an avalanche of particles and radiation that could be detected. "This will be completely new physics," Sergeev says. He adds that the gamma ray photons would be energetic enough to push atomic nuclei into excited states, ushering in a new branch of physics known as "nuclear photonics"—the use of intense light to control nuclear processes.

#### Their own evidence – even if nuke war could target cities and urban areas, they will only attack isolated places, their link chain doesn’t have a distinct – toon also relies on dust particles which we put defense on – lex reads green

Toon et al 19 [Owen B. Toon, PhD, Physics at Cornell; Charles G. Bardeen, Atmospheric Chemistry Observations and Modeling Laboratory, National Center for Atmospheric Research; Alan Robock, Department of Environmental Sciences, Rutgers University, New Brunswick; Lili Xia, Federation of American Scientists; Hans Kristensen, Natural Resources Defense Council; Matthew McKinzie, Department of Physics, University of Colorado, Boulder; R. J. Peterson, School of Earth, Environmental, and Marine Sciences, University of Texas Rio Grande Valley; Cheryl S. Harrison, Institute of Arctic and Alpine Research, University of Colorado, Boulder; Nicole S. Lovenduski , Department of Atmospheric and Oceanic Sciences, Institute of Arctic and Alpine Research; and Richard P. Turco, Department of Atmospheric and Oceanic Sciences, University of California, Los Angeles] "Rapidly expanding nuclear arsenals in Pakistan and India portend regional and global catastrophe," Science Advances, https://advances.sciencemag.org/content/5/10/eaay5478 Science Advances 02 Oct 2019: Vol. 5, no. 10 RE

Regional nuclear war casualty estimates. Even one nuclear weapon explosion in a city can do a great deal of damage. For example, in the most densely populated urban area in Pakistan, a 15-kt airburst at the optimum height to maximize blast damage could kill about 700,000 people (fig. S2B) and injure another 300,000. With a 100-kt airburst over the same region, roughly 2 million fatalities and an additional 1.5 million nonfatal casualties could occur. Similar numbers would result for nuclear explosions over large Indian cities (fig. S2A). Toon et al. (16) estimated that a war between India and Pakistan involving 50 nuclear weapons with 15-kt yield detonated as airbursts over the most densely populated cities of each nation would lead to about 22 million immediate fatalities and 44 million total casualties. Casualties include fatalities, severe injuries, and lesser injuries that can develop into more serious conditions, especially in the aftermath of a nuclear attack. At that time, it was assumed (16) that India had 85 (65 to 110) nuclear weapons and Pakistan had 52 (44 to 62), all with 15-kt yields. These casualty and fatality estimates were made using the LandScan2003 (18) population database together with the Gaussian probability distribution for fatalities and total casualties versus distance from ground zero shown in fig. S3 (16). However, the urban populations of India and Pakistan are growing rapidly. The total urban populations of India and Pakistan are projected to increase by about 90% between 2000 and 2025, as shown in fig. S4 (19). The number of weapons possessed by the two countries is also thought to be increasing rapidly. By 2025, India and Pakistan could have three and five times, respectively, the number of weapons estimated by Toon et al. (16), and these would likely have higher yields than previously estimated (16). We have recomputed the fatalities and casualties for the most recent Indian and Pakistani urban population counts using the approach discussed in Methods (see below) and in Toon et al. (16). Figure 2 illustrates the cumulative fatalities and cumulative total casualties as a function of the number of explosions and their yield derived using the LandScan2016 (20) population database. The corresponding fatalities calculated for individual targets are given in the Supplementary Materials (fig. S2). Cumulative fatalities (as well as overall casualties) are higher in India because it has a greater urban population. Fatalities are not linear with respect to the number, or yield, of the weapons used, because smaller cities (of which there are greater numbers) have lower populations, whereas higher-yield weapons on these targets would encounter low-density suburban or rural areas away from the city centers where lower-yield weapons concentrate most of their damage. Compared with India, Pakistani fatalities (fig. S2B) vary less with weapon yield above 15 kt, especially after the most densely populated 100 targets have been attacked, due to the relatively low populations of the remaining targets. India has many more moderate-sized cities than Pakistan, and fatalities continue to grow rapidly with yield above 15 kt, even for the 250th target (fig. S2A). For 50 weapons of 15-kt yield exploding on both India and Pakistan, we find that the casualty estimates have risen relative to Toon et al. (16) from 22 to 27 million fatalities and from 44 to 45 million total casualties (Fig. 2) due to the expanded urban populations in LandScan2016 (20) compared to LandScan2003 (18). These increases in fatalities and casualties are much less than the ~50% increase in urban population between 2000 and 2015 (fig. S4), suggesting that the size of the area that is urban increases more than the population density within the urban region. An even more marked increase in fatalities and casualties shown in Fig. 2 is due to increasing numbers of weapons and increasing yields. In Fig. 2, the targets are graphed in decreasing order of the population density within the target area [refer to Methods and (16)]. In the scenario outlined in table S1, Pakistan is assumed to use 150 strategic weapons on Indian urban targets and India is assumed to use 100 weapons on Pakistani urban targets. The calculations use the current population of India and Pakistan, not those for 2025, because it is not possible to forecast changing populations in individual target areas. Targets that are not in urban areas are not considered, but they would lead to additional fatalities and casualties. Table S2 lists the fatalities and casualties from the scenario given in table S1. About 50 million people would die if 15-kt weapons are used, almost 100 million if 50-kt weapons are used, and about 125 million if 100-kt weapons are used. The population density in the target area affects the casualties, as well as the estimated fuel load. Table S3 lists the population and population densities for the densest urban areas attacked and the least dense. The population density in the target area usually declines as the yield increases because more suburban areas are included in the larger areas that are damaged by higher-yield weapons. In some cases, especially for low-population regions in Pakistan, the population may decrease with yield because different urban areas are chosen as the last target for differing yields. The highest population densities in table S3 are in the range of 37,000 to 80,000 people/km2. The population density in the area of the mass fire in Hamburg during WWII is estimated to have been about 20,000 people/km2 (21). Similarly, the population density for the 150th weapon used on India is between 17,000 and 4900 people/km2 and that for the 100th weapon used on Pakistan is between 8500 and 1600 people/km2. For reference, the population density of 1980s San Jose, California, a suburban city, was estimated to be about 1300 people/km2 (16). During WWII, it is estimated that about 50 million people were killed, not considering those who died from disease and starvation over 6 years [e.g., (22)]. Because of the dense populations of cities in Pakistan and India, table S2 shows that even a war with 15-kt weapons could lead to fatalities approximately equal to those worldwide in WWII and a war with 100-kt weapons could directly kill about 2.5 times as many as died worldwide in WWII, and in this nuclear war, the fatalities could occur in a single week. The world’s annual death rate from all causes is about 56 million people per year (23). Therefore, a war between India and Pakistan in our scenario with 15-kt weapons could kill the same number of people in a week as would die naturally worldwide in a year, effectively increasing the immediate global death rate by a factor of 50. A regional catastrophe would occur if India and Pakistan were to engage in a full-scale nuclear war with their expanding arsenals. India would suffer two to three times more fatalities and casualties than Pakistan (table S2) because, in our scenario, Pakistan uses more weapons than India and because India has a much larger population and more densely populated cities. However, as a percentage of the urban population, Pakistan’s losses would be about twice those of India. In general, as shown in Fig. 2, the fatalities and casualties increase rapidly even up to the 250th explosion due to the high population in India, whereas the rate of increase for Pakistan is much lower even for the 50th explosion. The fatalities and casualties outlined in table S2, Fig. 2, and fig. S2 are computed, assuming airbursts used against urban targets, and that mass fires were started in each city, as occurred in Hiroshima. **It is likely that some of the 45 strategic weapons assumed to be used against isolated military targets, and some of the 40 tactical weapons, will be exploded as ground bursts. The direct casualties and fatalities from ground bursts may be relatively small. However, ground bursts carry soil into the fireball, where very small radioactive particles can attach themselves to the dust particles. The relatively large dust particles are likely to fall out of the atmosphere within a few days, when the radioactive particles are still very dangerous**. Large numbers of fatalities and casualties, potentially larger than the values given in table S2 and Fig. 2, can be caused by exposure to this radioactive material within a few days of the explosions.

### 1NC – Famine

#### Read their studies skeptically – most say famines kill billions and some assert everyone dies but that’s not warranted.

David S. Stevenson 17. Professor of planetary science at Caltech. 2017. “Agents of Mass Destruction.” The Nature of Life and Its Potential to Survive, Springer, Cham, pp. 273–340. link.springer.com, doi:10.1007/978-3-319-52911-0\_7.

What of humanity? Could it survive? In short, yes, if we are prepared to adapt to a life underground. Here, small communities of people could live on, feeding directly from the remnant biosphere, or from artificially lit greenhouse-cultivated plants. Humanity could persist in a vast underground ark. Here we could continue as a subterranean species, living for billions of years. Life could even become pleasant with enough sub-surface engineering. However, escape would only be permissible if we maintained sufficient technology to reach and re-colonize the frigid surface. With far more limited resources, and with most people likely having been wiped out in the initial freeze, the number of survivors in such caves might be measured in the hundreds. Survival of humanity would depend on whoever survived by maintaining a The Nature of Life and Its Potential to Survive 311 power supply, having food reserves, water reserves and seeds. If you could not maintain the food supply, most survivors would die of starvation within weeks of moving underground.

### 1NC – Ozone

#### Ozone impacts are out of the question – only actual study.

Kearney 87. [Cresson. In 1961 he took a position doing civil defense research with the Hudson Institute. In 1964 he joined the Oak Ridge National Laboratory civil defense project. During the Vietnam War, Kearny served as a civilian advisor to the U.S. Army, making several trips to the theater of operations.[9] Much of the supporting research that went into his most famous work, Nuclear War Survival Skills (NWSS), was conducted during the 1970s. Including a study on how the US might be affected by a potential nuclear war from the Sino-Soviet split, specifically focusing on the question; what would be the severity and how might the US deal with contamination of CONUS milk supplies that might result from the "trans-pacific" nuclear fallout that would originate over China.[10] Along with other more long-term survival publications such as "Maintaining nutritional adequacy during a prolonged food crisis [Basic foods for post-nuclear attack use]".[11] “Nuclear War Survival Skills Updated and Expanded”. <http://www.oism.org/nwss/s73p904.htm>] Justin

° Facts: Large nuclear explosions do inject huge amounts of nitrogen oxides (gasses that destroy ozone) into the stratosphere. However, the percent of the stratospheric ozone destroyed by a given amount of nitrogen oxides has been greatly overestimated in almost all theoretical calculations and models. For example, the Soviet and U.S. atmospheric nuclear test explosions of large weapons in 1952-1962 were calculated by Foley and Ruderman to result in a reduction of more than 10 percent in total ozone. (See M. H. Foley and M. A. Ruderman, 'Stratospheric NO from Past Nuclear Explosions", Journal of Geophysics, Res. 78, 4441-4450.) Yet observations that they cited showed no reductions in ozone. Nor did ultraviolet increase. Other theoreticians calculated sizable reductions in total ozone, but interpreted the observational data to indicate either no reduction, or much smaller reductions than their calculated ones.

A realistic simplified estimate of the increased ultraviolet light dangers to American survivors of a large nuclear war equates these hazards to moving from San Francisco to sea level at the equator, where the sea level incidence of skin cancers (seldom fatal) is highest- about 10 times higher than the incidence at San Francisco. Many additional thousands of American survivors might get skin cancer, but little or no increase in skin cancers might result if in the post-attack world deliberate sun tanning and going around hatless went out of fashion. Furthermore, almost all of today's warheads are smaller than those exploded in the large- weapons tests mentioned above; most would inject much smaller amounts of ozone-destroying gasses, or no gasses, into the stratosphere, where ozone deficiencies may persist for years. And nuclear weapons smaller than 500 kilotons result in increases (due to smog reactions) in upper tropospheric ozone. In a nuclear war, these increases would partially compensate for the upper-level tropospheric decreases-as explained by Julius S. Chang and Donald J. Wuebbles of Lawrence Livermore National Laboratory.