## 1

#### Permissibility presumption negate – a. res indicates the aff is proactive, permisiblit denies the existence of proactivity b – statements are more often false than true because any part can be false c – safety – you shouldn’t pursue action if you’re unsure if it’s good or not

#### Ethics must begin a priori and the meta-ethic is bindingness.

#### [1] Uncertainty – our experiences are inaccessible to others which allows people to say they don’t experience the same, however a priori principles are universally applied to all agents.

#### [2] Bindingness – I can keep asking “why should I follow this” which results in skep since obligations are predicated on ignorantly accepting rules. Only reason solves since asking “why reason?” requires reason which is self-justified.

#### That means we must universally will maxims— any non-universalizable norm justifies someone’s ability to impede on your ends.

#### Thus, the standard is consistency with the categorical imperative.

#### Prefer –

#### [1] All other frameworks collapse—non-Kantian theories source obligations in extrinsically good objects, but that presupposes the goodness of the rational will.

#### [2] Theory – Frameworks are topicality interps of the word ought so they should be theoretically justified. Prefer on resource disparities—a focus on evidence and statistics privileges debaters with the most preround prep which excludes lone-wolfs who lack huge evidence files. A debate under my framework can easily be won without any prep since huge evidence files aren’t required.

#### Clarify of weighing – clear categories - resolvability

#### Negate:

#### 1] Strikes violate individual autonomy by exercising coercion.

Gourevitch 18 [Alex; Brown University; “The Right to Strike: A Radical View,” American Political Science Review; 2018; [https://sci-hub.se/10.1017/s0003055418000321]](https://sci-hub.se/10.1017/s0003055418000321%5d//SJWen) Justin

\*\*Edited for ableist language

Every liberal democracy recognizes that workers have a right to strike. That right is protected in law, sometimes in the constitution itself. Yet strikes pose serious problems for liberal societies. They involve violence and coercion, they often violate some basic liberal liberties, they appear to involve group rights having priority over individual ones, and they can threaten public order itself. Strikes are also one of the most common forms of disruptive collective protest in modern history. Even given the dramatic decline in strike activity since its peak in the 1970s, they can play significant roles in our lives. For instance, just over the past few years in the United States, large illegal strikes by teachers ~~paralyzed~~ froze major school districts in Chicago and Seattle, as well as statewide in West Virginia, Oklahoma, Arizona, and Colorado; a strike by taxi drivers played a major role in debates and court decisions regarding immigration; and strikes by retail and foodservice workers were instrumental in getting new minimum wage and other legislation passed in states like California, New York, and North Carolina. Yet, despite their significance, there is almost no political philosophy written about strikes.1 This despite the enormous literature on neighboring forms of protest like nonviolence, civil disobedience, conscientious refusal, and social movements.

The right to strike raises far more issues than a single essay can handle. In what follows, I address a particularly significant problem regarding the right to strike and its relation to coercive strike tactics. I argue that strikes present a dilemma for liberal societies because for most workers to have a reasonable chance of success they need to use some coercive strike tactics. But these coercive strike tactics both violate the law and infringe upon what are widely held to be basic liberal rights. To resolve this dilemma, we have to know why workers have the right to strike in the first place. I argue that the best way of understanding the right to strike is as a right to resist the oppression that workers face in the standard liberal capitalist economy. This way of understanding the right explains why the use of coercive strike tactics is not morally constrained by the requirement to respect the basic liberties nor the related laws that strikers violate when using certain coercive tactics.

#### 2] Means to an end: employees ignore their duty to help their patients in favor of higher wages which treats them as a means to an end.

#### 3] Free-riding: strikes are a form of free-riding since those who don’t participate still reap the benefits.

Dolsak and Prakash 19 [Nives and Aseem; We write on environmental issues, climate politics and NGOs; “Climate Strikes: What They Accomplish And How They Could Have More Impact,” 9/14/19; Forbes; <https://www.forbes.com/sites/prakashdolsak/2019/09/14/climate-strikes-what-they-accomplish-and-how-they-could-have-more-impact/?sh=2244a9bd5eed>] Justin

While strikes and protests build solidarity among their supporters, they are susceptible to collective action problems. This is because **the goals that strikers pursue tend to create non-excludable benefits**. That is, benefits such as climate protection can be enjoyed by both strikers and non-strikers. Thus, large participation in climate strikes will reveal that in spite of free-riding problems, a large number of people have a strong preference for climate action.

## 2

#### The aff burden is to prove that the aff will logically happen in the status quo

Top of Form

Bottom of Form

#### Prefer:

#### 1] Text –

#### A] Ought is “used to express logical consequence” as defined by Merriam-Webster

(<http://www.merriam-webster.com/dictionary/ought>) //Massa

#### B] Oxford Dictionary defines ought as “used to indicate something that is probable.”

<https://en.oxforddictionaries.com/definition/ought> //Massa

#### c] “Should” means a logical consequence – 2 definitions.

Merriam-Webster. No Date. “Definition of Should.” *Merriam Webster Dictionary Online*. <https://www.merriam-webster.com/dictionary/should>. NM

should auxiliary verb Save Word To save this word, you'll need to log in. \ shəd, ˈshu̇d \ Definition of should **past tense of SHALL** 1—used in auxiliary function to express condition if he should leave his father, his father would die — Genesis 44:22 (Revised Standard Version) 2—used in auxiliary function to express obligation, propriety, or expediency 'tis commanded I should do so — William Shakespeare this is as it should be — H. L. Savage you should brush your teeth after each meal 3—**used** in auxiliary function **to express futurity from a point of view in the past** realized that she should have to do most of her farm work before sunrise — Ellen Glasgow 4—**used** in auxiliary function **to express what is probable or expected** with an early start, they should be here by noon 5—used in auxiliary function to express a request in a polite manner or to soften direct statement I should suggest that a guide … is the first essential — L. D. Reddick

#### 2] Debatability – a. it focuses debates on empirics about squo trends rather than irresolvable abstract principles that’ve been argued for years

#### b. the neg forces the most real world debates because it forces us to actually take into consideration things that are possible as opposed to abstract policymaking that’s impossible which means we are more material – the aff’s method just imagines we magically pass something that will never happen whereas we discuss real trends which link turns education claims

#### c. Prediction is impossible. Any action can lead to a domino effect that can have disastrous impacts in the end. For example, if I sneeze, it could lead to a butterfly effect that eventually causes my sneeze to form into a hurricane and kill thousands.

#### 3] Neg definition choice – the aff should have defined ought in the 1ac because it was in the rez so it’s predictable contestation, by not doing so they have forfeited their right to read a new definition – kills 1NC strategy since I premised my engagement on a lack of your definition.

#### 4] Log con isn’t mutually exclusive with comparative worlds a) logic is a side constraint on desirability b) proves why it’s not desirable since taking impossible actions are net bad since they produce no benefits and only opportunity costs c) reinterprets to the more logical world rather than more desireable world.

#### Now negate:

**Negate:**

#### 1] Inherency – either a) the aff is non-inherent and you vote neg on presumption or b) it is and it isn’t going to happen.

## 3

#### Interpretation: The affirmative may not specify a just government in which a right to strike ought to be recognized

#### “A” is an indefinite article that modifies “just governmnt” in the res – means that you have to prove the resolution true in a VACCUM, not in a particular instance

CCC (“Articles, Determiners, and Quantifiers”, http://grammar.ccc.commnet.edu/grammar/determiners/determiners.htm#articles, Capital Community College Foundation, a nonprofit 501 c-3 organization that supports scholarships, faculty development, and curriculum innovation) LHSLA JC/SJ

The three articles — a, an, the — are a kind of adjective. The is called the definite article because it usually precedes a specific or previously mentioned noun; a and an are called indefinite articles because they are used to refer to something in a less specific manner (an unspecified count noun). These words are also listed among the noun markers or determiners because they are almost invariably followed by a noun (or something else acting as a noun). caution CAUTION! Even after you learn all the principles behind the use of these articles, you will find an abundance of situations where choosing the correct article or choosing whether to use one or not will prove chancy. Icy highways are dangerous. The icy highways are dangerous. And both are correct. The is used with specific nouns. The is required when the noun it refers to represents something that is one of a kind: The moon circles the earth. The is required when the noun it refers to represents something in the abstract: The United States has encouraged the use of the private automobile as opposed to the use of public transit. The is required when the noun it refers to represents something named earlier in the text. (See below..) If you would like help with the distinction between count and non-count nouns, please refer to Count and Non-Count Nouns. We use a before singular count-nouns that begin with consonants (a cow, a barn, a sheep); we use an before singular count-nouns that begin with vowels or vowel-like sounds (an apple, an urban blight, an open door). Words that begin with an h sound often require an a (as in a horse, a history book, a hotel), but if an h-word begins with an actual vowel sound, use an an (as in an hour, an honor). We would say a useful device and a union matter because the u of those words actually sounds like yoo (as opposed, say, to the u of an ugly incident). The same is true of a European and a Euro (because of that consonantal "Yoo" sound). We would say a once-in-a-lifetime experience or a one-time hero because the words once and one begin with a w sound (as if they were spelled wuntz and won). Merriam-Webster's Dictionary says that we can use an before an h- word that begins with an unstressed syllable. Thus, we might say an hisTORical moment, but we would say a HIStory book. Many writers would call that an affectation and prefer that we say a historical, but apparently, this choice is a matter of personal taste. For help on using articles with abbreviations and acronyms (a or an FBI agent?), see the section on Abbreviations. First and subsequent reference: When we first refer to something in written text, we often use an indefinite article to modify it. A newspaper has an obligation to seek out and tell the truth. In a subsequent reference to this newspaper, however, we will use the definite article: There are situations, however, when the newspaper must determine whether the public's safety is jeopardized by knowing the truth. Another example: "I'd like a glass of orange juice, please," John said. "I put the glass of juice on the counter already," Sheila replied. Exception: When a modifier appears between the article and the noun, the subsequent article will continue to be indefinite: "I'd like a big glass of orange juice, please," John said. "I put a big glass of juice on the counter already," Sheila replied. Generic reference: We can refer to something in a generic way by using any of the three articles. We can do the same thing by omitting the article altogether. A beagle makes a great hunting dog and family companion. An airedale is sometimes a rather skittish animal. The golden retriever is a marvelous pet for children. Irish setters are not the highly intelligent animals they used to be. The difference between the generic indefinite pronoun and the normal indefinite pronoun is that the latter refers to any of that class ("I want to buy a beagle, and any old beagle will do.") whereas the former (see beagle sentence) refers to all members of that class

#### Violation: they spec [x]

#### Standards:

#### [1] precision – the counter-interp justifies them arbitrarily doing away with random words in the resolution which decks negative ground and preparation because the aff is no longer bounded by the resolution. Independent voter for jurisdiction – the judge doesn’t have the jurisdiction to vote aff if there wasn’t a legitimate aff.

#### [2] limits – the UN says there are 195 national governments but even that’s not an agreed upon brightline – explodes limits since there are tons of independent affs plus functionally infinite combinations, all with different advantages in different political situations. Kills neg prep and debatability since there are no DAs that apply to every aff – i.e. factors that affect labor shortages or unions in the US are different than in China – means the aff is always more prepared and wins just for speccing. There’s been China, Hungary, EU, Kazakhstan, US, India, UK, Egypt and now brazil

#### [3] tva – just read your aff as an advantage under a whole res advocacy, solves all ur offense- Potential abuse doesn’t permit 1AC abuse – allows you to be infinitely abusive in the 1AC-– if the neg doesn’t have specific prep, they’ll resort to cheaty word PICs which are net worse

#### Fairness – debate is a competitive activity that requires fairness for objective evaluation. Outweighs because it’s the only intrinsic part of debate – all other rules can be debated over but rely on some conception of fairness to be justified.

#### Drop the debater – a] deter future abuse and b] set better norms for debate.

#### Competing interps – [a] reasonability is arbitrary and encourages judge intervention since there’s no clear norm, [b] it creates a race to the top where we create the best possible norms for debate.

#### No RVIs – a] illogical, you don’t win for proving that you meet the burden of being fair, logic outweighs since it’s a prerequisite for evaluating any other argument, b] RVIs incentivize baiting theory and prepping it out which leads to maximally abusive practices c] creates a chilling affect where people are scared to check abuse which also leads to maximally abusvie practcies

## Case

#### New Affs are a voting issue

Graphical user interface, application

Description automatically generated

#### 

#### Standard is prep and clash 5 minutes of prep is not enough to put together a coherent 1nc or update generics—30 minutes is necessary to learn a little about the affirmative and piece together what 1nc positions apply and cut and research their applications to the affirmative which means that I’ll always lose and it controls the internal link to education arguments because we won’t be able to explore the intricacies of the aff

### framework

#### Reject their framework:

#### [1] The appeal to util makes debate unsafe, since the logic of “the end justifies the means” can justify *any* reprehensible action.

**Anderson** Anderson, Kerby. [National Director of Probe Ministries International] “Utilitarianism: The Greatest Good for the Greatest Number.” *Probe*, 2004**. RP**

One problem with utilitarianism is that its leads to an ‘end justifies the means’ mentality. If any worthwhile end can justify the means to attain it, a true ethical foundation is lost. But we all know that the end does not justify the means. If that were so,then Hitler could justify the Holocaust because the end was to purify the human race. Stalin could justify his slaughter of millions because he was trying to achieve a communist utopia. The end never justifies the means. The means must justify themselves. A particular act cannot be judged as good simply because it may lead to a good consequence. The means must be judged by some objective and consistent standard of morality. Second, utilitarianism cannot protect the rights of minorities if the goal is the greatest good for the greatest number. Americans in the eighteenth century could justify slavery on the basis that it provided a good consequence for a majority of Americans. Certainly the majority benefited from cheap slave labor even though the lives of black slaves were much worse. A third problem with utilitarianism is predicting the consequences. If morality is based on results, then we would have to have omniscience in order to accurately predict the consequence of any action. But at best we can only guess at the future, and often these educated guesses are wrong. A fourth problem with utilitarianism is that consequences themselves must be judged. When results occur, we must still ask whether they are good or bad results. [Further][,] [u]tilitarianism provides no objective and consistent foundation to judge results because results are the mechanism used to judge the action itself. Inviolability is intrinsically valuable.

**Vote them down – this abhorrent discourse promotes terrible ideologies in the debate space.**

#### Additionally:

#### [a] Reversibility: once oppressive rhetoric is used it cannot be taken back

#### [b] Norm setting: we are part of a larger debate community with extensive norms – letting bad discourse be rampant kills the community

#### [c] Competition: debate is an educational competition with no place for offensive rhetoric – that kills access to the lasting benefit debate provides

#### 2] Problem of induction

Vickers 14, John Vickers, 2014, The Problem of Induction, https://plato.stanford.edu/entries/induction-problem/

The original problem of induction can be simply put. It concerns the support or justification of inductive methods; methods that predict or infer, in Hume's words, that “instances of which we have had no experience resemble those of which we have had experience” (THN, 89). Such methods are clearly essential in scientific reasoning as well as in the conduct of our everyday affairs. The problem is how to support or justify them and it leads to a dilemma: the principle cannot be proved deductively, for it is contingent, and only necessary truths can be proved deductively. Nor can it be supported inductively—by arguing that it has always or usually been reliable in the past—for that would beg the question by assuming just what is to be proved.

#### Takes out their offense since it is predicated on using past experiences.

#### 4] Aggregate pleasure is impossible because pain is incommunicable – 5 headaches and a migraine can’t be compared since I don’t know how it feels for you versus me and if it’s the same or different, meaning weighing consequences is arbitrary.

#### 5] Consequentialism is irresolvable because if a bigger harm can outweigh a smaller, there’s always a non-zero chance of a bigger harm in the future and there’s no non-arbitrary point at which consequences stop being relevant

#### 6] No impact to anything – the universe is infinite.

Bostrom 11 Nick Bostrom (Professor, Faculty of Philosophy & Oxford Martin School Director, Future of Humanity Institute Director, Oxford Martin Programme on the Impacts of Future Technology University of Oxford) “Infinite Ethics” Analysis and Metaphysics, Vol. 10 (2011): pp. 9-59

In the standard Big Bang model, assuming the simplest topology (i.e., that space is singly connected), there are three basic possibilities: the universe can be open, flat, or closed. Current data suggests a flat or open universe, although the final verdict is pending. If the universe is either open or flat, then it is spatially infinite at every point in time and the model entails that it contains an infinite number of galaxies, stars, and planets. There exists a common misconception which confuses the universe with the (finite) “observable universe”. But the observable part—the part that could causally affect us—would be just an infinitesimal fraction of the whole. Statements about the “mass of the universe” or the “number of protons in the universe” generally refer to the content of this observable part; see e.g. [1]. Many cosmologists believe that our universe is just one in an infinite ensemble of universes (a multiverse), and this adds to the probability that the world is canonically infinite; for a popular review, see [2]. The “many worlds” of the Everett version of quantum physics, however, would not in any obvious way amount to the relevant kind of infinity; both because whether the “world”-count reaches infinity or merely a large finitude might be an artifact of convenient formalism rather than reflecting of physical reality, and also because the ethical significance of each Everettian “world” should, plausibly, be weighted by its associated measure (amplitude squared), which is a normalized; see e.g. [3].

### Advantage

#### Rigorous climate simulations prove that hydrophilic black carbon would cause atmospheric precipitation – results in a rainout effect that quickly reverses nuclear cooling

Reisner et al. 18 (Jon Reisner – Climate and atmospheric scientist at the Los Alamos National Laboratory. Gennaro D’Angelo – Climate scientist at the Los Alamos National Laboratory, Research scientist at the SETI institute, Associate specialist at the University of California, Santa Cruz, NASA Postdoctoral Fellow at the NASA Ames Research Center, UKAFF Fellow at the University of Exeter. Eunmo Koo - Scientist at Applied Terrestrial, Energy, and Atmospheric Modeling (ATEAM) Team, in Computational Earth Science Group (EES-16) in Earth and Environmental Sciences Division and Co-Lead of Parallel Computing Summer Research Internship (PCSRI) program at the Los Alamos National Laboratory, former Staff research associate at UC Berkeley. Wesley Even - Computational scientist in the Computational Physics and Methods Group at Los Alamos National Laboratory. Matthew Hecht – Atmospheric scientist at the Los Alamos National Laboratory. Elizabeth Hunke - Lead developer for the Los Alamos Sea Ice Model (CICE) at the Los Alamos National Laboratory responsible for development and incorporation of new parameterizations, model testing and validation, computational performance, documentation, and consultation with external model users on all aspects of sea ice modeling, including interfacing with global climate and earth system models. Darin Comeau – Climate scientist at the Los Alamos National Laboratory. Randy Bos - Project leader at the Los Alamos National Laboratory, former Weapons Effects program manager at Tech-Source. James Cooley – Computational scientist at the Los Alamos National Laboratory specializing in weapons physics, emergency response, and computational physics. <MKIM> “Climate impact of a regional nuclear weapons exchange:An improved assessment based on detailed source calculations”. 3/16/18. DOA: 7/13/19. <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2017JD027331>)

\*BC = Black Carbon

The no-rubble simulation produces a significantly more intense fire, with more fire spread, and consequently a significantly stronger plume with larger amounts of BC reaching into the upper atmosphere than the simulation with rubble, illustrated in Figure 5. While the no-rubble simulation **represents the worst-case scenario** involving vigorous fire activity, **only a relatively small amount of carbon makes its way into the stratosphere** during the course of the simulation. But while small compared to the surface BC mass, stratospheric BC amounts from the current simulations are significantly higher than what would be expected from burning vegetation such as trees (Heilman et al., 2014), e.g., the higher energy density of the building fuels and the initial fluence from the weapon produce an intense response within HIGRAD with initial updrafts of order 100 m/s in the lower troposphere. Or, in comparison to a mass fire, wildfires will burn only a small amount of fuel in the corresponding time period (roughly 10 minutes) that a nuclear weapon fluence can effectively ignite a large area of fuel producing an impressive atmospheric response. Figure 6 shows vertical profiles of BC multiplied by 100 (number of cities involved in the exchange) from the two simulations. The total amount of BC produced is in line with previous estimates (about 3.69 Tg from no-rubble simulation); however, the majority of BC resides **below the stratosphere** (3.46 Tg below 12 km) and can be **readily impacted by scavenging from precipitation** either via pyro-cumulonimbus produced by the fire itself (not modeled) or other synoptic weather systems. While the impact on climate of these more realistic profiles will be explored in the next section, it should be mentioned that **these estimates are** still **at the high end**, considering the inherent simplifications in the combustion model that lead to **overestimating BC production**. 3.3 Climate Results Long-term climatic effects critically depend on the initial injection height of the soot, with larger quantities reaching the upper troposphere/lower stratosphere inducing a greater cooling impact because of longer residence times (Robock et al., 2007a). Absorption of solar radiation by the BC aerosol and its subsequent radiative cooling tends to heat the surrounding air, driving an initial upward diffusion of the soot plumes, an effect that depends on the initial aerosol concentrations. **Mixing and sedimentation** tend to **reduce this process**, and low altitude emissions are also significantly impacted by precipitation if aging of the BC aerosol occurs on sufficiently rapid timescales. But once at stratospheric altitudes, aerosol dilution via coagulation is hindered by low particulate concentrations (e.g., Robock et al., 2007a) and lofting to much higher altitudes is inhibited by gravitational settling in the low-density air (Stenke et al., 2013), resulting in more stable BC concentrations over long times. Of the initial BC mass released in the atmosphere, most of which is emitted below 9 km, **70% rains out within the first month** and 78%, or about 2.9 Tg, is removed within the first two months (Figure 7, solid line), with the remainder (about 0.8 Tg, dashed line) being transported above about 12 km (200 hPa) within the first week. This outcome differs from the findings of, e.g., Stenke et al. (2013, their high BC-load cases) and Mills et al. (2014), who found that most of the BC mass (between 60 and 70%) is lifted in the stratosphere within the first couple of weeks. This can also be seen in Figure 8 (red lines) and in Figure 9, which include results from our calculation with the initial BC distribution from Mills et al. (2014). In that case, only 30% of the initial BC mass rains out in the troposphere during the first two weeks after the exchange, with the remainder rising to the stratosphere. In the study of Mills et al. (2008) this percentage is somewhat smaller, about 20%, and smaller still in the experiments of Robock et al. (2007a) in which the soot is initially emitted in the upper troposphere or higher. In Figure 7, the e-folding timescale for the removal of tropospheric soot, here interpreted as the time required for an initial drop of a factor e, is about one week. This result compares favorably with the “LT” experiment of Robock et al. (2007a), considering 5 Tg of BC released in the lower troposphere, in which 50% of the aerosols are removed within two weeks. By contrast, the initial e-folding timescale for the removal of stratospheric soot in Figure 8 is about 4.2 years (blue solid line), compared to about 8.4 years for the calculation using Mills et al. (2014) initial BC emission (red solid line). The removal timescale from our forced ensemble simulations is close to those obtained by Mills et al. (2008) in their 1 Tg experiment, by Robock et al. (2007a) in their experiment “UT 1 Tg”, and © 2018 American Geophysical Union. All rights reserved. by Stenke et al. (2013) in their experiment “Exp1”, in all of which 1 Tg of soot was emitted in the atmosphere in the aftermath of the exchange. Notably, the e-folding timescale for the decline of the BC mass in Figure 8 (blue solid line) is also close to the value of about 4 years quoted by Pausata et al. (2016) for their long-term “intermediate” scenario. In that scenario, which is also based on 5 Tg of soot initially distributed as in Mills et al. (2014), the factor-of2 shorter residence time of the aerosols is caused by particle growth via coagulation of BC with organic carbon. Figure 9 shows the BC mass-mixing ratio, horizontally averaged over the globe, as a function of atmospheric pressure (height) and time. The BC distributions used in our simulations imply that the upward transport of particles is substantially less efficient compared to the case in which 5 Tg of BC is directly injected into the upper troposphere. The semiannual cycle of lofting and sinking of the aerosols is associated with atmospheric heating and cooling during the solstice in each hemisphere (Robock et al., 2007a). During the first year, the oscillation amplitude in our forced ensemble simulations is particularly large during the summer solstice, compared to that during the winter solstice (see bottom panel of Figure 9), because of the higher soot concentrations in the Northern Hemisphere, as can be seen in Figure 11 (see also left panel of Figure 12). Comparing the top and bottom panels of Figure 9, the BC reaches the highest altitudes during the first year in both cases, but the concentrations at 0.1 hPa in the top panel can be 200 times as large. Qualitatively, the difference can be understood in terms of the air temperature increase caused by BC radiation emission, which is several tens of kelvin degrees in the simulations of Robock et al. (2007a, see their Figure 4), Mills et al. (2008, see their Figure 5), Stenke et al. (2013, see high-load cases in their Figure 4), Mills et al. (2014, see their Figure 7), and Pausata et al. (2016, see one-day emission cases in their Figure 1), due to high BC concentrations, but it amounts to only about 10 K in our forced ensemble simulations, as illustrated in Figure 10. Results similar to those presented in Figure 10 were obtained from the experiment “Exp1” performed by Stenke et al. (2013, see their Figure 4). **In that scenario as well, somewhat less that 1 Tg of BC remained in the atmosphere after the initial rainout**. As mentioned before, the BC aerosol that remains in the atmosphere, lifted to stratospheric heights by the rising soot plumes, undergoes sedimentation over a timescale of several years (Figures 8 and 9). This mass represents the effective amount of BC that can force climatic changes over multi-year timescales. In the forced ensemble simulations, it is about 0.8 Tg after the initial rainout, whereas it is about 3.4 Tg in the simulation with an initial soot distribution as in Mills et al. (2014). Our more realistic source simulation involves the worstcase assumption of no-rubble (along with other assumptions) and hence serves as an upper bound for the impact on climate. As mentioned above and further discussed below, our scenario induces perturbations on the climate system similar to those found in previous studies in which the climatic response was driven by roughly 1 Tg of soot rising to stratospheric heights following the exchange. Figure 11 illustrates the vertically integrated mass-mixing ratio of BC over the globe, at various times after the exchange for the simulation using the initial BC distribution of Mills et al. (2014, upper panels) and as an average from the forced ensemble members (lower panels). All simulations predict enhanced concentrations at high latitudes during the first year after the exchange. In the cases shown in the top panels, however, these high concentrations persist for several years (see also Figure 1 of Mills et al., 2014), whereas the forced ensemble simulations indicate that the BC concentration starts to decline after the first year. In fact, in the simulation represented in the top panels, mass-mixing ratios larger than about 1 kg of BC © 2018 American Geophysical Union. All rights reserved. per Tg of air persist for well over 10 years after the exchange, whereas they only last for 3 years in our forced simulations (compare top and middle panels of Figure 9). After the first year, values drop below 3 kg BC/Tg air, whereas it takes about 8 years to reach these values in the simulation in the top panels (see also Robock et al., 2007a). Over crop-producing, midlatitude regions in the Northern Hemisphere, the BC loading is reduced from more than 0.8 kg BC/Tg air in the simulation in the top panels to 0.2-0.4 kg BC/Tg air in our forced simulations (see middle and right panels). The more rapid clearing of the atmosphere in the forced ensemble is also signaled by the soot optical depth in the visible radiation spectrum, which drops below values of 0.03 toward the second half of the first year at mid latitudes in the Northern Hemisphere, and everywhere on the globe after about 2.5 years (without never attaining this value in the Southern Hemisphere). In contrast, the soot optical depth in the calculation shown in the top panels of Figure 11 becomes smaller than 0.03 everywhere only after about 10 years. The two cases show a similar tendency, in that the BC optical depth is typically lower between latitudes 30º S-30º N than it is at other latitudes. This behavior is associated to the persistence of stratospheric soot toward high-latitudes and the Arctic/Antarctic regions, as illustrated by the zonally-averaged, column-integrated mass-mixing ratio of the BC in Figure 12 for both the forced ensemble simulations (left panel) and the simulation with an initial 5 Tg BC emission in the upper troposphere (right panel). The spread in the globally averaged (near) surface temperature of the atmosphere, from the control (left panel) and forced (right panel) ensembles, is displayed in Figure 13. For each month, the plots show the largest variations (i.e., maximum and minimum values), within each ensemble of values obtained for that month, relative to the mean value of that month. The plot also shows yearly-averaged data (thinner lines). The spread is comparable in the control and forced ensembles, with average values calculated over the 33-years run length of 0.4-0.5 K. This spread is also similar to the internal variability of the globally averaged surface temperature quoted for the NCAR Large Ensemble Community Project (Kay et al., 2015). These results imply that surface air temperature differences, between forced and control simulations, which lie within the spread may not be distinguished from effects due to internal variability of the two simulation ensembles. Figure 14 shows the difference in the globally averaged surface temperature of the atmosphere (top panel), net solar radiation flux at surface (middle panel), and precipitation rate (bottom panel), computed as the (forced minus control) difference in ensemble mean values. The sum of standard deviations from each ensemble is shaded. Differences are qualitatively significant over the first few years, when the anomalies lie near or outside the total standard deviation. Inside the shaded region, differences may not be distinguished from those arising from the internal variability of one or both ensembles. The surface solar flux (middle panel) is the quantity that appears most affected by the BC emission, with qualitatively significant differences persisting for about 5 years. The precipitation rate (bottom panel) is instead affected only at the very beginning of the simulations. The red lines in all panels show the results from the simulation applying the initial BC distribution of Mills et al. (2014), where the period of significant impact is much longer owing to the higher altitude of the initial soot distribution that results in longer residence times of the BC aerosol in the atmosphere. When yearly averages of the same quantities are performed over the IndiaPakistan region, the differences in ensemble mean values lie within the total standard deviations of the two ensembles. The results in Figure 14 can also be compared to the outcomes of other previous studies. In their experiment “UT 1 Tg”, Robock et al. (2007a) found that, when only 1 Tg of soot © 2018 American Geophysical Union. All rights reserved. remains in the atmosphere after the initial rainout, temperature and precipitation anomalies are about 20% of those obtained from their standard 5 Tg BC emission case. Therefore, the largest differences they observed, during the first few years after the exchange, were about - 0.3 K and -0.06 mm/day, respectively, comparable to the anomalies in the top and bottom panels of Figure 14. Their standard 5 Tg emission case resulted in a solar radiation flux anomaly at surface of -12 W/m2 after the second year (see their Figure 3), between 5 and 6 time as large as the corresponding anomalies from our ensembles shown in the middle panel. In their experiment “Exp1”, Stenke et al. (2013) reported global mean surface temperature anomalies not exceeding about 0.3 K in magnitude and precipitation anomalies hovering around -0.07 mm/day during the first few years, again consistent with the results of Figure 14. In a recent study, Pausata et al. (2016) considered the effects of an admixture of BC and organic carbon aerosols, both of which would be emitted in the atmosphere in the aftermath of a nuclear exchange. In particular, they concentrated on the effects of coagulation of these aerosol species and examined their climatic impacts. The initial BC distribution was as in Mills et al. (2014), although the soot burden was released in the atmosphere over time periods of various lengths. Most relevant to our and other previous work are their one-day emission scenarios. They found that, during the first year, the largest values of the atmospheric surface temperature anomalies ranged between about -0.5 and -1.3 K, those of the sea surface temperature anomalies ranged between -0.2 and -0.55 K, and those of the precipitation anomalies varied between -0.15 and -0.2 mm/day. All these ranges are compatible with our results shown in Figure 14 as red lines and with those of Mills et al. (2014, see their Figures 3 and 6). As already mentioned in Section 2.3, the net solar flux anomalies at surface are also consistent. This overall agreement suggests that the **inclusion of organic carbon aerosols, and** ensuing **coagulation** with BC, **should not dramatically alter the climatic effects** resulting from our forced ensemble simulations. Moreover, aerosol growth would likely **shorten the residence time of the BC particulate in the atmosphere** (Pausata et al., 2016), possibly **reducing the duration of these effects.**

#### Isolated island populations repopulate Earth after radiation and nuclear winter – bunkers and submarines expand the likelihood of survival

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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

#### It would still be pretty bad – industrial civilization wouldn’t recover

Baum 19 Seth Baum, executive director of the [Global Catastrophic Risk Institute](https://gcrinstitute.org/), 4-8-2019, "Why catastrophes can change the course of humanity," BBC, https://www.bbc.com/future/article/20190408-how-catastrophes-can-change-the-path-of-humanity, SJBE

**To better understand how a catastrophe could shape humanity’s future, let’s consider one example: an all-out nuclear war that involved all of the world’s nuclear-armed countries: China, France, India, Israel, North Korea, Pakistan, Russia, the United Kingdom and the US**. Only the most expansive war would manage to draw in all of these countries. A more probable scenario would only involve Russia and the US, which together hold over 90% of the global nuclear arsenal. But for the sake of discussion, let’s consider **the worst-case nuclear war**. Even in the worst case, **much of the world would presumably be spared from immediate destruction**. Africa and Latin America in particular are full of countries that are neither close allies nor adversaries of any of the nuclear-armed countries. Residents of these countries would presumably survive the initial nuclear explosions, as would people who live in the targeted countries but away from the cities and military sites that get bombed. The harm from nuclear war would spread far beyond the bombed areas **The survivors’ world would instantly be changed. In addition to the social and political turmoil, they would also lose many important nodes in the global economy.** Many global supply chains are designed to be highly efficient under normal conditions but are fragile to even small disruptions – and this disruption would not be small at all. **Within weeks or even days, communities all over the world could face shortages of consumer goods, replacement parts for critical industrial infrastructure, and other basics**. Soon after, the global environmental effects would start to kick in. Nuclear explosions are so powerful that they can send the dust and ash from burning cities all the way into the stratosphere, which is the second layer of the atmosphere, located 7km (4 miles) above the surface at the poles and 20km (12 miles) at the equator. The stratosphere is above the clouds, so anything that gets up there doesn’t wash out in the rain. Instead, it spreads around the world within a few months and stays aloft for a few years. While aloft, it blocks incoming sunlight, cooling the surface and reducing precipitation, all of which is bad news for agriculture. (Find out more about [how prepared we are for the impact of nuclear war](http://www.bbc.com/future/story/20170821-how-prepared-are-we-for-the-impact-of-a-nuclear-war)). **The famine from a worst-case nuclear war would kill many people all around the world, possibly more than would die from the war itself. But it might not kill everyone. There are some food stockpiles that could keep some people alive until the skies clear. Additional food could be grown from artificial light or other sources, assuming supplies for that were intact. The combination of global famine plus the destruction of the war itself would severely strain our modern global civilisation.** It is possible that the survivors could keep life as we know it more or less intact. **But with all the pressures they face, it would be understandable if our civilisation collapsed, just as previous civilisations from Egypt to Easter Island once did (see “**[**Are we headed for civilisation collapse?**](http://www.bbc.com/future/story/20190218-are-we-on-the-road-to-civilisation-collapse)**”).** What the intersection of famine and destruction following a nuclear war tells us is that catastrophes are often interconnected. The consequences – and vulnerability – a single catastrophe creates can linger from many years after the event. A nuclear war isn’t just a nuclear war: it is also an economic recession and an agriculture failure. How well civilisation endures it may depend a lot on how much it has already been weakened by global warming and other environmental degradation. The effects of the nuclear war could precipitate additional catastrophes, such as a pandemic (due to weakened public health infrastructure) or a catastrophic failure of geoengineering (leading to accelerated climate change). This is a scenario my colleagues and I have called a “[double catastrophe](http://sethbaum.com/ac/2013_DoubleCatastrophe.html)”. Because of all these interconnections, it is important to study catastrophes all together, instead of in isolation. People often ask me which risks are the biggest, but this is the wrong way to look at it. We face an interconnected system of catastrophic risk, not a collection of isolated risks. My colleagues and I have developed the concept of “[integrated assessment](https://ssrn.com/abstract=3046816)” of catastrophic risks to study the interconnected risk and develop the best ways of addressing it. Regardless of what all the catastrophe entails, it raises the question of what happens next. If humanity goes extinct, this question is of course easy to answer: we’re all dead. But if some people survive, the answer is a subtler matter. **If civilisation ceased functioning, survivors would be largely on their own to keep themselves alive and healthy.** Today, most people live in urban areas and may struggle to grow their food. (Ask yourself: would you know how to survive without civilisation providing you your basic needs?) Ironically, some of the most well-off people in the post-catastrophe world could be the subsistence farmers who are today considered to be among the world’s poorest. (Read more about [what happens, and how people react, in a food crisis](http://www.bbc.com/future/story/20190319-what-happens-when-the-food-runs-out)). One critical task would be reproduction. Survivor populations would need to be large enough and close enough together in order to produce new generations of humans. Otherwise, the population would die out. **Scientists have proposed that as few as 150 or as many as 40,000 people could be needed to sustain a genetically viable population**. The more favourable the conditions, the fewer people are needed, and the more likely a population is to succeed. A post-catastrophe world would also have some major disadvantages. **For example, a lot of the most accessible fossil fuels and other resources have already been extracted and used up. Some industrial pollutants also would persist for many years.**

#### Extinction is inevitable from future technology — nanotech, our simulation gets shut down, AI, biotech, particle accelerators, and black swans

Bruce **Sterling**, 6-1-20**18**, "When Nick Bostrom says “Bang”," WIRED, https://www.wired.com/beyond-the-beyond/2018/06/nick-bostrom-says-bang/

4.1 Deliberate misuse of nanotechnology In a mature form, molecular nanotechnology will enable the construction of bacterium-scale self-replicating mechanical robots that can feed on dirt or other organic matter [22-25]. Such replicators could eat up the biosphere or destroy it by other means such as by poisoning it, burning it, or blocking out sunlight. A person of malicious intent in possession of this technology might cause the extinction of intelligent life on Earth by releasing such nanobots into the environment.[9] The technology to produce a destructive nanobot seems considerably easier to develop than the technology to create an effective defense against such an attack (a global nanotech immune system, an “active shield” [23]). It is therefore likely that there will be a period of vulnerability during which this technology must be prevented from coming into the wrong hands. Yet the technology could prove hard to regulate, since it doesn’t require rare radioactive isotopes or large, easily identifiable manufacturing plants, as does production of nuclear weapons [23]. Even if effective defenses against a limited nanotech attack are developed before dangerous replicators are designed and acquired by suicidal regimes or terrorists, there will still be the danger of an arms race between states possessing nanotechnology. It has been argued [26] that molecular manufacturing would lead to both arms race instability and crisis instability, to a higher degree than was the case with nuclear weapons. Arms race instability means that there would be dominant incentives for each competitor to escalate its armaments, leading to a runaway arms race. Crisis instability means that there would be dominant incentives for striking first. Two roughly balanced rivals acquiring nanotechnology would, on this view, begin a massive buildup of armaments and weapons development programs that would continue until a crisis occurs and war breaks out, potentially causing global terminal destruction. That the arms race could have been predicted is no guarantee that an international security system will be created ahead of time to prevent this disaster from happening. The nuclear arms race between the US and the USSR was predicted but occurred nevertheless. 4.2 Nuclear holocaust[winter] The US and Russia still have huge stockpiles of nuclear weapons. But would an all-out nuclear war really exterminate humankind? Note that: (i) For there to be an existential risk it suffices that we can’t be sure that it wouldn’t. (ii) The climatic effects of a large nuclear war are not well known (there is the possibility of a nuclear winter). (iii) Future arms races between other nations cannot be ruled out and these could lead to even greater arsenals than those present at the height of the Cold War. The world’s supply of plutonium has been increasing steadily to about two thousand tons, some ten times as much as remains tied up in warheads ([9], p. 26). (iv) Even if some humans survive the short-term effects of a nuclear war, it could lead to the collapse of civilization. A human race living under stone-age conditions may or may not be more resilient to extinction than other animal species. 4.3 We’re living in a simulation and it gets shut down A case can be made that the hypothesis that we are living in a computer simulation should be given a significant probability [27]. The basic idea behind this so-called “Simulation argument” is that vast amounts of computing power may become available in the future (see e.g. [28,29]), and that it could be used, among other things, to run large numbers of fine-grained simulations of past human civilizations. Under some not-too-implausible assumptions, the result can be that almost all minds like ours are simulated minds, and that we should therefore assign a significant probability to being such computer-emulated minds rather than the (subjectively indistinguishable) minds of originally evolved creatures. And if we are, we suffer the risk that the simulation may be shut down at any time. A decision to terminate our simulation may be prompted by our actions or by exogenous factors. While to some it may seem frivolous to list such a radical or “philosophical” hypothesis next the concrete threat of nuclear holocaust, we must seek to base these evaluations on reasons rather than untutored intuition. Until a refutation appears of the argument presented in [27], it would intellectually dishonest to neglect to mention simulation-shutdown as a potential extinction mode. 4.4 Badly programmed superintelligence When we create the first superintelligent entity [28-34], we might make a mistake and give it goals that lead it to annihilate humankind, assuming its enormous intellectual advantage gives it the power to do so. For example, we could mistakenly elevate a subgoal to the status of a supergoal. We tell it to solve a mathematical problem, and it complies by turning all the matter in the solar system into a giant calculating device, in the process killing the person who asked the question. (For further analysis of this, see [35].) 4.5 Genetically engineered biological agent With the fabulous advances in genetic technology currently taking place, it may become possible for a tyrant, terrorist, or lunatic to create a doomsday virus, an organism that combines long latency with high virulence and mortality [36]. Dangerous viruses can even be spawned unintentionally, as Australian researchers recently demonstrated when they created a modified mousepox virus with 100% mortality while trying to design a contraceptive virus for mice for use in pest control [37]. While this particular virus doesn’t affect humans, it is suspected that an analogous alteration would increase the mortality of the human smallpox virus. What underscores the future hazard here is that the research was quickly published in the open scientific literature [38]. It is hard to see how information generated in open biotech research programs could be contained no matter how grave the potential danger that it poses; and the same holds for research in nanotechnology. Genetic medicine will also lead to better cures and vaccines, but there is no guarantee that defense will always keep pace with offense. (Even the accidentally created mousepox virus had a 50% mortality rate on vaccinated mice.) Eventually, worry about biological weapons may be put to rest through the development of nanomedicine, but while nanotechnology has enormous long-term potential for medicine [39] it carries its own hazards. 4.6 Accidental misuse of nanotechnology (“gray goo”) The possibility of accidents can never be completely ruled out. However, there are many ways of making sure, through responsible engineering practices, that species-destroying accidents do not occur. One could avoid using self-replication; one could make nanobots dependent on some rare feedstock chemical that doesn’t exist in the wild; one could confine them to sealed environments; one could design them in such a way that any mutation was overwhelmingly likely to cause a nanobot to completely cease to function [40]. Accidental misuse is therefore a smaller concern than malicious misuse [23,25,41]. However, the distinction between the accidental and the deliberate can become blurred. While “in principle” it seems possible to make terminal nanotechnological accidents extremely improbable, the actual circumstances may not permit this ideal level of security to be realized. Compare nanotechnology with nuclear technology. From an engineering perspective, it is of course perfectly possible to use nuclear technology only for peaceful purposes such as nuclear reactors, which have a zero chance of destroying the whole planet. Yet in practice it may be very hard to avoid nuclear technology also being used to build nuclear weapons, leading to an arms race. With large nuclear arsenals on hair-trigger alert, there is inevitably a significant risk of accidental war. The same can happen with nanotechnology: it may be pressed into serving military objectives in a way that carries unavoidable risks of serious accidents. In some situations it can even be strategically advantageous to deliberately make one’s technology or control systems risky, for example in order to make a “threat that leaves something to chance” [42]. 4.7 Something unforeseen We need a catch-all category. It would be foolish to be confident that we have already imagined and anticipated all significant risks. Future technological or scientific developments may very well reveal novel ways of destroying the world. Some foreseen hazards (hence not members of the current category) which have been excluded from the list of bangs on grounds that they seem too unlikely to cause a global terminal disaster are: solar flares, supernovae, black hole explosions or mergers, gamma-ray bursts, galactic center outbursts, supervolcanos, loss of biodiversity, buildup of air pollution, gradual loss of human fertility, and various religious doomsday scenarios. The hypothesis that we will one day become “illuminated” and commit collective suicide or stop reproducing, as supporters of VHEMT (The Voluntary Human Extinction Movement) hope [43], appears unlikely. If it really were better not to exist (as Silenus told king Midas in the Greek myth, and as Arthur Schopenhauer argued [44] although for reasons specific to his philosophical system he didn’t advocate suicide), then we should not count this scenario as an existential disaster. The assumption that it is not worse to be alive should be regarded as an implicit assumption in the definition of Bangs. Erroneous collective suicide is an existential risk albeit one whose probability seems extremely slight. (For more on the ethics of human extinction, see chapter 4 of [9].) 4.8 Physics disasters The Manhattan Project bomb-builders’ concern about an A-bomb-derived atmospheric conflagration has contemporary analogues. There have been speculations that future high-energy particle accelerator experiments may cause a breakdown of a metastable vacuum state that our part of the cosmos might be in, converting it into a “true” vacuum of lower energy density [45]. This would result in an expanding bubble of total destruction that would sweep through the galaxy and beyond at the speed of light, tearing all matter apart as it proceeds. Another conceivability is that accelerator experiments might produce negatively charged stable “strangelets” (a hypothetical form of nuclear matter) or create a mini black hole that would sink to the center of the Earth and start accreting the rest of the planet [46]. These outcomes seem to be impossible given our best current physical theories. But the reason we do the experiments is precisely that we don’t really know what will happen. A more reassuring argument is that the energy densities attained in present day accelerators are far lower than those that occur naturally in collisions between cosmic rays [46,47]. It’s possible, however, that factors other than energy density are relevant for these hypothetical processes, and that those factors will be brought together in novel ways in future experiments. The main reason for concern in the “physics disasters” category is the meta-level observation that discoveries of all sorts of weird physical phenomena are made all the time, so even if right now all the particular physics disasters we have conceived of were absurdly improbable or impossible, there could be other more realistic failure-modes waiting to be uncovered. The ones listed here are merely illustrations of the general case.