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The Doomsday Argument Reconsidered

Abstract:

In our current unstable world, nuclear warfare, climate crises, and techno nihilism are three perilous clouds hovering over an anxious humanity. In this article I examine our current state of affairs with regard to the imminent risk of nuclear holocaust, rapid climate emergencies destroying the planet, and the cultural and political consequences of emerging technologies on the fate of civilization. In the wake of innumerable existential threats to the future of our world, I revisit the plausibility of the Doomsday Argument, which predicts the end of human existence.

Keywords:

Doomsday Argument, Doomsday Clock, climate change, nuclear warfare, techno warfare, terrorism, existential risk studies

A group of concerned scientists from the University of Chicago who had helped invent the first atomic bombs in The Manhattan Project formed the *Bulletin of the Atomic Scientists* in 1945. In 1947 they created the Doomsday Clock, an iconic symbolic clock face showing a countdown to the end of the world, designed to metaphorically represent existential dangers to humanity and the planet. The Clock has become universally recognized as a major indicator of threats to global catastrophe from nuclear warfare, climate change, and developing technologies in computer engineering and the life sciences. In 2015 the clock was set at 3 minutes to midnight and it had

remained there until the US presidential election of Donald Trump.¹ It is now 100 seconds to countdown, the closest it has ever been in history, hence surpassing the time set in 1953 while at the height of the Cold War.

The *Bulletin* is an independent nonprofit organization composed of international experts and advisors of humanitarian concern who assess the risks and benefits of scientific and technological advancements with the goal of influencing public engagement, foreign policy, treaty negotiations, and protection of the Earth and all its inhabitants. It has distilled critical issues and framed debates in various committees of Parliament and the United Nations on breakdowns and achievements in security efforts. Each year attention is paid to the most pressing global threats, which informs the setting of the minute hand of the Clock with regard to how we are more or less safe than the previous year. Despite gains by the Joint Comprehensive Plan of Action that facilitated the Iran nuclear deal, and hence advanced nuclear disarmament efforts in the Middle East and throughout the world, as well as the 2015 Climate Conference in Paris that brought nearly 200 countries together to pledge to reduce the looming doom of climate change, due to North Korea's nuclear testing and magniloquence, the nuclear modernization programs in the United States, Russia, and around the world, the inability of collective nations to effectively and safely deal with nuclear waste, and the persistence of planetary warming and the destruction of our environment, the Clock remains perilously close to midnight.² In the *Bulletin's* Science and Security Board's 2016 Statement, they deliver a foreboding omen:

Three minutes [to midnight] is too close. Far too close. We, the members of the Science and Security Board of the *Bulletin of the Atomic Scientists*, want to be clear about our decision not to move the hands of the Doomsday Clock in 2016: That decision is not good news, but an expression of dismay that world leaders continue to fail to focus their efforts and the world's attention on reducing the extreme danger posed by nuclear weapons and climate change. When we call these dangers existential, that is exactly what we mean: They threaten the very existence of civilization and therefore should be the first order of business for leaders who care about their constituents and their countries.³

Since 2015, things have only gotten worse. In 2015 there was much disturbing nuclear bombast with visible tensions between the leaders of the United States and Russia, North Korea, and Israel disgruntled over the Iran deal. And with the increase in Islamic State terrorism from Paris to Brussels, San Bernardino, Orlando, Istanbul, and Nice, the Syrian refugee crisis, and mass diasporas throughout Western Europe and North America, a world tinderbox kindles. World superpowers have initiated to maintain and modernize their nuclear warheads and infrastructure despite arms control treaty agreements of nuclear non-proliferation under the rhetoric and guise of a nuclear weapon-free world. When the United States plans to spend \$350 billion in the next 10 years to refurbish its nuclear weapons capabilities while spending \$5.8 billion each year in cleaning up its floundering nuclear waste disposal programs,⁴ there is something wrong with this picture. Presumably every country with a nuclear arsenal wants to defend itself against foreign "crazies," but they are

1) The decision to move the minute hand of the Clock is made by the *Bulletin's* Science and Security Board in conjunction with the Board of Sponsors, which includes 16 Nobel Laureates. The hands of the Clock were moved to three minutes before midnight on January 22, 2015, two and a half minutes in 2017, then two minutes in 2018 and 2019 making this nearest to the apocalypse since 1953, which was at the height of the Cold War. See *Bulletin of the Atomic Scientists* (2016, 2017, 2018, 2019).

2) See Bronson, "Statement from the executive director," i.

3) See Mecklin, "It Is Still 3 Minutes to Midnight," 4-5.

4) *Ibid.*, 2, 4.

equally concerned with maintaining power, flexing military muscle, and in advancing their own economy and megalomaniac political maneuverability. With a Russian state-sponsored news agency threatening to turn the United States into radioactive ash, North Korea's announcing they had developed a hydrogen bomb followed by a series of tests, NATO's military repositioning toward the Russian border, China's agreement to help Pakistan build nuclear missile submarine platforms as anxious India becomes more nervous, and dispute over free passage in the South China Sea followed by the US sending military naval presence to the island territories, the potential for major conflicts among nations with nuclear powers has escalated. The Hague's recent decision that China has no rights to these waters (rich in fishing, minerals, and underground fossil fuels) followed by China's brazen rebuke and defiance – claiming it will do whatever it wants, has only enflamed the tensions. And if Kim Jong-Un is allowed to continue to develop North Korea's nuclear arsenals without restraints,⁵ another international war is predictable.

Adding to the Science and Security Board's 2017 decision to move the clock closer to midnight was the world-shocking election of Donald Trump to the Oval Office. Given that Trump had carelessly and disturbingly spoke about using nuclear weapons during his campaign, followed by a series of executive orders once elected, it was no surprise that Iran immediately underwent a ballistic missile test followed by North Korea firing a missile over the Sea of Japan, just as Netanyahu announced plans for expanding Israeli settlements. Given that Iran had shown open hostility toward the international community on the heels of its nuclear deal, Pakistan and India continued warring in Kashmir, and North Korea had conducted its fourth and fifth underground nuclear tests in 2016 – followed by many more missiles testing after that, the current climate seems like we are all walking on eggshells. Given that Trump has gone on record that climate change is a hoax; and plans to expand oil pipelines, bring back mining jobs, and condone more industrial burning of coal and fossil fuels – the planet will only get hotter if he succeeds. The loss of trust in democratic institutions by the masses, the proliferation of fake news, security breaches, cyberhacking (such as Russia's deceptive offensives in trying to manipulate the US presidential election,) and the incompetent Trump administration which ignores governmental intelligence experts, professional organizations, academics, researchers, and those who possess expert knowledge, and discounts the truth and reality of sound science (such as by appointing a buffoon to the head of the Environmental Protection Agency who openly denied global warming),⁶ had only made international relations, ecology, and security conditions worse. And as Trump and Putin plan to expand their nuclear and military spending, the world is more dangerous now than ever before.

Despite promissory assurances from 196 signatory countries at the Paris accord to keep global warming emissions under 2 degrees Celsius, there is no way to enforce their vows or their compliance. And even if there was, the UN Climate Change Secretariat acknowledged that if all the countries were to follow through on their basic promises, the carbon dioxide budget would be exhausted long before the target date of reduced emissions. When the Republican Party, of the United States (one of the largest polluters of the planet,) decries that there is no such thing as manmade-caused global warming or the Anthropocene, nor that climate change is really even a problem, such hubris and reckless disregard for the empirical facts merely belies political propaganda designed not to challenge the status quo where corporate capitalists and lobby sectors bequeath large financial campaign contributions, not to mention the obvious truth that they are living in pompous denial: 2016 and 2019 were the hottest years on record with an increase in the global temperature surpassing 1 degree Celsius over preindustrial levels.

5) Ibid., 1–3.

6) See Davenport's analysis of Scott Pruitt's inane denial of the objective science and empirical facts of climate change; Davenport, "E.P.A. Chief Doubts Consensus View of Climate Change."

Since 2017, we have been on the cusp of a new nuclear arms race as we have recently witnessed with North Korea and Russia stoking the fire. As a result, the world has become a more dangerous place. With careless rhetoric, childish name-calling, and provocation from the United States, there is increased probability for war by intention, miscalculation, or accident. With increased military exercises along the borders of NATO, reduced arms control negotiations, upgrading arsenals that undermine the Intermediate-Range Nuclear Forces Treaty (INF), and the intensification of tensions in the Asia-Pacific region, South Asia, Pakistan and India, the South China Sea, and the Middle East, uncertainties of the US renunciation of the Iran deal and withdrawal from the Paris Agreement, which the White House has decided to break off, we must not underestimate the hazard. World order has been undermined and exacerbated by the Trump administration's backing away from longstanding US leadership in international diplomacy, which has devolved into disparaging invectives and cursing, mimicking the surreal irreality of an undisciplined, unpredictable, and disruptive Reality TV caricature who sits as the US president.

The decision to move the hands to 100 seconds to midnight highlights the urgency of the situation, what the *Bulletin* now refers to as "a new abnormal." In 2019, John Mecklin, editor of the Clock Statement, stated that the major threats of nuclear weapons and the climate crisis "were exacerbated this past year by the increased use of information warfare to undermine democracy around the world, amplifying risk from these and other threats and putting the future of civilization in extraordinary danger."⁷ In 2020 he stressed how matters have worsened on all fronts, including the increased peril of

Cyber-enabled disinformation campaigns to sow distrust in institutions and among nations, undermining domestic and international efforts to foster peace and protect the planet... We have seen influential leaders denigrate and discard the most effective methods for addressing complex threats – international agreements with strong verification regimes – in favor of their own narrow interests and domestic political gain.⁸

Our international security situation is now a new abnormal, where the US has abandoned its commitment to back the Iran deal, and withdrew from the INF Treaty, hence leaving the global arms control process to others without say, regulation, or oversight. And with candid commitments from the key nuclear nations to modernize its arsenals, what has gone from talk of denuclearization of weaponry in the past is now a new, unregulated global arms race under the guise of modernization and "threats to national security." The once promised hope of nuclear reduction and constraint has all but gone out the window.

The Science and Security Board of the *Bulletin of the Atomic Scientists* are also concerned about threats due to the rapid advancements of emerging technologies in the cyber realm, biotechnology, synthetic biology, genetic engineering, artificial intelligence (AI), information technologies, and the use of robotic weapons that place humanity in peril. The manufacturing of AI technologies and autonomous weapons that can act independently without human supervision, intervention, or decision making in executing activities that can kill is most worrisome, as they are susceptible to error, miscalculation, malfunctioning, misreading or inaccurately processing information in the moment, and open to manipulation by malicious agents who may wish to trick into thinking there is a war. With the deliberate interference of information technologies that present the illusion of truth and spread false information that is presented as fact, the existential risks for escalating fear and resultant conflict is ominous. Mecklin reproaches:

7) Mecklin, "A New Abnormal," 2.

8) Mecklin, "It Is 100 Seconds to Midnight," 3.

In many forums, including particularly social media, nationalist leaders and their surrogates lied shamelessly, insisting that their lies were truth, and the truth “fake news.” These intentional attempts to distort reality exaggerate social divisions, undermine trust in science, and diminish confidence in elections and democratic institutions. Because these distortions attack the rational discourse required for solving the complex problems facing humanity, cyber-enabled information warfare aggravates other major global dangers – including those posed by nuclear weapons and climate change – as it undermines civilization generally.⁹

When impudent and foolhardy leaders flail around nuclear language during times of diplomatic disputes and regional instabilities, portents of warfare are amplified. This is not a game; the world is not a Reality TV program. But the psychopaths among us and in positions of national political leadership set the tone for how the show will end. When propaganda and lies as information warfare are disseminated through communication networks pretending to be truth, fact, and empirical reality, this only inflames emotional prejudices and negative passions that eclipse the capacity of informed reason, logic, and sober science.

Because “the world is sleepwalking its way through a newly unstable nuclear landscape,” the *Bulletin’s* 2020 Doomsday Statement has gone so far as to “declare a state of emergency that requires the immediate, focused, and unrelenting attention of the entire world.”¹⁰ The United States’ derisive and bullying attitudes toward Iran, North Korea, Russia, and China only aggravates matters, which will likely result in a breakdown of arms control negotiations propelling the world toward a completely unregulated nuclear environment. And when international governmental climate change conferences result in no agreement on curbing emissions, not to mention dismantling and withdrawal from previous accords, it should come as no surprise that the planet would catch fire. 2019 was the year the world burned: India and Pakistan experienced record-breaking heatwaves followed by unrelenting floods, and out of control wildfires in both hemispheres, from Australia to the Arctic, California to the Amazon, consumed everything in its path like a ravenous swarm of locust descending on a field, such as in Africa. Tack onto that doomsday scenario the increased use of techno, space, and cyberwarfare, such as “deepfakes,” genetic engineering, synthetic biology that could be weaponized, AI weaponry without human supervision that could make lethal decisions or could be easily hacked and manipulated, and other disruptive high-speed technologies that are highly automated: such precarious conditions are only breeding grounds for ambiguity, misunderstandings, uncertainty, provocations, and panic that could lead to a rapid escalation of war – all signalling a “fundamental dysfunction in the world’s efforts to manage and reduce existential risk.”¹¹

Without proper societal oversight or the ability to control and regulate emergent technological sciences, these compounded existential dangers along with nuclear rhetoric and unmitigated climate change continue to pose global-scale risks to us all. Despite the diplomatic achievements of the Paris accord and the Iran nuclear agreement, the nuclear modernization programs of world superpowers usher in a new cold war era, and the world has barely done a thing to ameliorate let alone subvert climate catastrophe. Because of these failures in world leadership, over the past few years the *Bulletin* calls on world citizens and political agencies to:

- Dramatically reduce proposed spending on nuclear weapons modernization programs
- Reenergize the disarmament process, with a focus on results

9) Mecklin, “A New Abnormal,” 3.

10) Mecklin, “It Is 100 Seconds to Midnight,” 4.

11) *Ibid.*, 8.

- Encourage US and Russian leaders to limit their nuclear proliferation, reduce alert levels, provocative military exercises, prevent peacetime incidents along NATO borders, reinstate or renegotiate its differences over the INF Treaty, and deescalate mutual threats that have potential for crisis escalation and/or could accidentally precipitate a senseless war
- Engage North Korea in serious dialogue to reduce nuclear risks and cease its missile testing – the only country to violate the norm against nuclear testing in 20 years
- The US presidential administration needs to revisit its lamentable decision to exit the Joint Comprehensive Plan of Action for limiting Iran’s nuclear power initiative, which is in the best interests of the international community’s concerns over the spread of nuclear weapons
- Follow up on the Paris accord with actions that sharply reduce greenhouse gas emissions and fulfill the Paris promise of keeping warming below 2 degrees Celsius
- Insist that the United States acknowledge the reality and scientific truth of climate change, rejoin the Paris agreement, limit its nation’s pollution, and support carbon-friendly energy sources and policies
- Implore citizens of the globe, and especially from the US, to demand climate action from their governments and move toward a decarbonized world
- Provide support to poorer and developing countries so they can make a transition to post-carbon dependencies
- Establish new international protocols and laws that discourage and penalize misuse of science and information technology, spread false news (alternative facts/disinformation) in a post-truth world of runaway abuse in social media; and prevent deceptive political campaigns that undermine public trust in social institutions, the media, science, democracy, and objective reality itself
- Abolish autonomous weaponry technology that could make “kill” decisions without proper human supervision, oversight, or input
- Deal now with the commercial nuclear waste problem; and
- Create institutions specifically assigned to explore and address potentially catastrophic misuses of new technologies

This is the most dangerous time humanity has ever faced. We must unite and act.

Conclusion: “The Clock ticks. Global danger looms. Wise leaders should act – immediately.”¹² All of this calls for genuine relational exchange, diplomatic dialogue, international negotiation of values and needs, governmental restraint on intimidation and issuing threats against other nations, political compromise, restriction and regulation of private industry that cares more about capital exploitation than world peace, and an authentic desire for living in concord within our world communities and preserving our planet’s ecological integrity. No small feat indeed, especially when impasse, politics, and greed pre-empt any sincere discussions toward mutual cooperation among nations let alone working in concert toward viable solutions. Over the past few years the Science and Security Board warned that the probability of global catastrophe was very high, but from 2017–2020, they concluded that the danger is even greater and more urgent, imploring our “wise” cosmopolitan citizens to step up and “lead the way.”¹³ And the Clock keeps ticking.

12) Mecklin, “It Is Still 3 Minutes to Midnight,” 5.

13) Mecklin, “It Is Two and a Half Minutes to Midnight,” 8.

The Domsday Argument

In this age of terrorism post 9/11, world anxiety becomes our number one preoccupation. When deranged minds are willing to sacrifice their own lives during the suicidal terrorist acts of committing murder, no one or nation is immune from threat. The Brussels ISIS attack targeting the international hub of the diplomatic world that stands for peace shows how symbolic hatred and revenge has become. In the wake of such persistent anxiety, “unhappy and paranoid” becomes the epithet we shall apply to characterize collective humanity. And just as Freud’s seminal work, *Das Unbehagen in der Kultur*, described the unease, trepidation, and unhappiness within the culture of his day during the early rise of Hitler, we may justifiably conclude that the scale and ferocity of cross-cultural/interfaith/interethnic aggression has intensified and gotten much worse since his time. The fantasy that men are inherently gentle creatures who are born good, free of dispositional sin, and untainted by primitive intent can no longer be sustained by critical reason. It is an empirical fact that by all historiographical accounts of cultural anthropology, human civilization has been forged on human conflict, attachment deficits in parent-child rearing practices, emotional, physical, and sexual abuse, traumatization, dehumanization, and war. Given the historical progression of civilization, what reasonable trajectory do we posit for the future of humanity?

The astrophysicist and cosmologist Brandon Carter has provided a mathematical formulation (using Bayes’ theorem) that predicts the probability of human extinction.¹⁴ Given that there are nearly 8 billion people alive on this planet today, and that we are amongst the most people who have ever lived in the history of the human race, from a predictive statistical standpoint, it is speculated that there is an approximate 5% chance that we will expire within a couple hundred years and a 95% chance that complete human extinction will occur in approximately 7 thousand years, with a possible degree of freedom extending this figure to just over 9 thousand years. This is known as the “Domsday Argument.”¹⁵ In other words, if all the humans alive today are in a random place in the human history timeline, then we are nearer to extinction than not.

While there are different versions of this scenario that vary in scope and formulation, including critiques, refutations, and rebuttals, philosopher John Leslie has championed this argument in his chilling speculations on the end of the world.¹⁶ One cannot entertain the actual risks of complete human annihilation based on such brute evidence without sinking into worrisome pessimism. Leslie draws alarming attention to the underestimated dangers that threaten human extinction, including the notion that we could become extinct fairly soon. Despite the recognized risks of natural disaster, including volcanic eruptions, the Earth colliding with asteroids or comets, astronomical explosions like supernovae, galactic center outbursts, and solar flares, or a complex breakdown of the Earth’s biosphere, we are well aware that most of the immediate threats to the survival of

14) Although Carter, in “The Anthropic Principle and its Implication for Biological Evolution” and “Large Number Coincidences and the Anthropic Principle in Cosmology,” introduced the notion of the anthropic principle in cosmology, he never intended to apply it to the question of human extinction, which was picked up by others, most notably John Leslie, and used to speculate about the end of the world.

15) Nick Bostrom, see Bostrom’s *Anthropic Bias* and “The Domsday Argument,” provides a lengthy critique of the various types of doomsday arguments in science, cosmology, mathematics, and philosophy with an emphasis on anthropic bias and observation selection effects determining various outcomes, including the attribution of a priori probability weighting. Of course, depending upon the premises one presupposes or adopts, from mathematical-statistical-simulation models to philosophy and cultural anthropology, we get different probability shifts. Some claim to have refuted the argument based on probability theory, finding it highly speculative or simply a thought experiment, despite being inconsistent and incompatible with other refutations relying on probabilistic inferences, while others find the doomsday argument inconclusive.

16) See Leslie, *The End of the World*.

the human race come from man. We damage our own ozone layer, dump toxins into our air, lands, and seas via mass industrial pollution, increase greenhouse effects that ruin our ecosystems, and introduce fatal viral diseases and new varieties of plague that infiltrate our continents. Soon the world could become uninhabitable. From nuclear war to germ warfare, radiation poisoning, biological and chemical warfare, terrorism, criminality, technological manipulations such as genetic engineering disasters, food infections (e.g. salmonella bacteria,) computer-initiated network malfunctions, Internet viruses, or techno-war that jeopardize human survival, and scientific hubris – like biohacking, nanotechnology, or careless physics experimentations “at immensely high energies, [that] will upset a space-filling ‘scalar field’ and destroy the world”¹⁷ – these are but a few very serious reasons not to dismiss the ubiquitous threat of world annihilation.

Leslie gives a nice overview of the thrust of his reasoning on his version of the doomsday argument:

One might at first expect the human race to survive, no doubt in evolutionarily much modified form, for millions or even billions of years, perhaps just on Earth but, more plausibly, in huge colonies scattered through the galaxy and maybe even through many galaxies. Contemplating the entire history of the race – future as well as past history – I should in that case see myself as a very unusually early human. I might well be among the first 0.00001 per cent to live their lives. But what if the race is instead about to die out? I am then a fairly typical human. Recent population growth has been so rapid that, of all human lives lived so far, anything up to about 30 per cent ... are lives which are being lived at this very moment. Now, whenever lacking evidence to the contrary one should prefer to think of one’s own position as fairly typical rather than highly untypical. To promote the reasonable aim of making it quite ordinary that I exist where I do in human history, let me therefore assume that the human race will rapidly die out.¹⁸

Here, the question becomes: Are we among the most humans living today at any one time in the history of the human race? Given the current state of our world population boom, we have good reason to believe we are. And if this is the case, all things being equal, based on the balance of probability, we can assume that we fall within a random distribution of every human that has ever lived in the history of the human race. So in this way, following Leslie, we are fairly typical. Although we have no way of determining or knowing for certain the future of human life, or what may even constitute what a human being is or becomes due to biotechnology, genetic engineering, species evolution, and so forth, if we fall on a random human history timeline, then this increases the statistical odds that we are closer to extinction than not.

Nick Bostrom notes that in Leslie’s account, he does not claim that doom *will* come soon, but we must take into account empirical priors as existential risks, which shifts the balance of probability, and hence our confidence levels about these conditional probabilities.¹⁹ In fact, Bostrom applies Bayes’ theorem to Leslie’s hypothesis:

Suppose we are entertaining two hypotheses about how many [people] there will have been in total:

H_1 : There will have been a total of 200 billion humans.

H_2 : There will have been a total of 200 trillion humans.

17) Ibid., 1.

18) Leslie, “Is the End of the World Nigh?,” 65f.

19) Bostrom, *Anthropic Bias*, 95–96.

For simplicity, let us assume that these are the only possibilities. The next step is to assign prior probabilities to these hypotheses on the basis of available empirical information (but ignoring, for the moment, information about your birth rank.) For example, you might think that:

$$P(H_1) = 5\%$$

$$P(H_2) = 95\%$$

All that remains now is to factor in the information about your birth rank, which is in the neighborhood of 60 billion (R) for those of us who are alive at the beginning of the twenty-first century.

$$P(H_1|R) = \frac{P(R|H_1) P(H_1)}{P(R|H_1) P(H_1) + P(R|H_2) P(H_2)} \quad (\#)$$

$$= \frac{\frac{1}{200 \cdot 10^9} \times .05}{\left(\frac{1}{200 \cdot 10^9} \times .05\right) + \left(\frac{1}{200 \cdot 10^{12}} \times .95\right)}$$

$$\approx .98$$

In this example, the prior probability of Doom soon (H_1) of 5% is increased to about 98% when you take into account your birth rank.²⁰

Although Bostrom ignores (for the sake of parsimony) numerous other possible hypotheses one could test based on Bayes' probability theorem, we may appreciate how this lends credibility to Leslie's thesis.

Existential Risks

Nearly three decades ago, John Leslie, arguably one of the leading pioneers of existential risk studies, perspicaciously situates our current global concerns. He positions the risk of extinction by examining first-order threats to the survival of the human race in order to shock us into alarm and raise consciousness with the hope that we will immediately begin to make risk-reduction efforts. He begins with risks already well recognized, and then presents risks that are often unrecognized, focusing on (a) natural and (b) man-made disasters, as well as (c) philosophical and psychological dangers, what has come to be called existential risk parameters:²¹

Well Recognized Risks

1. Nuclear war
2. Biological warfare
3. Chemical warfare
4. Destruction of the ozone layer

20) Ibid.

21) See the opening discussion in Leslie, *The End of the World*, 4–14. These following topics are elaborated throughout his entire book.

5. Greenhouse effect
6. Poisoning by pollution, environmental degradation, and the population crisis
7. Naturally occurring diseases

Under-Recognized Risks

A: Natural Disasters

1. Volcanic eruptions
2. Strikes by asteroids and comets
3. An extreme ice age due to passage through an interstellar cloud
4. Nearby supernovae, galactic center outbursts, and solar flares
5. Other massive astronomical explosions (for example, black hole explosions, black hole mergers)
6. Breakdown of complex systems (for example, Earth's biosphere; the solar system itself)
7. Something-we-know-not-what

B: Man-Made Disasters

1. Unwillingness to rear children (for example, population shrinkage among rich nations)
2. Disasters from genetic engineering
3. Disasters from nanotechnology
4. Computer-caused disasters and computer replacements for humans
5. Disasters in other branches of technology
6. Physics experiments triggering global catastrophe (for example, creating a new Big Bang in the laboratory)
7. High-energy physics experiments producing an all-destroying phase transition (for example, a scalar field producing a vacuum metastability danger; igniting the atmosphere)
8. Annihilation by extraterrestrials
9. Other things we do not know that can or will transpire from human technological invention and intervention

Philosophical-Psychological-Sociological Risks

1. Threats associated with religions and their ideologies
2. Nihilistic pessimism
3. Ethical doctrines that are misguided, deny human values, or have no duty toward the future for merely "possible" people
4. Breakdown of "inalienable rights"
5. Uncooperative behavior among individuals, masses, and nations (for example, prisoner's dilemma)
6. Blindly avenging justice when there is no palpable good that comes from it (for example, a nuclear retaliation)

While some of these risks seem improbable, if not far-fetched, when taken as a whole, they have a chilling effect. Despite the fact that he executed these warnings decades ago, his predictions continue to hold sway today, as he had anticipated many of the potential planetary threats we currently face. If we take these premonitions seriously, we should be taking steps to ameliorate them and prevent future catastrophe by shifting the probability balance. Here Leslie calls for a prescriptive ethics that is very much in keeping with recent swings in global ecological consciousness surrounding the need to combat climate change, push for nuclear disarmament,

develop early detection systems for asteroids or other cosmic threats from space that are on a collision course with Earth, establish controls over physics experiments, nanotechnology, artificial intelligence, and the like, where scientific and technological advances could have runaway consequences if left unregulated. But we must not diminish, let alone ignore, the potential for species-annihilating disasters augmented by existential risk.

In our contemporary era of political and religious violence that legitimizes the morality of war with the support of military science, our conflict of cultures begets and bears witness to increased human tragedy and traumatization. There are pernicious threats associated with the subversive activities of fundamentalist religious groups that embrace ethical relativism and prescriptivism based on collective ideology just as there are repercussions from foolish decisions made by narcissistically grandiose politicians who hype up a country's citizenry based upon an appeal to emotion in the pursuit of national self-interest. If we do not kill each other by destroying our environment through chemical, biological, and nuclear war, leading to loss of biodiversity, disease, disastrous climate change, greenhouse calamity, desertification, and pollution of our planet, then overpopulation will surely erode our environment and tax our natural resources to satisfy basic human needs, which will likely lead to mass panic, mayhem, and global warfare. When people have no grain to eat, the moral principle of human rights becomes a vacuous concept.

Should We Take the Doomsday Argument Seriously?

So far we have been playing with the idea that we could manufacture a future prediction based on statistical probability without knowing all the constants of the universe, the exact nature of the empirical priors, the conditional probabilities, competing possibilities and counterfactuals, and the possible future contingencies and contexts that will come into being. Bostrom is particularly keen on unveiling human bias, observation selection effects, and self-sampling assumptions that militate the argument, while I would add how psychological projection and the various political and economic prejudices that drive natural scientists and mathematicians to devise their preferred methodologies and equation models and derive valid conclusions from them is potentially corrupt from the start, so any prediction is therefore inferential and speculative at best and must be conservatively weighed. Although probability, propensity, and confirmation theories do just that, all one has to do is quibble with or tweak the premises to get the desired outcomes one wants, especially if certain formal properties are merely formulations of a theorem where predictions follow mathematically. This all depends on how you chose to define your reference class, classify the sample according to the particular properties you want to emphasize, and the hypotheses you want to test. There is always an irreducibly subjective element to all of this that can change from person to person and condition to condition under different personal motivations and contextual circumstances.

Sceptics who challenge the doomsday argument offer many warranted criticisms. Bostrom reports he has encountered over one hundred objections to the doomsday argument, many of which he meticulously objects to or views as invalid, the details of which do not need to distract us here, but he ultimately concludes that the argument is not supportable due to anthropic bias, paradoxes of self-sampling assumptions, reference class problems, relativity of observers and observations made, and the abstract use of thought experiments that are not empirically probable, not to mention the fact that all observations and predictions are hermeneutically mediated interpretations that are irreducibly subjective. We may further ask: How could a mathematical theorem have any predictive validity when variables are arbitrarily postulated and applied to suit a theorist's self-predicated speculation? Since when should we assume that the complexities of life and human behavior can be predicted and controlled for? How can we anticipate let alone regulate such complex variables to get desired outcomes by manipulating the conditions that would bring about desired effects when we are simply arbitrarily playing

with conditionals? How could one possibly know what conditionals in the past were or if they really existed, let alone know how the future will transpire? How can we predict the possible future global state of affairs based on the past, let alone one subject's life? Why should we assume the universe is determinate when it could be indeterminate and open to flux, variability, change, and process that is neither predicable let alone accurate when positing the constants that are presumed to exist to begin with? In other words, so-called scientific predictions rest on the dubious premise that the world, hence the future, is determined *a priori*.

A calculation is in itself not an argument, but rather is used to support or refute a doomsday scenario. But we may ask, Doom or simply gloom? For example, depending upon what probabilistic inferences we draw, premises we presume, or propositions we posit, it is conceivable that even if some of these dangers are addressed and mitigated, it will not erase *in globo* some very heavily weighted risks. But even so, rather than leading to complete human extinction, they may subject us as humanity to a more gradual decline or leveling-off process, even if controlled, that could begin relatively soon in comparison to our random place in the human history timeline despite that it could be conceivably prolonged and/or relegated to large scale withering decays in certain parts of the world while having less pernicious effects in others. Here the balance of actual empirical conditions, not just abstract theoretical or mathematical formulas, must be factored in when calculations derived from statistical prediction seek to justify the very premises doomsday arguments wish to advance.

Our Final Century?

Like John Leslie, cosmologist Sir Martin Rees has been equally concerned about the fate of civilization by emphasizing the risks of bio, cyber, and nanotechnology that could either be used deliberately and sinisterly to perpetrate acts of megaterror, or as unintended consequences of error due to technological malfunctions or mishaps, scientific hubris such as lack of self-restraint and regulation of industry, laboratory mistakes, nuclear mismanagement, superintelligent computers run amok, or other human botch-ups that could bring about catastrophic ends. In fact, in a rather sensational way, he went on record in *Wired* magazine and staked a thousand dollars bet "That by the year 2020 an instance of bioerror or bioterror will have killed a million people."²² Although this remains to be seen, he is confident enough in this bleak forecast to lay down good money on the table. Moreover, he predicts that "the odds are no better than fifty-fifty that our present civilisation on Earth will survive to the end of the present century... What happens here on Earth, in this century, could conceivably make the difference between a near eternity filled with ever more complex and subtle forms of life and one filled with nothing but base matter."²³ Grim prospects indeed.

Changes and improvements in technology occur so rapidly that futurists predict everything from brain enhancement through implants and psychopharmacology, curing disease, doubling our lifespans, and colonizing the galaxies, to genetically modifying humans and engineering a new posthuman species. Nanotechnology is deemed the new instrument of prosperity, whether in computer science, engineering, medicine, neuroscience, and robotics. Miniturization is essential to all developing technologies, from a computer chip to microsurgery to constructing a drone. But what if nanomachines acquire the capacity to replicate themselves, form superintelligences, "take over" information technologies, computer networks, and control the fate of human beings? Although it may sound like a futuristic Sci-Fi thriller, experts think it is just around the corner. Micro, bio, and cybertechnologies may also be used for ill designed by human intent, such as terrorist organizations, disgruntled dissident groups, embittered misfits and lone-wolves, or rouge states in military conflict who initiate nuclear

22) Rees, *Our Final Hour*, 74.

23) *Ibid.*, 8.

warfare, release noxious fast-spreading pathogens into the air or in water supplies, or generate Internet software viruses that can infiltrate and destroy valuable data bases, steal from financial accounts, destabilize corporate and governmental network systems, and hack and extract confidential information of national security. The use of chemicals on civilian populations – from the anthrax attacks to chlorine poisoning in Aleppo by the Assad regime – is a reminder of how easily this can be accomplished. More ominously, lethally engineered airborne viruses may be developed and released into the atmosphere that could potentially wipe-out large scale populations in relatively brief periods of time before medical intervention can be mobilized or antidotes developed in labs. This outbreak scenario would make COVID-19, SARS, Swine Flu, and Ebola look insignificant in comparison to the devastation biochemically engineered viruses could rake on the world.

Rees believes that technological advances *in themselves* will render society more susceptible to disruption and attenuate world safety, especially when biotechnologies are used for human terror or encounter misadventures through human or computer error. Threats stemming from new science are most worrisome. It is possible that paranoiac relations between superpowers, or even a superpower and a rogue nation state, could escalate a nuclear enactment that would ignite the world. Iran and North Korea are prominent examples. Should such fear-mongering be troublesome in today's climate? If we estimate that human nature is ultimately primal and would succumb to base propensities, then I see no reason to be optimistic that we will transcend our primordial natures if there is no superimposed constraint by a macrosocial ethical structure such as reformed (new) governments or international central agencies, even if this requires law enforcement or military intervention. The notion of nuclear deterrence by threat of mass retaliation has not gone away since the cold war era. In fact, it has intensified since the globalization of technology.

If Rees is correct, we are all anxiously waiting for the bomb to drop (or the next plane or train to crash or explode as an act of terror) based on paranoiac reactions due to inadvertence or misjudgment from government officials that could trigger a runaway war-scenario hysteria, whereby the ideology of retaliation before one's own nuclear arsenal is destroyed enjoys popular support despite crushing the notion of world diplomacy. If everyone over-estimates threat, overreacts, and assumes worst-case situations as the empirically "objective" measure on which to make global political decisions, then we are all deeply entrenched in the proposition that human political relations are hopelessly subjugated by psychological and irrational currents that fuel psychopathology in all spheres of social and cultural governance. There is no way of minimizing this collective emotional effect given that each community or social-cultural group believes the antithetical Other is out to exploit, harm, or deracinate them in some capacity, even when there is no merit to such prejudicial projective fears. The mere fact that human relations operate in such modes of social discourse in every culture validates the notion that human nature is grounded upon universal experience. Groups of individuals or social collectives would not be fearful of alterity if there were not negative encounters borne of experience and retained in historical memory.

What would have happened if the al Qaeda terrorists who flew the planes into the World Trade Center and the Pentagon had a nuclear warhead aboard? Imagine ISIS, or any terrorist group, that acquires a nuclear weapon: a suicidal martyr would be more than happy to sacrifice his life and take out as many people as possible. Targeting a highly congested city center, airport, railway system, and/or skyscrapers for detonation – all of which have occurred, could conceivably kill millions of people with a nuclear explosion, not to mention countless others affected by the fallout. Rees further points out the "consequences could be even more catastrophic if a suicidal zealot were to become intentionally infected with smallpox and trigger an epidemic; in future there could be viruses even more lethal (and without an antidote.)"²⁴ a lesson we have learned from COVID. Add to this how pandemics and viruses of another kind, through cyberhacking, have become a real problem affecting

24) Rees, *Our Final Hour*, 42.

most of our lives in some form or another who rely on computer and information technology for personal, business, and work relations to the point that we are ontically dependent upon the Internet and mobile phone devices as an integral part of our daily existence.

A scientific (empirical) fact is that if a nuclear explosion were to occur in any location, it would leak radiation, immediately spread, and pollute a very large geographic region in a matter of minutes. Apparently enriched uranium (separated U_{-235}) according to the experts, is a far greater risk because it is easier to create a nuclear explosion from this fuel. All that is required is to get such a rigged warhead (as little as the size of a grapefruit) to explode in a highly densely populated area. And what about nuclear power plants? Rees argues that if these risk scenarios were properly considered, it would have drastically reshaped the way power plants were architecturally designed to conform to more proper safety standards, such as putting everything underground. And with lack of regulation over the oversight and maintenance of Third-World airlines, it would be easy to commandeer a plane and/or bribe an official to accommodate nefarious intents and acts. The Middle East is particularly ripe for a nuclear apocalypse. Tack on the religious belief in eschatology, and here we have a perfect storm.

Although the Doomsday Clock may be an ominous symbol for world destruction and the Doomsday Argument a speculative probability equation about the end of human existence, chances are skewed that it may not be merely a matter of, will this happen, but rather, when. If I were a bettin' man I would say we are on the brink of extinction.

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