# 1nc

## 2

#### Interpretation: the affirmative must use a lens of tropicality. It’s a prerequisite to ethical space policy discussion.

#### Violation: Vote neg - They don’t forefront a critical geography framing—that reproduces destructive colonial violence against the equatorial margins.

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Approaching concepts of outer space, geopolitics and science through Arthur C. Clarke first requires a broader discussion of relevant debates in postcolonial studies, science and technology studies, and historical geography. Synthesising some of these themes, the anthropologist Peter Redfield’s study of the European space programme aimed to ‘recombine elements of imaginative discourse with technical practise, tracing the trajectory of adventure as it leaves the planet, and highlighting the historical geography of power that runs through the Final Frontier’ (Redfield 2002, 792). This empirically rich work provides a sound theoretical basis for exploring the cultural and political roots of spaceflight in the late modern era, while taking seriously imaginative representations of outer space. Existing studies of outer space in this period have mostly examined, by contrast, the social and cultural ‘impacts’ of the better-known American and Soviet/Russian space programmes, in the geopolitical context of the Cold War (Dick and Launius 2007; Parker and Bell 2009). Redfield connects outer space and empire in two ways: Firstly, through analysing the imaginative geographies of exploration, conquest and adventure that have long characterised spaceflight narratives, and second, in examining the colonial status of the European Space Agency launch site in French Guiana in South America, home of the Ariane satellite launcher rocket since 1979. Other researchers have considered rocket sites in colonial locations such as Hammaguir in Algeria, launch site of the French satellite Astérix in 1965, and Woomera in South Australia, where the British Blue Streak rocket was tested in the 1960s (Gorman 2009; Instone 2010). The development of these sites as centres of imperial techno-science notably came at a time when European empires were disintegrating in spaces across the world, and thereby make effective case studies for examining late-modern connections to the empire of outer space.

An integral argument in critical studies of spaceflight is that space exploration represents a modernist dream that acts as a continuation of empire, implicating discourses of technology-as-progress. In this respect, historian Michael Adas has explained how, in the industrial era, science and technology were seen as ‘measures of human worth’, justifying European colonialism while also acting as the means through which imperial power was exercised (Adas 1989, 3). This pattern has been noted in accounts of technological determinism that frequently characterise narratives of space exploration. For example, the American space programme of the 1960s, specifically Project Apollo, is said to have exemplified and helped proliferate ‘technocratic’ modes of governance in the United States, typified by ‘a utopian attitude towards technology’ as a solution to all the world’s problems (Sage 2014, 57). More recently, ‘NewSpace’ magnates such as Elon Musk and Jeff Bezos have enrolled the language of utopian technological futurism to promote ambitious space ventures such as the colonisation of Mars (SpaceX 2018). Such framings have been described as ‘depressingly ubiquitous’ in portrayals of so-called ‘frontier technologies’, adding to debates on the extent to which technology can be seen as culturally and politically produced, rather than naturalised as a harbinger of progress and modernity (Bingham 2005, 202; Jasanoff and Kim 2015). Critics have typically rejected technological determinism as an effective explanation of societal development, drawing on postmodernist accounts that define a role for the social construction of science and technology (Shapin and Schaffer 1985). Indeed, researchers have demonstrated how spaceflight technology did not emerge naturally at any given place or time, with political and cultural factors influencing substantial geographical and historical disparities in its development (Winter 1983). Further studies have effectively outlined how various popular cultures, including science fiction novels, astronomical art and the public spectacle of rocketry, worked as integral parts of the wider discourse of twentieth-century outer space technology (MacDonald 2008; Redfield 2002; Sage 2008).

Adding further nuance to debates on the relationship between technology and culture, Redfield explains how a combination of political, cultural and geophysical factors led to the selection of French Guiana as the home of the European Space Agency’s rocket launch facility in the early 1970s (Redfield 2000). Notwithstanding its history as part of the French imperial sphere of influence, French Guiana’s significance for European spaceflight operations lies with its geographical location near to the equator, and its eastward-facing coastline. This is because, firstly, equatorial sites benefit from the maximum ‘latitudinal boost’ resulting from the centrifugal forces of the earth’s rotation, and, second, the Atlantic Ocean is made available as a vast testing range, where spent rockets can safely crash back down into the open seas. Furthermore, the equatorial region becomes prized in the geography of spaceport site selection because of its alignment with the prime ‘real estate’ of the geosynchronous orbit, located along a band in space 36,000 km above the earth’s equator (Collis 2009). As Clarke illustrated in 1945, satellites placed in this orbit attain specific value as they remain fixed above any given point on the earth’s equatorial belt, and can thereby be used for reliable global communications services (Clarke 1945). This new perspective was officially recognised in the 1976 Bogotá Declaration, which stated that ‘[t] he geostationary orbit is a scarce natural resource’, over which equatorial states should have national sovereignty (Bogotá Declaration 1976). While signed by a consortium of equatorial states, the declaration remains unratified by the United Nations, highlighting the unequal power geometries involved in outer space geopolitics. Such concerns demonstrate how the study of space launch sites, both actual and anticipated, presents opportunities for researchers interested in the intersections between science and technology studies, critical geopolitics and cultural-historical geographies of the tropical region.

Indeed, while equatorial sites have their own unique advantages for the space industry, postcolonial scholars have demonstrated how tropical spaces have been assigned particular characteristics, drawing on a wider body of work that has addressed the complicity of western culture in discourses of empire (Pratt 1992; Said 1993). Such characteristics relate to opportunities for adventure, the presence of bountiful natural resources, and the danger and excitement of exotic allure. For Richard Phillips, ‘European empires and European masculinities were imagined in geographies of adventure’ in children’s novels such as Daniel Defoe’s Robinson Crusoe (1719), famously set on a fictitious tropical island (Phillips 1997). Twentieth century imaginative spaces of adventure have also been interpreted in relation to geographies of empire, whether in relation to historical figures like T E Lawrence, or fictional archetypes such as James Bond or Tintin (Dawson 1994; Dodds 2003; Dunnett 2009). According to Graham Dawson, ‘the modern adventure tale is imbued with the imaginative resonance of colonial power relations underpinned by science and technology’, while at the same time, adventure becomes ‘balanced with anxiety and desire’ in the colonial context (Dawson 1994, 59, 53). The adventure genre and its associated tropes remain closely connected to narratives of space exploration, as seen in examples such as the 1964 feature film Robinson Crusoe on Mars, or Andy Weir’s 2014 novel The Martian and subsequent film release, whose extra-terrestrial spaces are represented through a combination of masculine endeavour and exotic encounter (Crossley 2010).

Beyond generic conceptions of adventure, research in cultural and historical geography has drawn on the concept of ‘tropicality’ as a way of understanding certain representations and experiences of tropical spaces, that also relate to wider cosmographic frameworks (Arnold 2000). As Denis Cosgrove reminds us, ‘the originating tropics [of Cancer and Capricorn] are celestial rather than terrestrial markers within a geocentric cosmos’ (Cosgrove 2005, 199). They comprise two great circles that delineate the equatorial band of the earth where the sun passes through the zenith directly above at least once a year, as defined by the earth’s axial tilt. It is the interplay between this cosmographic definition of the tropics, and ethnographic and biological understandings of the tropics, which has defined notions of tropicality in the western world. Such framings can be traced to medieval notions of an equatorial ‘torrid zone’ as part of a Ptolemaic theory of world climatic regions (Cormack 1994). While being considered a barrier to human (European) civilization, the equatorial zone has also been seen as a realm where ‘the superabundance of nature was believed to overwhelm human endeavour’ (Leys Stepan 2001, 18). Yet as voyages of discovery opened up previously unencountered spaces to European experience and representation, imaginative geographies of the tropics persisted. Some, for example, have associated ‘paradisal geographies’ with ‘New World islands … as the location of peoples as yet unfallen and as sites of natural richness’ (Withers 1999, 84). Others have recognised the ways in which ‘tropicality has frequently served as a foil to temperate nature’, or as a ‘site for European fantasies of self-realisation’ (Driver and Martins 2005, 3, 4). Tropical spaces have also been associated with forms of modernity, whether in relation to early modern voyages of discovery, or in ‘modernist abstraction[s] of nature’ in twentieth century landscape designs (Leys Stepan 2001, 210). This paper adapts cultural and cosmographical readings of tropicality in the context of late-imperial techno-science to consider a concept of ‘cosmological tropicality’, a sense in which tropical spaces are more intimately aligned with the heavenly movements of the cosmos, and therefore could hold the key to the future of space exploration.

Geographers Felix Driver and Luciana Martins have argued that understandings of tropicality have been largely framed through ‘projections’ of imagined geographies, and that researchers should attempt to understand such representations as they have been produced, negotiated or contested (Driver and Martins 2005, 5). Touching on similar themes, Gerry Kearns’ research on the late-nineteenth-century travels of Mary Kingsley and Halford Mackinder in colonial Africa has investigated the ways in which personal encounters and travel experiences helped shape the identities of British imperial subjects, informing their broader geopolitical outlooks (Kearns 1997). As such, while Clarke’s projections of Ceylon/Sri Lanka are inherently representational, they also relate closely to the tangible, experienced geographies of his life in Ceylon/Sri Lanka, and present the unusual perspective of a western individual who lived on this island for most of his adult life. In approaching Clarke by thinking through his experiences as well as the representational texts he produced, it becomes possible to engage ‘socio-technical’ understandings of the nuanced relationships between technology, society, representation, discourse and experience. Here, drawing from Bruno Latour’s conception of technology as a social and material construction, Nick Bingham has called for a renewed understanding of socio-technical assemblages ‘between diverse people, non-humans and places’ (Bingham 2005, 201). As such, this paper attempts to understand the extent to which Clarke’s projections of outer space technology were shaped by negotiation with, and experience of, the specific geographies of twentieth century Ceylon/Sri Lanka.

In his aforementioned essay on tropicality, Cosgrove warns that, ‘in rehearsing – even with critical intent – the ways in which Europeans so closely and outrageously have bound tropical ethnography into a mutually deterministic embrace with the physical environments of the tropics, we risk perpetuating the silencing of voices speaking from within tropical space’ (Cosgrove 2005, 198). The same could be said of any account that purports to interpret the visions of one Englishman’s fantasy of space exploration in a tropical ‘paradise’. Yet there remains value in ascertaining the ways in which outer space has been connected to earthly imaginative geographies, and how experiences of particular places have informed geopolitical cultures of outer space. While acknowledging the limitations of such an approach, this paper seeks to investigate the extent to which Clarke’s socio-technical constructions of Ceylon/Sri Lanka were formulated with respect to local culture and politics. Tariq Jazeel has, for example, contested the notion of ‘Sri Lankan island-ness’, explaining how the perceived unity of the Sri Lankan state today can be traced to British imperial rule from 1815 to 1948, before which the island had been made up of a number of separate kingdoms since the fifteenth century (Duncan 1990; Jazeel 2009). The replacement of this multi-cultural space with a unitary British imperial island colony was, according to one researcher, reflected in a sense of modernity in the everyday material cultures of local people, while the damaging legacy of the unification can be clearly seen in the destructive civil war that plagued the country from 1983 to 2009 (Wickramasinghe 2009). Such issues are pertinent to understanding the complex interactions that Clarke had with the places and landscapes of Ceylon/Sri Lanka, particularly the understandings of modernity and progress that were central to Clarke’s world-view.

Discourses of space exploration have, in the ways outlined here, been connected to a variety of familiar geographical imaginations concerning empire, adventure and the anticipation of a technologically-driven future. Yet studying Arthur C. Clarke adds the further perspective of experiencing and representing tropical spaces as part of a critical geopolitics of outer space, an exercise that has only received partial critical attention through Redfield’s work on French Guiana. By turning to three phases in Clarke’s life and works we can see how cultures of empire, technological determinism and ‘cosmological tropicality’ are played out in the immediate context of late-twentiethcentury Ceylon/Sri Lanka.

#### That ethical frame outweighs.

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On Earth, the environmental geopolitics of outer space are inseparable from questions of environmental justice. Environmental (in)justice unfolds across multiple scales through concrete processes: localized and stratospheric emissions from space launches (Carlsen, Kenesova, and Batyrbekova 2007; Jones, Bekki, and Pyle 1995), the placement of outer space related infrastructure in national and global peripheries (Gorman 2007; Mitchell 2017; Redfield 2001), and the use of such infrastructure to advance or thwart environmental destruction (Da Costa 2001; Guzmán 2013; Parks 2012).

Human engagement with outer space enlists industrial economies, global networks of infrastructure and expertise, and the generation and control of information. All of these activities take place in specific sites and are subject to ongoing transformations in territorial governance practices. By locating infrastructures that are securitized, dangerous, and environmentally toxic in remote areas, the state or empire accomplishes two things. It consolidates power in far-flung territories while mitigating against liabilities and security threats that might arise from placing launch infrastructures closer to the metropole. In order to reduce environmental impacts, adequate resources, personnel, and expertise need to be assigned to the task of monitoring and mitigating the regional fallout of rocket launches (Hall et al. 2014). This may not be the case if the site in question has been deemed sacrificable by those with territorial control.

Launches and Their Infrastructures

Reaching outer space requires Earthly infrastructure, which means that space launches have concrete footprints that change according to developments in launch technologies. The placement of outer space related infrastructure on Earth is a question of environmental (in)justice. Which sites are chosen, who is expropriated, and which environments are impacted is subject to strategic geopolitical calculations, which, more often than not, employ classical geopolitical reasoning (Hickman and Dolman 2002; Ingold 2006; Meira Filho, Guimarães Fortes, and Barcelos 2014; NDRI 2006). Launch sites are tightly controlled to reduce the risk of interference or failure, therefore situating launch sites in remote areas is often explained in terms of safety and security (Zapata and Murray 2008). No doubt this is important: rockets are composed of many tonnes of material and combustive fuel, so they must be launched in places where damage from routine as well as potentially catastrophic explosions can be contained. For humans to reach “the final frontier,” they must first find a frontier space on Earth that can be made into an empty space in which controlled explosions can be routine.

Frontiers are seldom as empty as those aiming to conquer them would claim. Where they are not populated by people, they are filled with other sorts of meanings and life forms (Klinger 2017; Tsing 2005). Potential launch sites and testing ranges deemed by government authorities to be simultaneously remote, safe, and suitable to contain the risks of rocket launch must first be made empty of people, with prior land use regimes or territorial claims pushed beyond designated buffer zones (Gorman 2007; Mitchell 2017). Hence the placement of space infrastructure follows colonial geographies of extraction, sacrifice, and risk (Mitchell 2017; Redfield 2001). As Gorman (2007) put it: “because of their distance from the metropole, these places lend themselves to hosting prisons, detention camps, military installations, nuclear weapons, and nuclear waste. All of these establishments, including rocket ranges, have inspired reactions of protest.” These so-called ‘peripheral’ spaces are nevertheless central to their inhabitants and their neighbors, who question the logic of extraglobal conquest in the face of unresolved Earthly injustices.

Consider, for example, the case of the launch site in Alcântara, Brazil, which has been well documented by Araújo and Filho (2006) and Mitchell (2017). Through a close examination of local, national, and international politics, these authors document how the government’s racialized approach to the subsistence communities displaced by space infrastructure deepened structural inequalities. Grassroots opposition to the launch site grew not out of an a priori ideological opposition of poor people to national progress in outer space, as some officials alleged, but rather resulted from the failure to account for the food insecurity generated by state resettlement projects. The resettlement schemes were themselves misinformed by impoverished notions of local livelihoods. Local claims against the deprivations caused by statesponsored space practices have deepened schisms between the military and civilian space programs at the federal government level.

Through the lens of classical geopolitics, these structural inequalities scarcely register, with the result that the ‘crawling’ progress of Brazil’s space program is pathologized as poor management practices symptomatic of an inadequately implemented national development vision (Amaral 2010). Critical geopolitics helps deconstruct the nationalist performativity of such endeavors by considering the political and economic value placed on the spectacle of spaceflight (Boczkowska 2017; Macdonald 2008, 2010; Sage 2016). Feminist geopolitics draws our attention to the racialized and gendered dispossession advanced by the state, through the construction of space infrastructure and exercised through access to land. The fact that environmental and public health impacts were only considered by the authorities after years of mobilization by Black social movements, religious communities, and scholars highlights the ways in which inattention to the local in the pursuit of space power perpetuates environmental injustice, which in turn interrupts national plans for space progress.

Rocket launches affect local and global environments through the construction of infrastructure, the exposure of local environments to toxic residues, and the dispersal of pollutants in land, air, and sea. Rockets are the only source of direct anthropogenic emissions sources in the stratosphere. Ozone-depleting substances (ODS) such as nitrous oxide, hydrogen chlorine, and aluminum oxide are emitted by rockets, and can destroy 105 ozone molecules before degrading (Voigt et al. 2013). The ozone layer prevents cancer and cataract-causing ultraviolet-b waves from reaching the Earth. As of 2013, rocket launches accounted for less than 1% of ODS emissions. As other ODS are phased out under the Montreal Protocol and the frequency of lower cost space launches increases, the proportion and quantity is likely to increase (Durrieu and Nelson 2013; Ross et al. 2009).

Although affluent economies in the northern hemisphere are responsible for most ODS emissions (Polvani 2011; Rousseaux et al. 1999), the geography of exposure disproportionately affects an overall higher population in remote regions and in the southern hemisphere (Norval et al. 2011; Robinson and Erickson 2015; Thompson et al. 2011) because ozone depletion is most serious in regions where high altitude stratospheric clouds are most likely to form: above the polar regions and major mountain ranges (Carslaw et al. 1998; Perlwitz et al. 2008). This is an example of environmental injustice on a global scale, where the global south bears the environmental burden of actions predominately taken in the global north, rocket launches included. In the process, global power relations are reinscribed through the uneven distribution of harm to peripheral and southern bodies, mediated in this case through the redistribution of gases in the stratosphere that increase exposure to solar radiation.

Coming closer to Earth, environmental geopolitics of outer space are manifest in the dispersal of particulate matter into ecosystems surrounding active launch sites. This is more than a strictly local environmental concern, because which spaces are subject to the hazards of launch sites involves careful calculations weighing financial cost, state power, and multifarious territorial interests. With each launch, surrounding areas are showered with toxins, heavy metals, and acids over a distance that varies widely with wind, weather, and precipitation patterns at the moment of lift-off.3 The most researched of these pollutants are hydrogen chloride, aluminum oxide, and various aerosolized heavy metals. Release of these pollutants from rocket launches results in localized regional acid rain (Madsen 1981), plant death, fish kills, and failed seed germination of native plants in launch sites (Marion, Black, and Zedler 1989; Schmalzer et al. 1992).

These effects, and research on them, are mostly concentrated within one kilometer of the launch site. But they have been recorded several kilometers away under certain weather conditions (Schmalzer et al. 1998). Recent studies on the concentration of trace elements in wildlife in areas near NASA launch activities in Florida, USA, found that more than half of the adults and juvenile alligators had “greater than toxic levels” of trace elements in their liver (Horai et al. 2014). Both the subject, and the vague statement of findings, highlights the lack of research into the impacts on downstream human and non-human communities. In contrast to the precautions taken to protect workers in buildings adjacent to facilities where these technologies are developed (Bolch et al. 1990; Chrostowski, Gan, and Campbell 2010), much less consideration is given to communities within the dynamic pollutant shadow of rocket launches.

In Kazakhstan, Russia, and China, researchers have begun examining the effects of the highly toxic liquid propellant, unsymmetrical dimethylhydrazine (UDMH), which has been in use since the dawn of the space age. It has noted carcinogenic, mutagenic, convulsant, teratogenic, and embryotoxic effects (Carlsen, Kenesova, and Batyrbekova 2007), and it has been found to cause DNA damage and chromosomal aberrations in rodents living near the Baikonur cosmodrome in Kazakhstan (Kolumbayeva et al. 2014). Despite these known hazards, methods to detect UDMH at the trace concentrations at which toxic effects begin to manifest in humans do not yet exist (Kenessov, Bakaikina, and Ormanbekovna 2015), meaning that there is no knowledge of how this circulates in the environment, bioaccumulates up the food chain, or could potentially be sequestered through soil or plant filtration. The lack of technology or methodology to adequately track the dispersal of hazardous pollutants that have been used for decades in the surrounding environment illustrates another aspect of environmental injustice: the preference on the part of political and economic elites to create spaces of waste rather than allocate adequate resources to maintain safe and non-toxic environments.4

No RVIs: a. Chills theory – If people know they might lose for reading theory, it will disincentivize them. b. You don’t get to win by being fair.

Use competing interpretations: a. Reasonability causes a race to the bottom with testing the limit of it b. collapses – de ate abspecified briteline

Drop the debater: for being abusive – we can’t restart the round from the 1AC and I’m skewed for the rest of the debate.

## 3

#### The meta-ethic is practical reason—

#### [1] Inescapability— I can question why to follow or the validity of an ethical theory, which concedes the authority of reason as if I question reason, I use reason to question. Outweighs on validity—any other truth risks falsity Reality may be fake, our experiences may be arbitrary, and experience may be descriptive not normative, but questioning the validity of reason requires reason, conceding its validity. Any other ethic begs the question of why, meaning it’s arbitrary and nonbinding

#### [2] Action theory— Only reason can explain why we take transitional action to an overall end. For example, setting the end of tea provides me a reason to unify the necessary actions to produce tea, like getting a pot, filling it with water, etc. Any other explanation fails since it can’t give meaning to why we take transitioning action – freezing action. 2 Impacts—

#### [a] That’s a side constraint on the AC—ethics is a guide to action so it must appeal to a structure of action.

#### [b] Bindingness—reason is intrinsic to actions since only it can provide value to transitioning action, which justifies universality

#### That justifies universality—

#### If we are all reasoners, we must all be able to determine if an action is good. An action that maximizes my freedom at the cost of others then would have to be recognized as good by everyone, but that leads to a contradiction where everyone takes other’s freedoms to maximize theirs, making it impossible to reach my end

#### Thus, the standard is respecting a system of inner and outer freedom

#### [2] Banning private space appropriation inhibits the sale and use of spacecraft and fuel- that’s a form of restricting the free economic choices of individuals

**Richman 12**, Sheldon. “The free market doesn’t need government regulation.” Reason, August 5, 2012. // AHS RG

Order grows from market forces. But where do **market forces** come from? They **are the result of human action. Individuals select ends and act to achieve them by adopting suitable means.** Since means are scarce and ends are abundant, **individuals economize in order to accomplish more rather than less.** And they always seek to exchange lower values for higher values (as they see them) and never the other way around. In a world of scarcity, tradeoffs are unavoidable, so one aims to trade up rather than down. (One’s trading partner does the same.) **The result of this**, along with other **features of human action**, and the world at large **is what we call market forces. But really, it is just men and women acting rationally in the world.**

## Case

### Framing

#### Presumption, permissibility, and skep negate –

**[1] Obligations- the resolution indicates the affirmative has to prove an obligation, and permissibility would deny the existence of an obligation**

**[2] Falsity- Statements are more often false than true because proving one part of the statement false disproves the entire statement. Presuming all statements are true creates contradictions which would be ethically bankrupt.**

**[3] Negating is harder – Aff gets last speech to crystallize and shape the debate in a way the favors them with no 3NR**

Util –

1] Problem of induction—I predict based on past experiences, but there’s no justification for why those past experiences are true besides they worked in the past, which is based on experiences and is circular

2] Infinite consequences—each action has a consequence which leads to another consequence—if I drop a pen, that could lead to a hurricane so there is no consequence that can be predicted

3] Util triggers skep—if our bodies naturally know pain is bad and pleasure is good, we automatically act off pain and pleasure ie I automatically remove my hand from a hot stove bc receptors unconsciously trigger my hand to move—means we don’t have control over action and there can’t be moral prescription

4] Infinite regress—calculating consequences begs the question of how long I should calculate to have a precise prediction. Triggers infinite regress since I can think how long to calculate calculation and so forth—freezes action

### 1NC – Advantage 2

T/L – Reject laundry lists – no real extinctiom impact in the card or explanation of how they get there means u should err heavily neg

First impact scenario is econ decline – that’s good=.

**Collapse is inevitable and growth causes a laundry list of impacts**

**Foster 19** – Professor of Sociology @ the University of Oregon, Ph.D. in Political Science @ York University, editor of the Monthly Review, former critical Essay Editor/Archives Editor, Organization & Environment, editor and author of numerous books and articles about economics, environment, and capitalism [John, “Capitalism Has Failed—What Next?” 2/1/2019, [https://monthlyreview.org/2019/02/01/capitalism-has-failed-what-next](https://monthlyreview.org/2019/02/01/capitalism-has-failed-what-next/), DKP]

Less than two decades into the twenty-first century, it is evident that **capitalism has failed** as a social system. The world is mired in economic stagnation, financialization, and the most extreme inequality in human history, accompanied by mass unemployment and underemployment, precariousness, poverty, hunger, wasted output and lives, and what at this point can only be called a planetary ecological **“death spiral.”**1 The digital revolution, the greatest technological advance of our time, has rapidly mutated from a promise of free communication and liberated production into new means of surveillance, control, and displacement of the working population. The institutions of liberal democracy **are at the point of collapse**, while fascism, the rear guard of the capitalist system, is again on the march, along with patriarchy, racism, imperialism, and war. To say that capitalism is a failed system is not, of course, to suggest that its breakdown and disintegration is imminent.2 It does, however, mean that it has passed from being a historically necessary and creative system at its inception to being a historically unnecessary and destructive one in the present century. Today, more than ever, the world is faced with the epochal choice between “the revolutionary reconstitution of society at large and the common ruin of the contending classes.”3 Indications of this failure of capitalism are everywhere. Stagnation of investment punctuated by bubbles of financial expansion, which then inevitably burst, now characterizes the so-called free market.4 Soaring inequality in income and wealth has its counterpart in the declining material circumstances of a majority of the population. Real wages for most workers in the United States have barely budged in forty years despite steadily rising productivity.5 Work intensity has increased, while work and safety protections on the job have been systematically jettisoned. Unemployment data has become more and more meaningless due to a new institutionalized underemployment in the form of contract labor in the gig economy.6 Unions have been reduced to mere shadows of their former glory as capitalism has asserted totalitarian control over workplaces. With the demise of Soviet-type societies, social democracy in Europe has perished in the new atmosphere of “liberated capitalism.”7 The capture of the surplus value produced by overexploited populations in the poorest regions of the world, via the global labor arbitrage instituted by multinational corporations, is leading to an unprecedented amassing of financial wealth at the center of the world economy and relative poverty in the periphery.8 Around $21 trillion of offshore funds are currently lodged in tax havens on islands mostly in the Caribbean, constituting “the fortified refuge of Big Finance.”9 Technologically driven monopolies resulting from the global-communications revolution, together with the rise to dominance of Wall Street-based financial capital geared to speculative asset creation, have further contributed to the riches of today’s “1 percent.” Forty-two billionaires now enjoy as much wealth as half the world’s population, while the three richest men in the United States—Jeff Bezos, Bill Gates, and Warren Buffett—have more wealth than half the U.S. population.10 In every region of the world, inequality has increased sharply in recent decades.11 The gap in per capita income and wealth between the richest and poorest nations, which has been the dominant trend for centuries, is rapidly widening once again.12 More than 60 percent of the world’s employed population, some **two billion people**, now work in the impoverished informal sector, forming a massive global proletariat. The global reserve army of labor is some 70 percent larger than the active labor army of formally employed workers.13 Adequate **health care**, **housing**, **education**, and **clean water** and **air** are increasingly out of reach for large sections of the population, even in wealthy countries in North America and Europe, while transportation is becoming more difficult in the United States and many other countries due to irrationally high levels of dependency on the automobile and disinvestment in public transportation. Urban structures are more and more characterized by **gentrification** and **segregation**, with cities becoming the playthings of the well-to-do while marginalized populations are shunted aside. About half a million people, most of them children, are homeless on any given night in the United States.14 New York City is experiencing a major rat infestation, attributed to warming temperatures, mirroring trends around the world.15 In the United States and other high-income countries, life expectancy is in decline, with a remarkable resurgence of Victorian illnesses related to poverty and exploitation. In Britain, gout, scarlet fever, whooping cough, and even scurvy are now resurgent, along with tuberculosis. With inadequate enforcement of work health and safety regulations, black lung disease has returned with a vengeance in U.S. coal country.16 Overuse of antibiotics, particularly by capitalist agribusiness, is leading to an **antibiotic-resistance crisis**, with the dangerous growth of superbugs generating increasing numbers of deaths, which by mid–century could surpass annual cancer deaths, prompting the World Health Organization to declare a “global health emergency.”17 These dire conditions, arising from the workings of the system, are consistent with what Frederick Engels, in the Condition of the Working Class in England, called “social murder.”18 At the instigation of giant corporations, philanthrocapitalist foundations, and neoliberal governments, public education has been restructured around corporate-designed testing based on the implementation of robotic common-core standards. This is generating massive databases on the student population, much of which are now being surreptitiously marketed and sold.19 The corporatization and privatization of education is feeding the progressive subordination of children’s needs to the cash nexus of the commodity market. We are thus seeing a dramatic return of Thomas Gradgrind’s and Mr. M’Choakumchild’s crass utilitarian philosophy dramatized in Charles Dickens’s Hard Times: “Facts are alone wanted in life” and “You are never to fancy.”20 Having been reduced to **intellectual dungeons**, many of the poorest, most racially segregated schools in the United States are mere **pipelines for prisons or the military.**21 More than two million people in the United States are behind bars, a higher rate of incarceration than any other country in the world, **constituting a new Jim Crow.** The total population in prison is nearly equal to the number of people in Houston, Texas, the fourth largest U.S. city. African Americans and Latinos make up 56 percent of those incarcerated, while constituting only about 32 percent of the U.S. population. Nearly 50 percent of American adults, and a much higher percentage among African Americans and Native Americans, have an immediate family member who has spent or is currently spending time behind bars. Both black men and Native American men in the United States are nearly three times, Hispanic men nearly two times, more likely to die of police shootings than white men.22 Racial divides are now widening across the entire planet. Violence against women and the expropriation of their unpaid labor, as well as the higher level of exploitation of their paid labor, are integral to the way in which power is organized in capitalist society—and how it seeks to divide rather than unify the population. More than a third of women worldwide have experienced physical/sexual violence. Women’s bodies, in particular, are objectified, reified, and commodified as part of the normal workings of monopoly-capitalist marketing.23 The mass media-propaganda system, part of the larger corporate matrix, is now merging into a social media-based propaganda system that is more porous and seemingly anarchic, but more universal and more than ever favoring money and power. Utilizing modern marketing and surveillance techniques, which now dominate all digital interactions, vested interests are able to tailor their messages, largely unchecked, to individuals and their social networks, creating concerns about “fake news” on all sides.24 Numerous business entities promising technological manipulation of voters in countries across the world have now surfaced, auctioning off their services to the highest bidders.25 The elimination of net neutrality in the United States means further concentration, centralization, and control over the entire Internet by monopolistic service providers. Elections are increasingly prey to unregulated “dark money” emanating from the coffers of corporations and the billionaire class. Although presenting itself as the world’s leading democracy, the United States, as Paul Baran and Paul Sweezy stated in Monopoly Capital in 1966, “is democratic in form and plutocratic in content.”26 In the Trump administration, following a long-established tradition, 72 percent of those appointed to the cabinet have come from the higher corporate echelons, while others have been drawn from the military.27 War, engineered by the United States and other major powers at the apex of the system, has become perpetual in strategic oil regions

#### Growth is unsustainable AND causes extinction.

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As the previous chapters have shown, economic growth is regarded as a prime policy aim by policy makers and economists because it is thought to be essential for reducing poverty and generating rising living standards and stable levels of employment (Ben-Ami 2010: 19–20). More generally, support for economic growth is usually intertwined with advocating social progress based on scientific rationality and reason and hence with an optimistic view of humans’ ingenuity to solve problems (ibid.: 17, 20, Chap. 5). Growth criticism thus tends to be portrayed as anti-progress and inherently conservative (ibid.: Chap. 8). While it is important to acknowledge and discuss this view, it needs to be emphasised that growth criticism is formulated with long-term human welfare in mind which advocates alternative types of social progress (Barry 1998). This chapter first outlines ecological and social strands of growth critiques and then introduces relevant concepts of and positions within the postgrowth debate. Ecological Critiques of G rowth Generally speaking, two types of growth criticism can be distinguished: the first focuses on limitations of GDP as a measure of economic performance; the second goes beyond this by highlighting the inappropriateness of growth as the ultimate goal of economic activity and its negative implications for environment and society. Since GDP measures the monetary value of all final goods and services in an economy, it excludes the environmental costs generated by production. For instance, as long as there is no cost associated with emitting greenhouse gases , the cost for the environmental and social damage following from this is not reflected in GDP figures. Worse even, GDP increases as a consequence of some types of environmental damage: if deforestation and timber trade increase or if natural disasters or industrial accidents require expenditures for clean-up and reconstruction, GDP figures will rise (Douthwaite 1999: 18; Leipert 1986). Several critics of GDP as a measure of progress have proposed alternative indicators of welfare such as the Genuine Progress Indicator, Green GDPs or other approaches which factor in environmental costs (see Chap. 5 for more details), but they do not necessarily object to economic growth being the primary goal of economic activity (van den Bergh 2011). In contrast, the idea of ecological limits to growth goes beyond the critique of GDP as a measure of economic performance. Instead, it maintains that economic growth should not, and probably cannot, be the main goal of economic activity because it requires increasing resource inputs, some of which are non-renewable, and generates wastes, including greenhouse gases, that disturb various ecosystems, severely threatening human and planetary functioning in the short and long term. 4 CRITIQUES OF GROWTH 41 Resources are regarded as non-renewable if they cannot be naturally replaced at the rate of consumption (Daly and Farley 2011: 75–76). Examples include fossil fuels, earth minerals and metals, and some nuclear materials like uranium (Daly and Farley 2011: 77; Meadows et al. 2004: 87–107). Based on work by Georgescu-Roegen (1971), many ecological economists also assume that non-renewable resources cannot be fully recycled because they become degraded in the process of economic activity. Historically speaking, economic growth is a fairly recent phenomenon (Fig. 2.1). Since its onset in the late seventeenth century in Europe and mid-eighteenth century in the US (Gordon 2012), it has gone hand in hand with an exponentially increasing use of non-renewable resources such as fossil fuels (Fig. 4.1). While we are not yet close to running out of non-renewable resources, over time they will become more difficult and hence more expensive to recover. This idea is captured by the concept of “energy returned on energy invested” (EROEI). In relation to oil for instance, it has been shown that the easily recoverable fields have been targeted first and that therefore greater energy (and hence financial) inputs will be required to produce more oil. Over time, the ratio of energy returned on energy invested will decrease, reducing the financial incentive to invest further in the recovery of these non-renewable resources (Dale et al. 2011; Brandt et al. 2015: 2). Relevant to this is also the debate about peak oil—a concept coined by Shell Oil geologist Marion King Hubbert in the 1950s—the point at which the rate of global conventional oil production reaches its maximum which is expected to take place roughly once half of global oil reserves have been produced. There is still controversy about whether global peak oil will occur, and if so when, as it is difficult to predict, or get reliable data on, the rate at which alternative types of energy will replace oil (if this was to happen fast enough, peak oil might not be reached, if it has not yet occurred), the size of remaining oil reserves and the future efficiency of oil extraction technologies (Chapman 2014). However, it is plausible to assume that oil prices will rise in the long term if conventional oil availability diminishes, while global demand for oil increases with continuing economic and population growth. Since economic growth in the second half of the twentieth century required increasing inputs of conventional oil, higher oil prices would have a negative impact on growth unless alternative technologies are developed that can generate equivalent liquid fuels at lower prices (Murphy and Hall 2011). Some scholars have criticised the focus on physical/energy resource limitations as initially highlighted in the “limits to growth” debate (Meadows et al. 1972) and state that instead catastrophic climate change is likely to be a more serious and immanent threat to humanity (Schwartzman 2012). The main arguments here are first that much uncertainty remains about the potential and timing of peak oil, future availability of other fossil fuels and development of alternative low energy resources, while the impacts of climate change are already immanent and may accelerate within the very near future. Second, even if peaks in fossil fuel production occurred in the near future, remaining resources could still be exploited to their maximum. However, this would be devastating from a climate change perspective as, according to the latest IPCC scenarios, greenhouse gas emissions need to turn net-zero by the second half of this century for there to be a good chance to limit global warming to 2° Celsius (and ideally, below that) (Anderson and Peters 2016). It is telling that some of the more recent debates about ecological limits to growth put much more emphasis on environmental impacts of growth, rather than on peak oil or other resource limitations (Dietz and O’Neill 2013). Differently put, limits of sinks, especially to absorb greenhouse gases, and to the regeneration of vital ecosystems are now attracting greater concern, compared to limits of resources. Growing economic production generates increasing pressures on the environment due to pollution of air, water and soil, the destruction of natural habitats and landscapes, for instance, through deforestation and the extraction of natural resources. Therefore, growth often also threatens the regeneration of renewable resources such as healthy soil, freshwater and forests, as well as the functioning of vital ecosystems and ecosystems services such as the purification of air and water, water absorption and storage and the related mitigation of droughts and floods, decomposition and detoxification and absorption of wastes, pollination and pest control (Meadows et al. 2004: 83–84). Recent research on planetary boundaries has started to identify thresholds of environmental pollution or disturbance of a range of ecosystems services beyond which the functioning of human life on earth will be put at risk.

2nd scenario is warming – prob want another sheet for this

#### We’re already past the tipping point

#### Glikson ‘16 [Earth and Paleo-climate Scientist, Visiting Fellow at the Australian National University, Research School of Earth Science, the School of Archaeology and Anthropology, and the Planetary Science Institute, and a member of the ANU Climate Change Institute (Andrew, “Global heating and the dilemma of climate scientists”, 1-28-16, ABC, http://www.abc.net.au/news/2016-01-29/glikson-the-dilemma-of-a-climate-scientist/7123246]PM

For one, they do. **A number of prominent climate scientists, mostly representing the scientific consensus on climate change documented by the IPCC, have tried their best to convey the message in public forums. These scientists are mostly shunned by the conservative media which commonly offers platforms for those who do not accept the scientific evidence and the basic laws of nature. A sizable group of climate scientists tends to regard the IPCC-based climate consensus as too optimistic**. However, mostly these scientists tend to be shunned by the media, as stated by Chomsky: It's interesting that these (public climate) debates leave out almost entirely a third part of the debate, namely, **a very substantial number of scientists, competent scientists, who think that the scientific consensus is much too optimistic. A group of scientists at MIT came out with a report about a year ago describing what they called the most comprehensive modelling of the climate that had ever been done. Their conclusion, which was unreported in public media as far as I know, was that the major scientific consensus of the international commission is just way off, it's much too optimistic ... their own conclusion was that unless we terminate use of fossil fuels almost immediately, it's finished. We'll never be able to overcome the consequences.** That's not part of the debate.

#### Solves for tons of disease

**Idso and Idso 12,** Craig and Keith Idso, 5-2-2012, "CO2 Science," No Publication, <http://co2science.org/articles/V15/N18/EDIT.php> Keith E. Idso is a botanist and vice president of the Center for the Study of Carbon Dioxide and Global Change. CRAIG D. IDSO is the founder, former president, and currently chairman of the Center for the Study of Carbon Dioxide and Global Change.

At the turn of the last millennium, when our father was still an actively-working researcher, he and five colleagues grew common spider lily (Hymenocallis littoralis) plants out-of-doors at the U.S. Water Conservation Laboratory in Phoenix, Arizona. This they did for two consecutive two-year cycles, within clear-plastic-wall open-top chambers that had their atmospheric CO2 concentrations continuously maintained at either the normal concentration, which at their urban site was about 400 ppm, or at an enriched level of 700 ppm. Then, at the ends of each of the two-year periods, they harvested the bulbs produced by the plants and measured their biomass, along with the concentrations of several substances they contained that had previously been proven to be effective in fighting various human maladies. In doing so, they found that the 75% increase in the air's CO2 concentration resulted in a 48% increase in aboveground plant biomass and a 56% increase in belowground bulb biomass. In addition, the extra CO2 also increased the concentrations of five bulb constituents that possessed anti-cancer and anti-viral properties. These substances are listed in table below, along with the percentage increases they each exhibited, which when considered in their totality yield a mean increase of 12%. And combined with the 56% increase in bulb biomass, the net result was a mean active-ingredient increase of 75% due to the 75% increase in the air's CO2 concentration. What is especially exciting about these findings is that the substances the six scientists studied have been demonstrated to be effective in fighting a number of debilitating human diseases, including leukemia, ovary sarcoma, melanoma, brain cancer, colon cancer, lung cancer, renal cancer, Japanese encephalitis, yellow fever, dengue fever, Punta Tora fever and Rift Valley fever, as reported (with pertinent supporting citations) in their paper. Furthermore, there is reason to believe that many other such substances in other medicinal plants may also be benefited by atmospheric CO2 enrichment. See, for example, Health Effects (CO2 - Health-Promoting Substances: [Medicinal Plants](http://co2science.org/subject/h/co2healthmedicinal.php) in our Subject Index. This larger body of work also points to the tantalizing possibility that there may be a number of still other health-promoting substances in the tissues of the foods we regularly eat that may additionally have their concentrations enhanced by the ongoing rise in the air's CO2 concentration. And indeed there are, as may readily be seen by perusing the items archived under Health Effects (CO2 - Health-Promoting Substances: [Common Food Plants](http://co2science.org/subject/h/co2healthpromoting.php) in our Subject Index. And these findings lead to our speculation that the ever-lengthening life-span of people all around the world may well be due, at least in part, to the historical - and still ongoing - rise in the air's CO2 content. So here's to our health ... and the health of our children's children ... courtesy (in part) of the atmosphere's steadily rising carbon dioxide concentration; for if the world's climate alarmists can attribute nearly everything bad that happens nowadays, to the ongoing rise in the air's CO2 content, surely we can point out a possible benefit or two. And the potential benefit we describe here is a huge one.

#### Pandemics end civilization – no burnout

Kerscher 14. Karl-Heinz, professor and management consultant “Space Education”, Wissenschaftliche Studie, 2014

The death toll for a pandemic is equal to the virulence, the deadliness of the pathogen or pathogens, multiplied by the number of people eventually infected. It has been hypothesized that there is an upper limit to the virulence of naturally evolved pathogens. This is because a pathogen that quickly kills its hosts might not have enough time to spread to new ones, while one that kills its hosts more slowly or not at all will allow carriers more time to spread the infection, and thus likely out-compete a more lethal species or strain. This simple model predicts that if virulence and transmission are not linked in any way, pathogens will evolve towards low virulence and rapid transmission. However, this assumption is not always valid and in more complex models, where the level of virulence and the rate of transmission are related, high levels of virulence can evolve. The level of virulence that is possible is instead limited by the existence of complex populations of hosts, with different susceptibilities to infection, or by some hosts being geographically isolated. The size of the host population and competition between different strains of pathogens can also alter virulence. There are numerous historical examples of pandemics that have had a devastating effect on a large number of people, which makes the possibility of global pandemic a realistic threat to human civilization.

### 1NC – Advantage 1

Def want a sheet for this

#### Extinction is inevitable from future technology

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 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.

#### War is inevitable---BUT, the longer we wait, the worse it gets.

Seth **Baum &** Anthony **Barrett 18**. Global Catastrophic Risk Institute. 2018. “A Model for the Impacts of Nuclear War.” SSRN Electronic Journal. Crossref, doi:10.2139/ssrn.3155983.

On the other end of the spectrum, the norm could be weaker. The Hiroshima and Nagasaki bombings provided a vivid and enduring image of the horrors of nuclear war—hence the norm can reasonably be described as a legacy of the bombings. Without this image, there would be less to motivate the norm. A weaker norm could in turn have led to a nuclear war occurring later, especially during a near-miss event like the Cuban missile crisis. A later nuclear war would likely be much more severe, assuming some significant buildup of nuclear arsenals and especially if “overkill” targeting was used. A new nuclear war could bring a similarly wide range of shifts in nuclear weapons norms. It could strengthen the norm, hastening nuclear disarmament. Already, there is a political initiative drawing attention to the humanitarian consequences of nuclear weapons use in order to promote a new treaty to ban nuclear weapons as a step towards complete nuclear disarmament (Borrie 2014). It is easy to imagine this initiative using any new nuclear attacks to advance their goals. Alternatively, it could weaken the norm, potentially leading to more and/or larger nuclear wars. This is a common concern, as seen for example in debates over low-yield bunker buster nuclear weapons (Nelson 2003). Given that the impacts of a large nuclear war could be extremely severe, a shift in nuclear weapons norms could easily be the single most consequential effect of a smaller nuclear war.

#### Nuke war won’t cause extinction---BUT, it’ll spur political will for meaningful disarmament.

Daniel **Deudney 18**. Associate Professor of Political Science at Johns Hopkins University. 03/15/2018. “The Great Debate.” The Oxford Handbook of International Security. www.oxfordhandbooks.com, doi:10.1093/oxfordhb/9780198777854.013.22. //reem

Although nuclear war is the oldest of these technogenic threats to civilization and human survival, and although important steps to restraint, particularly at the end of the Cold War, have been achieved, the nuclear world is increasingly changing in major ways, and in almost entirely dangerous directions. The third “bombs away” phase of the great debate on the nuclear-political question is more consequentially divided than in the first two phases. Even more ominously, most of the momentum lies with the forces that are pulling states toward nuclear-use, and with the radical actors bent on inflicting catastrophic damage on the leading states in the international system, particularly the United States. In contrast, the arms control project, although intellectually vibrant, is largely in retreat on the world political stage. The arms control settlement of the Cold War is unraveling, and the world public is more divided and distracted than ever. With the recent election of President Donald Trump, the United States, which has played such a dominant role in nuclear politics since its scientists invented these fiendish engines, now has an impulsive and uninformed leader, boding ill for nuclear restraint and effective crisis management. Given current trends, it is prudent to assume that sooner or later, and probably sooner, nuclear weapons will again be the used in war. But this bad news may contain a “silver lining” of good news. Unlike a general nuclear war that might have occurred during the Cold War, such a nuclear event now would probably not mark the end of civilization (or of humanity), due to the great reductions in nuclear forces achieved at the end of the Cold War. Furthermore, politics on “the day after” could have immense potential for positive change. The survivors would not be likely to envy the dead, but would surely have a greatly renewed resolution for “never again.” Such an event, completely unpredictable in its particulars, would unambiguously put the nuclear-political question back at the top of the world political agenda. It would unmistakeably remind leading states of their vulnerability It might also trigger more robust efforts to achieve the global regulation of nuclear capability. Like the bombings of Hiroshima and Nagasaki that did so much to catalyze the elevated concern for nuclear security in the early Cold War, and like the experience “at the brink” in the Cuban Missile Crisis of 1962, the now bubbling nuclear caldron holds the possibility of inaugurating a major period of institutional innovation and adjustment toward a fully “bombs away” future.

#### Superior studies- theirs are confirmation-bias laden and repeatedly disproven

S. Fred **Singer 18**. Professor emeritus at the University of Virginia and a founding director and now chairman emeritus of the Science & Environmental Policy Project, specialist in atmospheric and space physics, founding director of the U.S. Weather Satellite Service, now part of NOAA, served as vice chair of the U.S. National Advisory Committee on Oceans &amp; Atmosphere, an elected fellow of several scientific societies, including APS, AGU, AAAS, AIAA, Sigma Xi, and Tau Beta Pi, and a senior fellow of the Heartland Institute and the Independent Institute. 6-27-2018. "Remember Nuclear Winter?." American Thinker. https://www.americanthinker.com/articles/2018/06/remember\_nuclear\_winter.html

Nuclear Winter burst on the academic scene in December 1983 with the publication of the hypothesis in the prestigious journal Science. It was accompanied by a study by Paul Ehrlich, et al. that hinted that it might cause the extinction of human life on the planet. MCANW stands for Medical Campaign Against Nuclear Weapons. Photo via Wellcome Images. The five authors of the Nuclear Winter hypothesis were labeled TTAPS, using the initials of their family names (T stands for Owen Toon and P stands for Jim Pollak, both Ph.D. students of Carl Sagan at Cornell University.) Carl Sagan himself was the main author and driving force. Actually, Sagan had scooped the Science paper by publishing the gist of the hypothesis in Parade magazine, which claimed a readership of 50 million! Previously, Sagan had briefed people in public office and elsewhere, so they were all primed for the popular reaction, which was tremendous. Many of today's readers may not remember Carl Sagan. He was a brilliant astrophysicist but also highly political. Imagine Al Gore, but with an excellent science background. Sagan had developed and narrated a television series called Cosmos that popularized astrophysics and much else, including cosmology, the history of the universe. He even suggested the possible existence of extraterrestrial intelligence and started a listening project called SETI (Search for Extraterrestrial Intelligence). SETI is still searching today and has not found any evidence so far. Sagan became a sort of icon; many people in the U.S. and abroad knew his name and face. Carl Sagan also had another passion: saving humanity from a general nuclear war, a laudable aim. He had been arguing vigorously and publicly for a "freeze" on the production of more nuclear weapons. President Ronald Reagan outdid him and negotiated a nuclear weapons reduction with the USSR. In the meantime, much excitement was stirred up by Nuclear Winter. Study after study tried to confirm and expand the hypothesis, led by the Defense Department (DOD), which took the hypothesis seriously and spent millions of dollars on various reports that accepted Nuclear Winter rather uncritically. The National Research Council (NRC) of the National Academy of Sciences published a report that put in more quantitative detail. It enabled critics of the hypothesis to find flaws – and many did. The names Russell Seitz, Dick Wilson (both of Cambridge, Mass.), Steve Schneider (Palo Alto, Calif.), and Bob Ehrlich (Fairfax, Va.) (no relation to Paul Ehrlich) come to mind. The hypothesis was really "politics disguised as science." The whole TTAPS scheme was contrived to deliver the desired consequence. It required the smoke layer to be of just the right thickness, covering the whole Earth, and lasting for many months. The Kuwait oil fires in 1991 produced a lot of smoke, but it rained out after a few days. I had a mini-debate with Sagan on the TV program Nightline and published a more critical analysis of the whole hypothesis in the journal Meteorology & Atmospheric Physics. I don't know if Carl ever saw my paper. But I learned a lot from doing this analysis that was useful in later global warming research. For example, the initial nuclear bursts inject water vapor into the stratosphere, which turns into contrail-like cirrus clouds. That actually leads to a strong initial warming and a "nuclear summer."

#### Industrial civilization wouldn’t recover.

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Imagine that the world as we know it ends tomorrow. There’s a global catastrophe: a pandemic virus, an asteroid strike, or perhaps a nuclear holocaust. The vast majority of the human race perishes. Our civilisation collapses. The post-apocalyptic survivors find themselves in a devastated world of decaying, deserted cities and roving gangs of bandits looting and taking by force. Bad as things sound, that’s not the end for humanity. We bounce back. Sooner or later, peace and order emerge again, just as they have time and again through history. Stable communities take shape. They begin the agonising process of rebuilding their technological base from scratch. But here’s the question: how far could such a society rebuild? Is there any chance, for instance, that a post-apocalyptic society could reboot a technological civilisation? Let’s make the basis of this thought experiment a little more specific. Today, we have already consumed the most easily drainable crude oil and, particularly in Britain, much of the shallowest, most readily mined deposits of coal. Fossil fuels are central to the organisation of modern industrial society, just as they were central to its development. Those, by the way, are distinct roles: even if we could somehow do without fossil fuels now (which we can’t, quite), it’s a different question whether we could have got to where we are without ever having had them. So, would a society starting over on a planet stripped of its fossil fuel deposits have the chance to progress through its own Industrial Revolution? Or to phrase it another way, what might have happened if, for whatever reason, the Earth had never acquired its extensive underground deposits of coal and oil in the first place? Would our progress necessarily have halted in the 18th century, in a pre-industrial state? It’s easy to underestimate our current dependence on fossil fuels. In everyday life, their most visible use is the petrol or diesel pumped into the vehicles that fill our roads, and the coal and natural gas which fire the power stations that electrify our modern lives. But we also rely on a range of different industrial materials, and in most cases, high temperatures are required to transform the stuff we dig out of the ground or harvest from the landscape into something useful. You can’t smelt metal, make glass, roast the ingredients of concrete, or synthesise artificial fertiliser without a lot of heat. It is fossil fuels – coal, gas and oil – that provide most of this thermal energy. In fact, the problem is even worse than that. Many of the chemicals required in bulk to run the modern world, from pesticides to plastics, derive from the diverse organic compounds in crude oil. Given the dwindling reserves of crude oil left in the world, it could be argued that the most wasteful use for this limited resource is to simply burn it. We should be carefully preserving what’s left for the vital repertoire of valuable organic compounds it offers. But my topic here is not what we should do now. Presumably everybody knows that we must transition to a low-carbon economy one way or another. No, I want to answer a question whose interest is (let’s hope) more theoretical. Is the emergence of a technologically advanced civilisation necessarily contingent on the easy availability of ancient energy? Is it possible to build an industrialised civilisation without fossil fuels? And the answer to that question is: maybe – but it would be extremely difficult. Let’s see how. We’ll start with a natural thought. Many of our alternative energy technologies are already highly developed. Solar panels, for example, represent a good option today, and are appearing more and more on the roofs of houses and businesses. It’s tempting to think that a rebooted society could simply pick up where we leave off. Why couldn’t our civilisation 2.0 just start with renewables? Well, it could, in a very limited way. If you find yourself among the survivors in a post-apocalyptic world, you could scavenge enough working solar panels to keep your lifestyle electrified for a good long while. Without moving parts, photovoltaic cells require little maintenance and are remarkably resilient. They do deteriorate over time, though, from moisture penetrating the casing and from sunlight itself degrading the high-purity silicon layers. The electricity generated by a solar panel declines by about 1 per cent every year so, after a few generations, all our hand-me-down solar panels will have degraded to the point of uselessness. Then what? New ones would be fiendishly difficult to create from scratch. Solar panels are made from thin slices of extremely pure silicon, and although the raw material is common sand, it must be processed and refined using complex and precise techniques – the same technological capabilities, more or less, that we need for modern semiconductor electronics components. These techniques took a long time to develop, and would presumably take a long time to recover. So photovoltaic solar power would not be within the capability of a society early in the industrialisation process. Perhaps, though, we were on the right track by starting with electrical power. Most of our renewable-energy technologies produce electricity. In our own historical development, it so happens that the core phenomena of electricity were discovered in the first half of the 1800s, well after the early development of steam engines. Heavy industry was already committed to combustion-based machinery, and electricity has largely assumed a subsidiary role in the organisation of our economies ever since. But could that sequence have run the other way? Is there some developmental requirement that thermal energy must come first? On the face of it, it’s not beyond the bounds of possibility that a progressing society could construct electrical generators and couple them to simple windmills and waterwheels, later progressing to wind turbines and hydroelectric dams. In a world without fossil fuels, one might envisage an electrified civilisation that largely bypasses combustion engines, building its transport infrastructure around electric trains and trams for long-distance and urban transport. I say ‘largely’. We couldn’t get round it all together. When it comes to generating the white heat demanded by modern industry, there are few good options but to burn stuff While the electric motor could perhaps replace the coal-burning steam engine for mechanical applications, society, as we’ve already seen, also relies upon thermal energy to drive the essential chemical and physical transformations it needs. How could an industrialising society produce crucial building materials such as iron and steel, brick, mortar, cement and glass without resorting to deposits of coal? You can of course create heat from electricity. We already use electric ovens and kilns. Modern arc furnaces are used for producing cast iron or recycling steel. The problem isn’t so much that electricity can’t be used to heat things, but that for meaningful industrial activity you’ve got to generate prodigious amounts of it, which is challenging using only renewable energy sources such as wind and water. An alternative is to generate high temperatures using solar power directly. Rather than relying on photovoltaic panels, concentrated solar thermal farms use giant mirrors to focus the sun’s rays onto a small spot. The heat concentrated in this way can be exploited to drive certain chemical or industrial processes, or else to raise steam and drive a generator. Even so, it is difficult (for example) to produce the very high temperatures inside an iron-smelting blast furnace using such a system. What’s more, it goes without saying that the effectiveness of concentrated solar power depends strongly on the local climate. No, when it comes to generating the white heat demanded by modern industry, there are few good options but to burn stuff. But that doesn’t mean the stuff we burn necessarily has to be fossil fuels. Let’s take a quick detour into the pre-history of modern industry. Long before the adoption of coal, charcoal was widely used for smelting metals. In many respects it is superior: charcoal burns hotter than coal and contains far fewer impurities. In fact, coal’s impurities were a major delaying factor on the Industrial Revolution. Released during combustion, they can taint the product being heated. During smelting, sulphur contaminants can soak into the molten iron, making the metal brittle and unsafe to use. It took a long time to work out how to treat coal to make it useful for many industrial applications. And, in the meantime, charcoal worked perfectly well. And then, well, we stopped using it. In retrospect, that’s a pity. When it comes from a sustainable source, charcoal burning is essentially carbon-neutral, because it doesn’t release any new carbon into the atmosphere – not that this would have been a consideration for the early industrialists. But charcoal-based industry didn’t die out altogether. In fact, it survived to flourish in Brazil. Because it has substantial iron deposits but few coalmines, Brazil is the largest charcoal producer in the world and the ninth biggest steel producer. We aren’t talking about a cottage industry here, and this makes Brazil a very encouraging example for our thought experiment. The trees used in Brazil’s charcoal industry are mainly fast-growing eucalyptus, cultivated specifically for the purpose. The traditional method for creating charcoal is to pile chopped staves of air-dried timber into a great dome-shaped mound and then cover it with turf or soil to restrict airflow as the wood smoulders. The Brazilian enterprise has scaled up this traditional craft to an industrial operation. Dried timber is stacked into squat, cylindrical kilns, built of brick or masonry and arranged in long lines so that they can be easily filled and unloaded in sequence. The largest sites can sport hundreds of such kilns. Once filled, their entrances are sealed and a fire is lit from the top. The skill in charcoal production is to allow just enough air into the interior of the kiln. There must be enough combustion heat to drive out moisture and volatiles and to pyrolyse the wood, but not so much that you are left with nothing but a pile of ashes. The kiln attendant monitors the state of the burn by carefully watching the smoke seeping out of the top, opening air holes or sealing with clay as necessary to regulate the process. Brazil shows how the raw materials of modern civilisation can be supplied without reliance on fossil fuels Good things come to those who wait, and this wood pyrolysis process can take up to a week of carefully controlled smouldering. The same basic method has been used for millennia. However, the ends to which the fuel is put are distinctly modern. Brazilian charcoal is trucked out of the forests to the country’s blast furnaces where it is used to transform ore into pig iron. This pig iron is the basic ingredient of modern mass-produced steel. The Brazilian product is exported to countries such as China and the US where it becomes cars and trucks, sinks, bathtubs, and kitchen appliances. Around two-thirds of Brazilian charcoal comes from sustainable plantations, and so this modern-day practice has been dubbed ‘green steel’. Sadly, the final third is supplied by the non-sustainable felling of primary forest. Even so, the Brazilian case does provide an example of how the raw materials of modern civilisation can be supplied without reliance on fossil fuels. Another, related option might be wood gasification. The use of wood to provide heat is as old as mankind, and yet simply burning timber only uses about a third of its energy. The rest is lost when gases and vapours released by the burning process blow away in the wind. Under the right conditions, even smoke is combustible. We don’t want to waste it. Better than simple burning, then, is to drive the thermal breakdown of the wood and collect the gases. You can see the basic principle at work for yourself just by lighting a match. The luminous flame isn’t actually touching the matchwood: it dances above, with a clear gap in between. The flame actually feeds on the hot gases given off as the wood breaks down in the heat, and the gases combust only once they mix with oxygen from the air. Matches are fascinating when you look at them closely. Wartime gasifier cars could achieve about 1.5 miles per kilogram. Today’s designs improve upon this To release these gases in a controlled way, bake some timber in a closed container. Oxygen is restricted so that the wood doesn’t simply catch fire. Its complex molecules decompose through a process known as pyrolysis, and then the hot carbonised lumps of charcoal at the bottom of the container react with the breakdown products to produce flammable gases such as hydrogen and carbon monoxide. The resultant ‘producer gas’ is a versatile fuel: it can be stored or piped for use in heating or street lights, and is also suitable for use in complex machinery such as the internal combustion engine. More than a million gasifier-powered cars across the world kept civilian transport running during the oil shortages of the Second World War. In occupied Denmark, 95 per cent of all tractors, trucks and fishing boats were powered by wood-gas generators. The energy content of about 3 kg of wood (depending on its dryness and density) is equivalent to a litre of petrol, and the fuel consumption of a gasifier-powered car is given in miles per kilogram of wood rather than miles per gallon. Wartime gasifier cars could achieve about 1.5 miles per kilogram. Today’s designs improve upon this. But you can do a lot more with wood gases than just keep your vehicle on the road. It turns out to be suitable for any of the manufacturing processes needing heat that we looked at before, such as kilns for lime, cement or bricks. Wood gas generator units could easily power agricultural or industrial equipment, or pumps. Sweden and Denmark are world leaders in their use of sustainable forests and agricultural waste for turning the steam turbines in power stations. And once the steam has been used in their ‘Combined Heat and Power’ (CHP) electricity plants, it is piped to the surrounding towns and industries to heat them, allowing such CHP stations to approach 90 per cent energy efficiency. Such plants suggest a marvellous vision of industry wholly weaned from its dependency on fossil fuel. Is that our solution, then? Could our rebooting society run on wood, supplemented with electricity from renewable sources? Maybe so, if the population was fairly small. But here’s the catch. These options all presuppose that our survivors are able to construct efficient steam turbines, CHP stations and internal combustion engines. We know how to do all that, of course – but in the event of a civilisational collapse, who is to say that the knowledge won’t be lost? And if it is, what are the chances that our descendants could reconstruct it? In our own history, the first successful application of steam engines was in pumping out coal mines. This was a setting in which fuel was already abundant, so it didn’t matter that the first, primitive designs were terribly inefficient. The increased output of coal from the mines was used to first smelt and then forge more iron. Iron components were used to construct further steam engines, which were in turn used to pump mines or drive the blast furnaces at iron foundries. And of course, steam engines were themselves employed at machine shops to construct yet more steam engines. It was only once steam engines were being built and operated that subsequent engineers were able to devise ways to increase their efficiency and shrink fuel demands. They found ways to reduce their size and weight, adapting them for applications in transport or factory machinery. In other words, there was a positive feedback loop at the very core of the industrial revolution: the production of coal, iron and steam engines were all mutually supportive. In a world without readily mined coal, would there ever be the opportunity to test profligate prototypes of steam engines, even if they could mature and become more efficient over time? How feasible is it that a society could attain a sufficient understanding of thermodynamics, metallurgy and mechanics to make the precisely interacting components of an internal combustion engine, without first cutting its teeth on much simpler external combustion engines – the separate boiler and cylinder-piston of steam engines? It took a lot of energy to develop our technologies to their present heights, and presumably it would take a lot of energy to do it again. Fossil fuels are out. That means our future society will need an awful lot of timber. An industrial revolution without coal would be, at a minimum, very difficult In a temperate climate such as the UK’s, an acre of broadleaf trees produces about four to five tonnes of biomass fuel every year. If you cultivated fast-growing kinds such as willow or miscanthus grass, you could quadruple that. The trick to maximising timber production is to employ coppicing – cultivating trees such as ash or willow that resprout from their own stump, becoming ready for harvest again in five to 15 years. This way you can ensure a sustained supply of timber and not face an energy crisis once you’ve deforested your surroundings. But here’s the thing: coppicing was already a well-developed technique in pre-industrial Britain. It couldn’t meet all of the energy requirements of the burgeoning society. The central problem is that woodland, even when it is well-managed, competes with other land uses, principally agriculture. The double-whammy of development is that, as a society’s population grows, it requires more farmland to provide enough food and also greater timber production for energy. The two needs compete for largely the same land areas. We know how this played out in our own past. From the mid-16th century, Britain responded to these factors by increasing the exploitation of its coal fields – essentially harvesting the energy of ancient forests beneath the ground without compromising its agricultural output. The same energy provided by one hectare of coppice for a year is provided by about five to 10 tonnes of coal, and it can be dug out of the ground an awful lot quicker than waiting for the woodland to regrow. It is this limitation in the supply of thermal energy that would pose the biggest problem to a society trying to industrialise without easy access to fossil fuels. This is true in our post-apocalyptic scenario, and it would be equally true in any counterfactual world that never developed fossil fuels for whatever reason. For a society to stand any chance of industrialising under such conditions, it would have to focus its efforts in certain, very favourable natural environments: not the coal-island of 18th-century Britain, but perhaps areas of Scandinavia or Canada that combine fast-flowing streams for hydroelectric power and large areas of forest that can be harvested sustainably for thermal energy. Even so, an industrial revolution without coal would be, at a minimum, very difficult. Today, use of fossil fuels is actually growing, which is worrying for a number of reasons too familiar to rehearse here. Steps towards a low-carbon economy are vital. But we should also recognise how pivotal those accumulated reservoirs of thermal energy were in getting us to where we are. Maybe we could have made it the hard way. A slow-burn progression through the stages of mechanisation, supported by a combination of renewable electricity and sustainably grown biomass, might be possible after all. Then again, it might not. We’d better hope we can secure the future of our own civilisation, because we might have scuppered the chances of any society to follow in our wake.

Prob want another sheet for this

Space col failing means we cant go to space – that’s good -

#### Extraterrestrial life exists – there are 10 thousand advanced civilizations in our galaxy

Santschi quoting Frank **Drake, 05**

[Darrell R.; The Press-Enterprise & Frank Drake member of the National Academy of Sciences where he chaired the Board of Physics and Astronomy of the National Research Council (1989-92). He also served as President of the Astronomical Society of the Pacific. He was a Professor of Astronomy at Cornell University (1964-84) and served as the Director of the Arecibo Observatory. He is currently involved in Project Phoenix (SETI) He is Emeritus Professor of Astronomy and Astrophysics at the University of California, Santa Cruz where he also served as Dean of Natural Sciences (1984-88). “Scientist: Cosmos calculations add up to life” Press Enterprise (Riverside, CA) March 5, 2005 L/N]

There are 10 billion habitable planets in the Milky Way galaxy alone, according to Frank Drake, senior scientist at the Mountain View-based Search for Extraterrestrial Intelligence Institute."If we take some of the most popular guesses," he said, "We come up with perhaps 10,000 civilizations like our own in the Milky Way." CARD CONTINUES "Yes, there is life in outer space," Drake said in an interview before his lecture. "That's easy to say. There are so many planets and we know enough about life to know that the development of life is an easy thing once you have a planet similar to the Earth. So there must be life out there."

#### Humans are developing Self-Replicating Von Neumann Probes.

**Sandberg, No Date.** (Anders Sandberg, “Thistledown” PhD in Computational Neuroscience from Stockholm University, Post-doctoral Research Assistant for the Oxford Group of the EU-ENHANCE Project at the Uehiro Centre for Practical Ethics, and Research Associate at the Future of Humanity Institute. Online.

This paper describes one possible architecture for a general purpose exploration and colonization probe, employing self- replicating machine technology (von Neumann machines) to both establish a beach-head in the remote system and to send copies of itself to unexplored systems. The use of von Neumann probes have previously been suggested by others [Refs, refs in Tipler]. The Basic Lifecycle of a Probe The lifecycle consists of nine different phases: 1. Launch. Using a laser-driven solar sail the probe is launched towards the destination system. Over a period of several years it is accelerated to a high albeit sub-relativistic speed. 2. Coasting phase. The probe passively travels the distance between the systems. 3. Braking phase. [Magsail?] The laser is switched on. The solar sail divides into a small central disc and a large outer annulus. Reflected light from the annulus is used to brake the central disc as it approaches the destination system. 4. Navigation phase. The probe navigates the destination system using its solar sail. Using its sensors surveys the system, especially looking for carbonaceous chondrites. 5. Seeding. Once the probe has found a suitable asteroid, it approaches and plants one javellin-like seed into its surface. This seeding process may be repeated with other asteroids in order to reduce risks. 6. Sprouting. Self-replicating nano- or micro-machines are released from the javellin-seed. They begin to colonize the asteroid surface, replicating and building a photovoltaic covering which also acts as a protective shield against ultraviolet light. 7. Maturation. Once the probe "biomass" is large enough growth is changed from replication to building an antenna system. 8. Flowering. The antenna is directed towards the departure system, and a signal is sent back. The probe goes into a hibernating state where it waits for a response. 9. Reproducing. Eventually a responce arrives from the departure system, containing new instructions about what to build. This could involve building new probes and launching laser systems, or the creation of a habitat suited for colonization. A radio beacon is activated proclaiming the system as inhabited (to avoid having other systems send redundant probes).

#### Von Neumann Probes would destroy the Universe.

**Bostrom 2k6**, Oxford Philosophy Professor, 06 <Dinosaurs, dodos, humans?, Global Agenda February 28, 2006 Dinosaurs, Dodos, Humans, Institute for Ethics In Emerging Technologies http://ieet.org/index.php/IEET/more/bostrom200601/>

Invasion of the robotic probes Some studies suggest that an uncoordinated colonization race could, instead, lead to the evolution of self-replicating robotic colonization probes that would use up these cosmic commons to no other purpose than to make more copies of themselves.

#### Independent colony is impossible.

**Levchenko et al. 19**. Professors in the Plasma Sources and Applications Centre/Space Propulsion Centre, NIE, Nanyang Technological University. 2019. “Mars Colonization: Beyond Getting There.” Global Challenges, vol. 3, no. 1.

Settlement of Mars—is it a dream or a necessity? From scientific publications to public forms, there is certainly little consensus on whether colonization of Mars is necessary or even possible, with a rich diversity of opinions that range from categorical It is a necessity!20 to equally categorical Should Humans Colonize Other Planets? No.21 A strong proponent of the idea, Orwig puts forward five reasons for Mars colonization, implicitly stating that establishing a permanent colony of humans on Mars is no longer an option but a real necessity.20 Specifically, these arguments are: Survival of humans as a species; Exploring the potential of life on Mars to sustain humans; Using space technology to positively contribute to our quality of life, from health to minimizing and reversing negative aspects of anthropogenic activity of humans on Earth; Developing as a species; Gaining political and economic leadership. The first argument captures the essence of what most space colonization proponents feel—our ever growing environmental footprint threatens the survival of human race on Earth. Indeed, a large body of evidence points to human activity as the main cause of extinction of many species, with shrinking biodiversity and depleting resources threatening the very survival of humans on this planet. Colonization of other planets could potentially increase the probability of our survival. While being at the core of such ambitious projects as Mars One, a self‐sustained colony of any size on Mars is hardly feasible in the foreseeable future. Indeed, sustaining even a small number of colonists would require a continuous supply of food, oxygen, water and basic materials.