# 1NC

### 1NC – OFF

#### Pleasure and pain are intrinsic value and disvalue – everything else regresses – robust neuroscience.

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**Pleasure** is not only one of the three primary reward functions but it also **defines reward.** As homeostasis explains the functions of only a limited number of rewards, the principal reason why particular stimuli, objects, events, situations, and activities are rewarding may be due to pleasure. This applies first of all to sex and to the primary homeostatic rewards of food and liquid and extends to money, taste, beauty, social encounters and nonmaterial, internally set, and intrinsic rewards. Pleasure, as the primary effect of rewards, drives the prime reward functions of learning, approach behavior, and decision making and provides the **basis for hedonic theories** of reward function. We are attracted by most rewards and exert intense efforts to obtain them, just because they are enjoyable [10]. Pleasure is a passive reaction that derives from the experience or prediction of reward and may lead to a long-lasting state of happiness. The word happiness is difficult to define. In fact, just obtaining physical pleasure may not be enough. One key to happiness involves a network of good friends. However, it is not obvious how the higher forms of satisfaction and pleasure are related to an ice cream cone, or to your team winning a sporting event. Recent multidisciplinary research, using both humans and detailed invasive brain analysis of animals has discovered some critical ways that the brain processes pleasure [14]. Pleasure as a hallmark of reward is sufficient for defining a reward, but it may not be necessary. A reward may generate positive learning and approach behavior simply because it contains substances that are essential for body function. When we are hungry, we may eat bad and unpleasant meals. A monkey who receives hundreds of small drops of water every morning in the laboratory is unlikely to feel a rush of pleasure every time it gets the 0.1 ml. Nevertheless, with these precautions in mind, we may define any stimulus, object, event, activity, or situation that has the potential to produce pleasure as a reward. In the context of reward deficiency or for disorders of addiction, homeostasis pursues pharmacological treatments: drugs to treat drug addiction, obesity, and other compulsive behaviors. The theory of allostasis suggests broader approaches - such as re-expanding the range of possible pleasures and providing opportunities to expend effort in their pursuit. [15]. It is noteworthy, the first animal studies eliciting approach behavior by electrical brain stimulation interpreted their findings as a discovery of the brain’s pleasure centers [16] which were later partly associated with midbrain dopamine neurons [17–19] despite the notorious difficulties of identifying emotions in animals. Evolutionary theories of pleasure: The love connection BO:D Charles Darwin and other biological scientists that have examined the biological evolution and its basic principles found various mechanisms that steer behavior and biological development. Besides their theory on natural selection, it was particularly the sexual selection process that gained significance in the latter context over the last century, especially when it comes to the question of what makes us “what we are,” i.e., human. However, the capacity to sexually select and evolve is not at all a human accomplishment alone or a sign of our uniqueness; yet, we humans, as it seems, are ingenious in fooling ourselves and others–when we are in love or desperately search for it. It is well established that modern biological theory conjectures that **organisms are** the **result of evolutionary competition.** In fact, Richard Dawkins stresses gene survival and propagation as the basic mechanism of life [20]. Only genes that lead to the fittest phenotype will make it. It is noteworthy that the phenotype is selected based on behavior that maximizes gene propagation. To do so, the phenotype must survive and generate offspring, and be better at it than its competitors. Thus, the ultimate, distal function of rewards is to increase evolutionary fitness by ensuring the survival of the organism and reproduction. It is agreed that learning, approach, economic decisions, and positive emotions are the proximal functions through which phenotypes obtain other necessary nutrients for survival, mating, and care for offspring. Behavioral reward functions have evolved to help individuals to survive and propagate their genes. Apparently, people need to live well and long enough to reproduce. Most would agree that homo-sapiens do so by ingesting the substances that make their bodies function properly. For this reason, foods and drinks are rewards. Additional rewards, including those used for economic exchanges, ensure sufficient palatable food and drink supply. Mating and gene propagation is supported by powerful sexual attraction. Additional properties, like body form, augment the chance to mate and nourish and defend offspring and are therefore also rewards. Care for offspring until they can reproduce themselves helps gene propagation and is rewarding; otherwise, many believe mating is useless. According to David E Comings, as any small edge will ultimately result in evolutionary advantage [21], additional reward mechanisms like novelty seeking and exploration widen the spectrum of available rewards and thus enhance the chance for survival, reproduction, and ultimate gene propagation. These functions may help us to obtain the benefits of distant rewards that are determined by our own interests and not immediately available in the environment. Thus the distal reward function in gene propagation and evolutionary fitness defines the proximal reward functions that we see in everyday behavior. That is why foods, drinks, mates, and offspring are rewarding. There have been theories linking pleasure as a required component of health benefits salutogenesis, (salugenesis). In essence, under these terms, pleasure is described as a state or feeling of happiness and satisfaction resulting from an experience that one enjoys. Regarding pleasure, it is a double-edged sword, on the one hand, it promotes positive feelings (like mindfulness) and even better cognition, possibly through the release of dopamine [22]. But on the other hand, pleasure simultaneously encourages addiction and other negative behaviors, i.e., motivational toxicity. It is a complex neurobiological phenomenon, relying on reward circuitry or limbic activity. It is important to realize that through the “Brain Reward Cascade” (BRC) endorphin and endogenous morphinergic mechanisms may play a role [23]. While natural rewards are essential for survival and appetitive motivation leading to beneficial biological behaviors like eating, sex, and reproduction, crucial social interactions seem to further facilitate the positive effects exerted by pleasurable experiences. Indeed, experimentation with addictive drugs is capable of directly acting on reward pathways and causing deterioration of these systems promoting hypodopaminergia [24]. Most would agree that pleasurable activities can stimulate personal growth and may help to induce healthy behavioral changes, including stress management [25]. The work of Esch and Stefano [26] concerning the link between compassion and love implicate the brain reward system, and pleasure induction suggests that social contact in general, i.e., love, attachment, and compassion, can be highly effective in stress reduction, survival, and overall health. Understanding the role of neurotransmission and pleasurable states both positive and negative have been adequately studied over many decades [26–37], but comparative anatomical and neurobiological function between animals and homo sapiens appear to be required and seem to be in an infancy stage. Finding happiness is different between apes and humans As stated earlier in this expert opinion one key to happiness involves a network of good friends [38]. However, it is not entirely clear exactly how the higher forms of satisfaction and pleasure are related to a sugar rush, winning a sports event or even sky diving, all of which augment dopamine release at the reward brain site. Recent multidisciplinary research, using both humans and detailed invasive brain analysis of animals has discovered some critical ways that the brain processes pleasure. Remarkably, there are pathways for ordinary liking and pleasure, which are limited in scope as described above in this commentary. However, there are **many brain regions**, often termed hot and cold spots, that significantly **modulate** (increase or decrease) our **pleasure or** even **produce the opposite** of pleasure— that is disgust and fear [39]. One specific region of the nucleus accumbens is organized like a computer keyboard, with particular stimulus triggers in rows— producing an increase and decrease of pleasure and disgust. Moreover, the cortex has unique roles in the cognitive evaluation of our feelings of pleasure [40]. Importantly, the interplay of these multiple triggers and the higher brain centers in the prefrontal cortex are very intricate and are just being uncovered. Desire and reward centers It is surprising that many different sources of pleasure activate the same circuits between the mesocorticolimbic regions (Figure 1). Reward and desire are two aspects pleasure induction and have a very widespread, large circuit. Some part of this circuit distinguishes between desire and dread. The so-called pleasure circuitry called “REWARD” involves a well-known dopamine pathway in the mesolimbic system that can influence both pleasure and motivation. In simplest terms, the well-established mesolimbic system is a dopamine circuit for reward. It starts in the ventral tegmental area (VTA) of the midbrain and travels to the nucleus accumbens (Figure 2). It is the cornerstone target to all addictions. The VTA is encompassed with neurons using glutamate, GABA, and dopamine. The nucleus accumbens (NAc) is located within the ventral striatum and is divided into two sub-regions—the motor and limbic regions associated with its core and shell, respectively. The NAc has spiny neurons that receive dopamine from the VTA and glutamate (a dopamine driver) from the hippocampus, amygdala and medial prefrontal cortex. Subsequently, the NAc projects GABA signals to an area termed the ventral pallidum (VP). The region is a relay station in the limbic loop of the basal ganglia, critical for motivation, behavior, emotions and the “Feel Good” response. This defined system of the brain is involved in all addictions –substance, and non –substance related. In 1995, our laboratory coined the term “Reward Deficiency Syndrome” (RDS) to describe genetic and epigenetic induced hypodopaminergia in the “Brain Reward Cascade” that contribute to addiction and compulsive behaviors [3,6,41]. Furthermore, ordinary “liking” of something, or pure pleasure, is represented by small regions mainly in the limbic system (old reptilian part of the brain). These may be part of larger neural circuits. In Latin, hedus is the term for “sweet”; and in Greek, hodone is the term for “pleasure.” Thus, the word Hedonic is now referring to various subcomponents of pleasure: some associated with purely sensory and others with more complex emotions involving morals, aesthetics, and social interactions. The capacity to have pleasure is part of being healthy and may even extend life, especially if linked to optimism as a dopaminergic response [42]. Psychiatric illness often includes symptoms of an abnormal inability to experience pleasure, referred to as anhedonia. A negative feeling state is called dysphoria, which can consist of many emotions such as pain, depression, anxiety, fear, and disgust. Previously many scientists used animal research to uncover the complex mechanisms of pleasure, liking, motivation and even emotions like panic and fear, as discussed above [43]. However, as a significant amount of related research about the specific brain regions of pleasure/reward circuitry has been derived from invasive studies of animals, these cannot be directly compared with subjective states experienced by humans. In an attempt to resolve the controversy regarding the causal contributions of mesolimbic dopamine systems to reward, we have previously evaluated the three-main competing explanatory categories: “liking,” “learning,” and “wanting” [3]. That is, dopamine may mediate (a) liking: the hedonic impact of reward, (b) learning: learned predictions about rewarding effects, or (c) wanting: the pursuit of rewards by attributing incentive salience to reward-related stimuli [44]. We have evaluated these hypotheses, especially as they relate to the RDS, and we find that the incentive salience or “wanting” hypothesis of dopaminergic functioning is supported by a majority of the scientific evidence. Various neuroimaging studies have shown that anticipated behaviors such as sex and gaming, delicious foods and drugs of abuse all affect brain regions associated with reward networks, and may not be unidirectional. Drugs of abuse enhance dopamine signaling which sensitizes mesolimbic brain mechanisms that apparently evolved explicitly to attribute incentive salience to various rewards [45]. Addictive substances are voluntarily self-administered, and they enhance (directly or indirectly) dopaminergic synaptic function in the NAc. This activation of the brain reward networks (producing the ecstatic “high” that users seek). Although these circuits were initially thought to encode a set point of hedonic tone, it is now being considered to be far more complicated in function, also encoding attention, reward expectancy, disconfirmation of reward expectancy, and incentive motivation [46]. The argument about addiction as a disease may be confused with a predisposition to substance and nonsubstance rewards relative to the extreme effect of drugs of abuse on brain neurochemistry. The former sets up an individual to be at high risk through both genetic polymorphisms in reward genes as well as harmful epigenetic insult. Some Psychologists, even with all the data, still infer that addiction is not a disease [47]. Elevated stress levels, together with polymorphisms (genetic variations) of various dopaminergic genes and the genes related to other neurotransmitters (and their genetic variants), and may have an additive effect on vulnerability to various addictions [48]. In this regard, Vanyukov, et al. [48] suggested based on review that whereas the gateway hypothesis does not specify mechanistic connections between “stages,” and does not extend to the risks for addictions the concept of common liability to addictions may be more parsimonious. The latter theory is grounded in genetic theory and supported by data identifying common sources of variation in the risk for specific addictions (e.g., RDS). This commonality has identifiable neurobiological substrate and plausible evolutionary explanations. Over many years the controversy of dopamine involvement in especially “pleasure” has led to confusion concerning separating motivation from actual pleasure (wanting versus liking) [49]. We take the position that animal studies cannot provide real clinical information as described by self-reports in humans. As mentioned earlier and in the abstract, on November 23rd, 2017, evidence for our concerns was discovered [50] In essence, although nonhuman primate brains are similar to our own, the disparity between other primates and those of human cognitive abilities tells us that surface similarity is not the whole story. Sousa et al. [50] small case found various differentially expressed genes, to associate with pleasure related systems. Furthermore, the dopaminergic interneurons located in the human neocortex were absent from the neocortex of nonhuman African apes. Such differences in neuronal transcriptional programs may underlie a variety of neurodevelopmental disorders. In simpler terms, the system controls the production of dopamine, a chemical messenger that plays a significant role in pleasure and rewards. The senior author, Dr. Nenad Sestan from Yale, stated: “Humans have evolved a dopamine system that is different than the one in chimpanzees.” This may explain why the behavior of humans is so unique from that of non-human primates, even though our brains are so surprisingly similar, Sestan said: “It might also shed light on why people are vulnerable to mental disorders such as autism (possibly even addiction).” Remarkably, this research finding emerged from an extensive, multicenter collaboration to compare the brains across several species. These researchers examined 247 specimens of neural tissue from six humans, five chimpanzees, and five macaque monkeys. Moreover, these investigators analyzed which genes were turned on or off in 16 regions of the brain. While the differences among species were subtle, **there was** a **remarkable contrast in** the **neocortices**, specifically in an area of the brain that is much more developed in humans than in chimpanzees. In fact, these researchers found that a gene called tyrosine hydroxylase (TH) for the enzyme, responsible for the production of dopamine, was expressed in the neocortex of humans, but not chimpanzees. As discussed earlier, dopamine is best known for its essential role within the brain’s reward system; the very system that responds to everything from sex, to gambling, to food, and to addictive drugs. However, dopamine also assists in regulating emotional responses, memory, and movement. Notably, abnormal dopamine levels have been linked to disorders including Parkinson’s, schizophrenia and spectrum disorders such as autism and addiction or RDS. Nora Volkow, the director of NIDA, pointed out that one alluring possibility is that the neurotransmitter dopamine plays a substantial role in humans’ ability to pursue various rewards that are perhaps months or even years away in the future. This same idea has been suggested by Dr. Robert Sapolsky, a professor of biology and neurology at Stanford University. Dr. Sapolsky cited evidence that dopamine levels rise dramatically in humans when we anticipate potential rewards that are uncertain and even far off in our futures, such as retirement or even the possible alterlife. This may explain what often motivates people to work for things that have no apparent short-term benefit [51]. In similar work, Volkow and Bale [52] proposed a model in which dopamine can favor NOW processes through phasic signaling in reward circuits or LATER processes through tonic signaling in control circuits. Specifically, they suggest that through its modulation of the orbitofrontal cortex, which processes salience attribution, dopamine also enables shilting from NOW to LATER, while its modulation of the insula, which processes interoceptive information, influences the probability of selecting NOW versus LATER actions based on an individual’s physiological state. This hypothesis further supports the concept that disruptions along these circuits contribute to diverse pathologies, including obesity and addiction or RDS.

#### Thus, the standard is maximizing expected well-being or act hedonistic util. Prefer additionally –

#### 1] Death is bad and outweighs – a) agents can’t act if they fear for their bodily security which constrains every ethical theory, b) it destroys the subject itself – kills any ability to achieve value in ethics since life is a prerequisite which means it’s a side constraint since we can’t reach the end goal of ethics without life

#### 2] Actor spec—governments must use util because they don’t have intentions and are constantly dealing with tradeoffs—outweighs since different agents have different obligations—takes out calc indicts since they are empirically denied.

#### 3] Link turn TJFs – util is better because a large majority of authors on this topic talk about the benefits and harms of appropriation in terms of wellbeing so ours outweighs on predictability

### 1NC - OFF

#### Text – Private Appropriation of Outer Space except for Space Elevators is Unjust. Private entities should recognize extra-terrestrial life as agents and reform articles 2 and 4 of the OST to allow for the appropriation of outer space by space elevators.

#### Space Elevators constitute Appropriation – they impede orbits.

Matignon 19 Louis de Gouyon Matignon 3-3-2019 "LEGAL ASPECTS OF THE SPACE ELEVATOR TRANSPORTATION SYSTEM" <https://www.spacelegalissues.com/space-law-legal-aspects-of-the-space-elevator-transportation-system/> [PhD in space law (co-supervised by both Philippe Delebecque, from Université Paris 1 Panthéon-Sorbonne, France, and Christopher D. Johnson, from Georgetown University || regularly write articles on the website Space Legal Issues so as to popularise space law and public international law]//Elmer

An Earth-based space elevator would consist of a cable with one end attached to the surface near the equator and the other end in space beyond geostationary orbit. An orbit is the curved path through which objects in space move around a planet or a star. The 1967 Treaty’s regime and customary law enshrine the principle of non-appropriation and freedom of access to orbital positions. Space Law and International Telecommunication Laws combined to protect this use against any interference. The majority of space-launched objects are satellites that are launched in Earth’s orbit (a very small part of space objects – scientific objects for space exploration – are launched into outer space beyond terrestrial orbits). It is important to precise that an orbit does not exist: satellites describe orbits by obeying the general laws of universal attraction. Depending on the launching techniques and parameters, the orbital trajectory of a satellite may vary. Sun-synchronous satellites fly over a given location constantly at the same time in local civil time: they are used for remote sensing, meteorology or the study of the atmosphere. Geostationary satellites are placed in a very high orbit; they give an impression of immobility because they remain permanently at the same vertical point of a terrestrial point (they are mainly used for telecommunications and television broadcasting). A geocentric orbit or Earth orbit involves any object orbiting Planet Earth, such as the Moon or artificial satellites. Geocentric (having the Earth as its centre) orbits are organised as follow: 1) Low Earth orbit (LEO): geocentric orbits with altitudes (the height of an object above the average surface of the Earth’s oceans) from 100 to 2 000 kilometres. Satellites in LEO have a small momentary field of view, only able to observe and communicate with a fraction of the Earth at a time, meaning a network or constellation of satellites is required in order to provide continuous coverage. Satellites in lower regions of LEO also suffer from fast orbital decay (in orbital mechanics, decay is a gradual decrease of the distance between two orbiting bodies at their closest approach, the periapsis, over many orbital periods), requiring either periodic reboosting to maintain a stable orbit, or launching replacement satellites when old ones re-enter. 2) Medium Earth orbit (MEO), also known as an intermediate circular orbit: geocentric orbits ranging in altitude from 2 000 kilometres to just below geosynchronous orbit at 35 786 kilometres. The most common use for satellites in this region is for navigation, communication, and geodetic/space environment science. The most common altitude is approximately 20 000 kilometres which yields an orbital period of twelve hours. 3) Geosynchronous orbit (GSO) and geostationary orbit (GEO) are orbits around Earth at an altitude of 35 786 kilometres matching Earth’s sidereal rotation period. All geosynchronous and geostationary orbits have a semi-major axis of 42 164 kilometres. A geostationary orbit stays exactly above the equator, whereas a geosynchronous orbit may swing north and south to cover more of the Earth’s surface. Communications satellites and weather satellites are often placed in geostationary orbits, so that the satellite antennae (located on Earth) that communicate with them do not have to rotate to track them, but can be pointed permanently at the position in the sky where the satellites are located. 4) High Earth orbit: geocentric orbits above the altitude of 35 786 kilometres. The competing forces of gravity, which is stronger at the lower end, and the outward/upward centrifugal force, which is stronger at the upper end, would result in the cable being held up, under tension, and stationary over a single position on Earth. With the tether deployed, climbers could repeatedly climb the tether to space by mechanical means, releasing their cargo to orbit. Climbers could also descend the tether to return cargo to the surface from orbit.

#### Private Companies are pursuing Space Elevators.

Alfano 15 Andrea Alfano 8-18-2015 “All Of These Companies Are Working On A Space Elevator” <https://www.techtimes.com/articles/77612/20150818/companies-working-space-elevator.htm> (Writer at the Tech Times)//Elmer

Space elevators are solid proof that any mundane object sounds way cooler if you stick the word "space" in front of it. But there's much more than coolness at stake when building a space elevator – this technology has the potential to revolutionize space transportation, and the Canadian private space company Thoth Technology that was recently awarded a patent for its space elevator design isn't the only company in the game. One of the other major players is a U.S.-based company called LiftPort Group, founded by space entrepreneur Michael Laine in 2003. Its plan for a space elevator is vastly different from the one for which Thoth received a patent, however. Whereas Thoth's plans entail tethering a 12-mile-high inflatable space elevator to the Earth, LiftPort is shooting for the moon. Originally, LiftPort had planned to build an Earth elevator, too, but it abandoned the idea in 2007 in favor of building a lunar elevator. The basic design for a lunar elevator is an anchor in the moon that is attached to a cable that extends to a space station situated at a very special point. Known as a Lagrange Point, this is the gravitational tipping point between the Earth and the moon, where their gravitational pulls essentially cancel one another out. A robot could then travel up and down the tether, ferrying cargo between the moon and the station. Out farther in space, a counterweight would balance out the system. Both types of space elevator are intended to increase space access, but in very different ways. Thoth's Earth elevator aims to make launches easier by starting off 12 miles above the Earth's surface. LiftPort's space elevator aims to increase access to the moon in particular, because it is much easier to launch a rocket to the Lagrange Point and dock it at a space station than it is to get to the moon directly. There's a third major company based in Japan called Obayashi Corp. whose plans look like a hybrid of Thoth's and LiftPort's. Obayashi is not a space company, however – it's actually a construction company. Like Thoth, Obayashi plans to build an Earth elevator. But its Earth elevator would consist of a cable tethered to the blue planet, a robotic cargo-carrier, a space station, and a counterweight. It essentially looks like LiftPort's plans, but stuck to the Earth instead of to the moon.

#### They’re feasible.

Smith 17 Vincent Smith 6-21-2017 "3 Challenges for Engineering A Space Elevator" <https://www.engineering.com/story/3-challenges-for-engineering-a-space-elevator> (Engineer)//Elmer

There's a lot of junk orbiting Earth. Thousands of hours have been poured into previous NASA missions, ensuring the least possible contamination by even the tiniest motes of dust and dirt. The kinds of instrumentation that would monitor a space elevator would need to be similarly discerning. However, the fact that it would be a permanent fixture means that sooner or later, a space elevator would cross paths with meteors and even remnants of previous space missions left behind as space debris. The extreme of this phenomenon even has a name: Kessler Syndrome, where the density of low earth debris becomes so large that nothing can pass it safely into outer space. This cascading problem of space debris collisions was featured in the film Gravity. As Bullock and Clooney can tell you, this phenomenon could cause catastrophic damage to the overall structure (or knock it off balance, returning to our 'oscillation' concerns). Edwards recognized this, and devoted an entire section of his report to addressing it. According to the report, part of dealing with this obstacle is recognizing and tracking low-earth orbit objects large enough to do damage to the structure. According to Section 10.3 of the report, “A study was done at Johnson Space Center on the construction of a system that could track objects down to 1cm in size with 100m accuracy using effectively current technology. This is very close to the tracking network we would need for the space elevator.” For situations in which avoidance is not always possible (the amount of low-earth orbit debris increases significantly from altitudes of approximately 300 to 1,000 miles), Edwards posits that increasing the thickness of the cable will make it robust enough to withstand all but the largest of objects, which could be tracked and avoided ahead of time using the systems previously mentioned. Even for these exceptional pieces of debris, Edwards illustrates in a section simply labeled “Meteors” that only (i) direct impact by an object (ii) over 3cm in diameter, (iii) with enough force to stay on the initial plane of impact (as opposed to being deflected or redirected by contact with the elevator apparatus), would create the kind of catastrophic damage that we associate with a complete severing of the cable. Designing the cable with curvature and panels specifically for deflection has been proposed by both Edwards as well as several other survivability reports, including this one, put together for the 2010 International Space Elevator Consortium (ISEC). Definitive answers as to the effectiveness of these measures are hopefully forthcoming, but it's at least comforting to know that there are first, second, and third lines of defense prepared for just such occasions.

#### Regardless of completion, Elevators spur investment in Nanotechnology

Liam O’Brien 16. University of Wollongong. 07/2016. “Nanotechnology in Space.” Young Scientists Journal; Canterbury, no. 19, p. 22.

Nanotechnology is at the forefront of scientific development, continuing to astound and innovate. Likewise, the space industry is rapidly increasing in sophistication and competition, with companies such as SpaceX, Blue Origin and Virgin Galactic becoming increasingly prevalent in what could become a new commercial space race. The various space programs over the past 60 years have led to a multitude of beneficial impacts for everyday society. Nanotechnology, through research and development in space has the potential to do the same. Potential applications of nanotechnology in space are numerous, many of them have the potential to capture and inspire generations to come. One of these applications is the space elevator. By using carbon nanotubes, a super light yet strong material, this concept would be an actual physical structure from the surface of the Earth to an altitude of approximately 36 000 km. The tallest building in the world would fit into this elevator over 42 000 times. The counterweight, used to keep the elevator taught, is proposed to be an asteroid. This would need to be at a distance of 100 000 km, a quarter of the distance to the moon. The benefits of such a structure would be enormous. 95% of a space shuttle's weight at take-off is fuel, costing US$ 20 000 per kilogram to send something into space. However, with a space elevator the cost per kilogram can be reduced to as little as US$ 200. Exploration to other planets can begin at the tower, and travel to and from the moon could become as simple as a morning commute to work. Solar sails provide the means to travel large distances and incredible speeds. Much like sails on a boat use wind, the solar sail uses light as a source of propulsion. Ideally these sails would be kilometres in length and only a few micrometres in thickness. This provides us with the ability to travel at speeds previously unheard of. Using carbon nanotubes once again, a solar sail has the capability to travel at 39 756 km/s which is 13% of the speed of light! This sail could reach Pluto in an astonishing 1.7 days, and Alpha Centauri in just 32 years. Space travel to other planets, other stars, could be possible with solar sails. The Planetary Society is funding for a space sail of itself, and has successfully launched one into orbit. NASA has also sent a sail into orbit, allowing it to burn up in the atmosphere after 240 days. Investing time and resources into nanotechnology for space exploration has benefits for society today. Materials such as graphene are being used in modern manufacturing at an increasing rate as the applications become utilised. Carbon nanotubes will change the way we think about materials and their strength. These nanotubes have a tensile strength one hundred times that of steel, yet are only a sixth of the weight. Imagine light weight vehicles using less petrol and energy as well as being just as strong as regular vehicles. With potentials to revolutionize the way we think about space travel, nanotechnology has a bright future. As a new field of science, it has the capability to push the human race to the outer reaches of our galaxy and hopefully one day to other stars. It will inspire generations of explorers and dreamers to challenge themselves and advance the human race into the next era. As Richard Feynman said in his 1959 talk 'There's Plenty of Room at the Bottom' "A field in which little has been done, but in which an enormous amount can be done. There is still plenty more to achieve.

#### Nanomaterials solve Warming and Water Scarcity.

Khullar 17 Bhavya Khullar 9-4-2017 "Nanomaterials Could Combat Climate Change and Reduce Pollution" <https://www.scientificamerican.com/article/nanomaterials-could-combat-climate-change-and-reduce-pollution/> (Former Programme Officer with the Food Safety and Toxins Unit, Centre for Science and Environment (CSE))//Elmer

August 18, 2017 — The list of environmental problems that the world faces may be huge, but some strategies for solving them are remarkably small. First explored for applications in microscopy and computing, nanomaterials—materials made up of units that are each thousands of times smaller than the thickness of a human hair—are emerging as useful for tackling threats to our planet’s well-being. Scientists across the globe are developing nanomaterials that can efficiently use carbon dioxide from the air, capture toxic pollutants from water and degrade solid waste into useful products. “Nanomaterials could help us mitigate pollution. They are efficient catalysts and mostly recyclable. Now, they have to become economical for commercialization and better to replace present-day technologies completely,” says Arun Chattopadhyay, a member of the chemistry faculty at the Center for Nanotechnology, Indian Institute of Technology Guwahati. HARVESTING CO2 To help slow the climate-changing rise in atmospheric CO2levels, researchers have developed nanoCO2 harvesters that can suck atmospheric carbon dioxide and deploy it for industrial purposes. “Nanomaterials can convert carbon dioxide into useful products like alcohol. The materials could be simple chemical catalysts or photochemical in nature that work in the presence of sunlight,” says Chattopadhyay, who has been working with nanomaterials to tackle environmental pollutants for more than a decade. Many research groups are working to address a problem that, if solved, could be a holy grail in combating climate change: how to pull CO2 out of the atmosphere and convert it into useful products. Chattopadhyay isn’t alone. Many research groups are working to address a problem that, if solved, could be a holy grail in combating climate change: how to pull CO2 out of the atmosphere and convert it into useful products. Nanoparticles offer a promising approach to this because they have a large surface-area-to-volume ratio for interacting with CO2 and properties that allow them to facilitate the conversion of CO2into other things. The challenge is to make them economically viable. Researchers have tried everything from metallic to carbon-based nanoparticles to reduce the cost, but so far they haven’t become efficient enough for industrial-scale application. One of the most recent points of progress in this area is work by scientists at the CSIR-Indian Institute of Petroleum and the Lille University of Science and Technology in France. The researchers developed a nanoCO2 harvester that uses water and sunlight to convert atmospheric CO2 into methanol, which can be employed as an engine fuel, a solvent, an antifreeze agent and a diluent of ethanol. Made by wrapping a layer of modified graphene oxide around spheres of copper zinc oxide and magnetite, the material looks like a miniature golf ball, captures CO2 more efficiently than conventional catalysts and can be readily reused, according to Suman Jain, senior scientist of the Indian Institute of Petroleum, Dehradun in India, who developed the nanoCO2harvester. Jain says that the nanoCO2 harvester has a large molecular surface area and captures more CO2 than a conventional catalyst with similar surface area would, which makes the conversion more efficient. But due to their small size, the nanoparticles have a tendency to clump up, making them inactive with prolonged use. Jain adds that synthesizing useful nanoparticle-based materials is also challenging because it’s hard to make the particles a consistent size. Chattopadhyay says the efficiency of such materials can be improved further, providing hope for useful application in the future. CLEANSING WATER Most toxic dyes used in textile and leather industries can be captured with nanoparticles. “Water pollutants such as dyes from human-created waste like those from tanneries could get to natural sources of water like deep tube wells or groundwater if wastewater from these industries is left untreated,” says Chattopadhyay. “This problem is rather difficult to solve.” An international group of researchers led by professor Elzbieta Megiel of the University of Warsaw in Poland reports that nanomaterials have been widely studied for removing heavy metals and dyes from wastewater. According to the research team, adsorption processes using materials containing magnetic nanoparticles are highly effective and can be easily performed because such nanoparticles have a large number of sites on their surface that can capture pollutants and don’t readily degrade in water. Chattopadhyay adds that appropriately designed magnetic nanomaterials can be used to separate pollutants such as arsenic, lead, chromium and mercury from water. However, the nanotech-based approach has to be more efficient than conventional water purification technology to make it worthwhile. In addition to removing dyes and metals, nanomaterials can also be used to clean up oil spills. Researchers led by Pulickel Ajayan at Rice University in Houston, Texas, have developed a reusable nanosponge that can remove oil from contaminated seawater. The technology shows promise, but it’s not yet ready for prime time. “While the nanosponge is a good material to deal with oil spills, these results are confined to the laboratory,” says Ashok Ganguli, director of the Institute of Nano Science and Technology in Mohali, Punjab, India. “Large-scale synthesis is required if we have to remove oil from seawater which is spread over several miles.” Although scientists have yet to successfully synthesize nanomaterials for cleaning oil spills at a scale large enough for practical application, “this may become possible with more research and industry partnerships,” Chattopadhyay says.

#### Warming causes Extinction – that outweighs even under kant because it takes away the freedom to get food, water, and to live

Kareiva 18, Peter, and Valerie Carranza. "Existential risk due to ecosystem collapse: Nature strikes back." Futures 102 (2018): 39-50. (Ph.D. in ecology and applied mathematics from Cornell University, director of the Institute of the Environment and Sustainability at UCLA, Pritzker Distinguished Professor in Environment & Sustainability at UCLA)//Re-cut by Elmer

In summary, six of the nine proposed planetary boundaries (phosphorous, nitrogen, biodiversity, land use, atmospheric aerosol loading, and chemical pollution) are unlikely to be associated with existential risks. They all correspond to a degraded environment, but in our assessment do not represent existential risks. However, the three remaining boundaries (**climate change**, global **freshwater** cycle, **and** ocean **acidification**) do **pose existential risks**. This is **because of** intrinsic **positive feedback loops**, substantial lag times between system change and experiencing the consequences of that change, and the fact these different boundaries interact with one another in ways that yield surprises. In addition, climate, freshwater, and ocean acidification are all **directly connected to** the provision of **food and water**, and **shortages** of food and water can **create conflict** and social unrest. Climate change has a long history of disrupting civilizations and sometimes precipitating the collapse of cultures or mass emigrations (McMichael, 2017). For example, the 12th century drought in the North American Southwest is held responsible for the collapse of the Anasazi pueblo culture. More recently, the infamous potato famine of 1846–1849 and the large migration of Irish to the U.S. can be traced to a combination of factors, one of which was climate. Specifically, 1846 was an unusually warm and moist year in Ireland, providing the climatic conditions favorable to the fungus that caused the potato blight. As is so often the case, poor government had a role as well—as the British government forbade the import of grains from outside Britain (imports that could have helped to redress the ravaged potato yields). Climate change intersects with freshwater resources because it is expected to exacerbate drought and water scarcity, as well as flooding. Climate change can even impair water quality because it is associated with heavy rains that overwhelm sewage treatment facilities, or because it results in higher concentrations of pollutants in groundwater as a result of enhanced evaporation and reduced groundwater recharge. **Ample clean water** is not a luxury—it **is essential for human survival**. Consequently, cities, regions and nations that lack clean freshwater are vulnerable to social disruption and disease. Finally, ocean acidification is linked to climate change because it is driven by CO2 emissions just as global warming is. With close to 20% of the world’s protein coming from oceans (FAO, 2016), the potential for severe impacts due to acidification is obvious. Less obvious, but perhaps more insidious, is the interaction between climate change and the loss of oyster and coral reefs due to acidification. Acidification is known to interfere with oyster reef building and coral reefs. Climate change also increases storm frequency and severity. Coral reefs and oyster reefs provide protection from storm surge because they reduce wave energy (Spalding et al., 2014). If these reefs are lost due to acidification at the same time as storms become more severe and sea level rises, coastal communities will be exposed to unprecedented storm surge—and may be ravaged by recurrent storms. A key feature of the risk associated with climate change is that mean annual temperature and mean annual rainfall are not the variables of interest. Rather it is extreme episodic events that place nations and entire regions of the world at risk. These extreme events are by definition “rare” (once every hundred years), and changes in their likelihood are challenging to detect because of their rarity, but are exactly the manifestations of climate change that we must get better at anticipating (Diffenbaugh et al., 2017). Society will have a hard time responding to shorter intervals between rare extreme events because in the lifespan of an individual human, a person might experience as few as two or three extreme events. How likely is it that you would notice a change in the interval between events that are separated by decades, especially given that the interval is not regular but varies stochastically? A concrete example of this dilemma can be found in the past and expected future changes in storm-related flooding of New York City. The highly disruptive flooding of New York City associated with Hurricane Sandy represented a flood height that occurred once every 500 years in the 18th century, and that occurs now once every 25 years, but is expected to occur once every 5 years by 2050 (Garner et al., 2017). This change in frequency of extreme floods has profound implications for the measures New York City should take to protect its infrastructure and its population, yet because of the stochastic nature of such events, this shift in flood frequency is an elevated risk that will go unnoticed by most people. 4. The combination of positive feedback loops and societal inertia is fertile ground for global environmental catastrophes **Humans** are remarkably ingenious, and **have adapted** to crises **throughout** their **history**. Our doom has been repeatedly predicted, only to be averted by innovation (Ridley, 2011). **However**, the many **stories** **of** human ingenuity **successfully** **addressing** **existential risks** such as global famine or extreme air pollution **represent** environmental c**hallenges that are** largely **linear**, have immediate consequences, **and operate without positive feedbacks**. For example, the fact that food is in short supply does not increase the rate at which humans consume food—thereby increasing the shortage. Similarly, massive air pollution episodes such as the London fog of 1952 that killed 12,000 people did not make future air pollution events more likely. In fact it was just the opposite—the London fog sent such a clear message that Britain quickly enacted pollution control measures (Stradling, 2016). Food shortages, air pollution, water pollution, etc. send immediate signals to society of harm, which then trigger a negative feedback of society seeking to reduce the harm. In contrast, today’s great environmental crisis of climate change may cause some harm but there are generally long time delays between rising CO2 concentrations and damage to humans. The consequence of these delays are an absence of urgency; thus although 70% of Americans believe global warming is happening, only 40% think it will harm them (http://climatecommunication.yale.edu/visualizations-data/ycom-us-2016/). Secondly, unlike past environmental challenges, **the Earth’s climate system is rife with positive feedback loops**. In particular, as CO2 increases and the climate warms, that **very warming can cause more CO2 release** which further increases global warming, and then more CO2, and so on. Table 2 summarizes the best documented positive feedback loops for the Earth’s climate system. These feedbacks can be neatly categorized into carbon cycle, biogeochemical, biogeophysical, cloud, ice-albedo, and water vapor feedbacks. As important as it is to understand these feedbacks individually, it is even more essential to study the interactive nature of these feedbacks. Modeling studies show that when interactions among feedback loops are included, uncertainty increases dramatically and there is a heightened potential for perturbations to be magnified (e.g., Cox, Betts, Jones, Spall, & Totterdell, 2000; Hajima, Tachiiri, Ito, & Kawamiya, 2014; Knutti & Rugenstein, 2015; Rosenfeld, Sherwood, Wood, & Donner, 2014). This produces a wide range of future scenarios. Positive feedbacks in the carbon cycle involves the enhancement of future carbon contributions to the atmosphere due to some initial increase in atmospheric CO2. This happens because as CO2 accumulates, it reduces the efficiency in which oceans and terrestrial ecosystems sequester carbon, which in return feeds back to exacerbate climate change (Friedlingstein et al., 2001). Warming can also increase the rate at which organic matter decays and carbon is released into the atmosphere, thereby causing more warming (Melillo et al., 2017). Increases in food shortages and lack of water is also of major concern when biogeophysical feedback mechanisms perpetuate drought conditions. The underlying mechanism here is that losses in vegetation increases the surface albedo, which suppresses rainfall, and thus enhances future vegetation loss and more suppression of rainfall—thereby initiating or prolonging a drought (Chamey, Stone, & Quirk, 1975). To top it off, overgrazing depletes the soil, leading to augmented vegetation loss (Anderies, Janssen, & Walker, 2002). Climate change often also increases the risk of forest fires, as a result of higher temperatures and persistent drought conditions. The expectation is that **forest fires will become more frequent** and severe with climate warming and drought (Scholze, Knorr, Arnell, & Prentice, 2006), a trend for which we have already seen evidence (Allen et al., 2010). Tragically, the increased severity and risk of Southern California wildfires recently predicted by climate scientists (Jin et al., 2015), was realized in December 2017, with the largest fire in the history of California (the “Thomas fire” that burned 282,000 acres, https://www.vox.com/2017/12/27/16822180/thomas-fire-california-largest-wildfire). This **catastrophic fire** embodies the sorts of positive feedbacks and interacting factors that **could catch humanity off-guard and produce a** true **apocalyptic event.** Record-breaking rains produced an extraordinary flush of new vegetation, that then dried out as record heat waves and dry conditions took hold, coupled with stronger than normal winds, and ignition. Of course the record-fire released CO2 into the atmosphere, thereby contributing to future warming. Out of all types of feedbacks, water vapor and the ice-albedo feedbacks are the most clearly understood mechanisms. Losses in reflective snow and ice cover drive up surface temperatures, leading to even more melting of snow and ice cover—this is known as the ice-albedo feedback (Curry, Schramm, & Ebert, 1995). As snow and ice continue to melt at a more rapid pace, millions of people may be displaced by flooding risks as a consequence of sea level rise near coastal communities (Biermann & Boas, 2010; Myers, 2002; Nicholls et al., 2011). The water vapor feedback operates when warmer atmospheric conditions strengthen the saturation vapor pressure, which creates a warming effect given water vapor’s strong greenhouse gas properties (Manabe & Wetherald, 1967). Global warming tends to increase cloud formation because warmer temperatures lead to more evaporation of water into the atmosphere, and warmer temperature also allows the atmosphere to hold more water. The key question is whether this increase in clouds associated with global warming will result in a positive feedback loop (more warming) or a negative feedback loop (less warming). For decades, scientists have sought to answer this question and understand the net role clouds play in future climate projections (Schneider et al., 2017). Clouds are complex because they both have a cooling (reflecting incoming solar radiation) and warming (absorbing incoming solar radiation) effect (Lashof, DeAngelo, Saleska, & Harte, 1997). The type of cloud, altitude, and optical properties combine to determine how these countervailing effects balance out. Although still under debate, it appears that in most circumstances the cloud feedback is likely positive (Boucher et al., 2013). For example, models and observations show that increasing greenhouse gas concentrations reduces the low-level cloud fraction in the Northeast Pacific at decadal time scales. This then has a positive feedback effect and enhances climate warming since less solar radiation is reflected by the atmosphere (Clement, Burgman, & Norris, 2009). The key lesson from the long list of potentially positive feedbacks and their interactions is that **runaway climate change,** and runaway perturbations have to be taken as a serious possibility. Table 2 is just a snapshot of the type of feedbacks that have been identified (see Supplementary material for a more thorough explanation of positive feedback loops). However, this list is not exhaustive and the possibility of undiscovered positive feedbacks **portends** even greater **existential risks**. The many environmental crises humankind has previously averted (famine, ozone depletion, London fog, water pollution, etc.) were averted because of political will based on solid scientific understanding. We cannot count on complete scientific understanding when it comes to positive feedback loops and climate change.

#### Space Elevators solve Space Debris – reduces Rocket Launches

Forgan 19, Duncan H. Solving Fermi's Paradox. Vol. 10. Cambridge University Press, 2019. (Associate Lecturer at the Centre for Exoplanet Science at the University of St Andrews, Scotland, founding member of the UK Search for Extra-terrestrial Intelligence (SETI) research network and leads UK research efforts into the search)//Elmer

All objects in HEO reside beyond the geostationary orbit (GEO). The orbital period at GEO (w'hich is aligned with the Earth's equator) is equal to the Earth’s rotational period. As a result, from a ground observer’s perspective the satellite resides at a fixed point in the sky, with clear advantages for uses such as global communication. Activities at HEO are considerably less than at LEO and MEO. Earth's orbital environment does contain a natural component - the meteoroids. These pose little to no threat to space operations - the true threat is self-derived. The current limitations of spacefaring technology ensure that every launch is accompanied by substantial amounts of space debris. This debris ranges in size from dust grains to paint flecks to large derelict spacecraft and satellites. According to NASA’s Orbital Debris Program Office, some 21.000 objects greater than 10 cm in size are currently being tracked in LEO. with the population below 10 cm substantially higher. Most debris produced at launch tends to be deposited with no supplemental velocity - hence these objects tend to follow the initial launch trajectory, which often orbits with high eccentricity and inclination. However, these orbits do intersect with the orbits of Earth’s artificial satellite population, resulting in impacts w'hich tend to produce further debris. The vast majority of the low-size debris population is so-called fragmentation debris. This is produced during spacecraft deterioration, and in the most abun- dance during spacecraft break-up and impacts. The first satellite-satellite collision occurred in 1961. resulting in a 400% increase in fragmentation debris (Johnson et al.. 2008). Most notably, a substantial source of fragmentation debris was the deliberate destruction of the Fengyun 1C satellite by the People’s Republic of China, which created approximately 2.000 debris fragments. As with collisions of ‘natural debris’, debris-debris collisions tend to result in an increased count of debris fragments. Since the late 1970s, it has been understood that man-made debris could pose an existential risk to space operations. Kessler and Cour-Palais (1978) worked from the then-population of satellites to extrapolate the debris production rate over the next 30 years. Impact rates on spacecraft at any location. /, can be calculated if one knows the local density of debris p, the mean relative velocity vrei\* and the cross-sectional area ct: [[EQUATION 13.5 OMITTED]] Each impact increases p without substantially altering vrel or o. We should there- fore expect the impact rate (and hence the density of objects) to continue growing at an exponential rate: [[EQUATION 13.6 OMITTED]] Kessler and Cour-Palais (1978) predicted that by the year 2000, p would have increased beyond the critical value for generating a collisional cascade. As new collisions occur, these begin to increase ^jjp, which in turn increases resulting in a rapid positive feedback, with p and I reaching such large values that LEO is rendered completely unnavigable. This has not come to pass - LEO remains navigable, partially due to a slight overprediction of debris produced by individual launches. The spectre of a collisional cascade (often referred to as Kessler syndrome) still looms over human space exploration, as debris counts continue to rise. Without a corresponding dedicated effort to reduce these counts, either through mitigating strategies to reduce the production of debris during launches, or through removal of debris fragments from LEO. we cannot guarantee the protection of the current flotilla of satellites, leaving our highly satellite-dependent society at deep risk. What strategies can be deployed to remove space debris? Almost all debris removal techniques rely on using the Earth’s atmosphere as a waste disposal sys- tem. Most debris is sufficiently small that atmospheric entry would result in its complete destruction, with no appreciable polluting effects. Atmospheric entry requires the debris fragments to be decelerated so that their orbits begin to intersect with lower atmospheric altitudes. Once a critical altitude is reached, atmospheric drag is sufficiently strong that the debris undergoes runaway deceleration and ultimately destruction. There are multiple proposed techniques for decelerating debris. Some mechani- cal methods include capturing the debris using either a net or harpoon, and applying a modest level of reverse thrust. These are most effective for larger fragments, and especially intact satellites (Forshaw et al., 2015). Attaching sails to the debris is also a possibility if the orbit is sufficiently low for weak atmospheric drag. The Japanese space agency JAXA’s Kounotori Integrated Tether Experiment (KITE) will trail a long conductive cable. As a current is passed through the cable, and the cable traverses the Earth’s magnetic field, the cable experiences a magnetic drag force that will de-orbit the spacecraft. Orbiting and ground-based lasers can decelerate the debris through a variety of means. For small debris fragments, the radiation pressure produced by the laser can provide drag. A more powerful laser can act on larger debris fragments through ablation. As the laser ablates the debris, the resulting recoil generated by the escaping material produces drag and encourages de-orbit. A more lateral solution is to ensure that launches and general space-based activity no longer generate debris. These approaches advocate lower-energy launch mechanisms that do not rely on powerful combustion. The most famous is the space elevator (see Aravind. 2007). Originally conceived by Tsiolkovsky, the ele- vator consists of an extremely durable cable extended from a point near the Earth’s equator, up to an anchor point located at GEO (most conceptions of the anchor point envision an asteroid parked in GEO). ‘Climber’ cars can then be attached to the cable and lifted to LEO, MEO and even GEO by a variety of propulsion methods. Most notably, the cars can be driven to GEO without the need for chemical rockets or nuclear explosions - indeed, a great deal of energy can be saved by having coupled cars, one ascending and one descending. Space elevators would solve a great number of problems relating to entering (and leaving) Earth orbit, substantially reducing the cost of delivering payload out of the Earth's atmosphere. The technical challenges involved in deploying a cable tens of thousands of kilometres long are enormous, not to mention the material science required to produce a cable of sufficient tensile strength and flexibility in the first place. The gravitational force (and centrifugal force) felt by the cable will vary significantly along its length. As cars climb the cable, the Coriolis force will move the car (and cable) horizontally also, providing further strain on the cable material. The relatively slow traversal of the biologically hazardous Van Allen Belt on the route to GEO is also a potential concern for crewed space travel. Whatever the means, a spacefaring civilisation (or at least, a civilisation that utilises its local orbital environment as we do) must develop a non-polluting solution to space travel, whether that is via the construction of a space elevator, a maglev launch loop, rail gun, or some other form of non-rocket acceleration. If it cannot perform pollution-free spacecraft launches (or fully clean up its pollution), then it will eventually succumb to Kessler syndrome, with potentially drastic consequences for future space use, with likely civilisation-ending effects (Solution C.13).

#### Reject 1AR theory- A] 7-6 time skew means it’s endlessly aff biased B] I don’t have a 3nr which allows for endless extrapolation C] 1AR theory is skewed to the aff because they have a 2ar judge psychology warrant.

#### Infinite abuse claims are wrong- A] Spikes solve-you can just preempt paradigms in the 1AC B] Functional limits- 1nc is only 7 minutes long

#### Condo is good proving a CP is bad doesn’t prove the plan is good, a logical policy maker can always choose not to act. Logic outweighs – it’s the basis of all rational arguments.

#### PICs are good - 1] They’re most logical --- they prove a component of the plan was bad and should be excluded 2] Key to neg ground --- the Aff picks the plan and chooses their ground, and the neg reciprocally needs to strategically coopt components of the Aff to combat the prep asymmetry 3] PICs negate – they prove a component of the aff is bad and provides an alternative advocacy to rectify it

## Case

### FW

Ethics begin a posterori – when I put my hand on a hot stove, only cognitive binding makes me take it off

AT Empirical uncertainty: scientific studies have concluded that humans all have dopamine levels and feel pleasure/pain

AT Constitutive authority – link turn – we don’t follow reasoning sometimes, but we always have to follow neurological senses

AT Naturalistic fallacy – yes we ought to appeal to pleasure and pain because it’s intrinsic and not doing so would cause tons of pain

AT universalizability – fails because people who are unable to breed or are disabled would be condemned which is morally repugnant

AT TJFS – predictability link turns because the only way we know what to debate is if everyones reading it

Prefer consequence based fws: they are the most predictable – there are tons of fws that have intent bases but only ours is accessible

Consequences don’t fail – emperics prove

AT Infinite consequenecs: we can predict to certain points with science

AT induction circular – question of probability – we can wake up with 99.9% certainty the sun will come up every morning

AT Action theory – calculus solves – we can combine actions and being able to move disproves this

AT Act-omission distinction – no distinction in context of governments – they’re morally responsible for everything that happens

AT Farr – link turn – only util cares about minorities because their world assumes racism doesn’t exist

### Contention

#### Contention – Libertarianism mandates a market-oriented approach to space—that negates

Broker 20 [(Tyler, work has been published in the Gonzaga Law Review, the Albany Law Review and the University of Memphis Law Review.) “Space Law Can Only Be Libertarian Minded,” Above the Law, 1-14-20, <https://abovethelaw.com/2020/01/space-law-can-only-be-libertarian-minded/>] TDI

The impact on human daily life from a transition to the virtually unlimited resource reality of space cannot be overstated. However, when it comes to the law, a minimalist, dare I say libertarian, approach appears as the only applicable system. In the words of NASA, “2020 promises to be a big year for space exploration.” Yet, as Rand Simberg points out in Reason magazine, it is actually private American investment that is currently moving space exploration to “a pace unseen since the 1960s.” According to Simberg, due to this increase in private investment “We are now on the verge of getting affordable private access to orbit for large masses of payload and people.” The impact of that type of affordable travel into space might sound sensational to some, but in reality the benefits that space can offer are far greater than any benefit currently attributed to any major policy proposal being discussed at the national level. The sheer amount of resources available within our current reach/capabilities simply speaks for itself. However, although those new realities will, as Simberg says, “bring to the fore a lot of ideological issues that up to now were just theoretical,” I believe it will also eliminate many economic and legal distinctions we currently utilize today. For example, the sheer number of resources we can already obtain in space means that in the rapidly near future, the distinction between a nonpublic good or a public good will be rendered meaningless. In other words, because the resources available within our solar system exist in such quantities, all goods will become nonrivalrous in their consumption and nonexcludable in their distribution. This would mean government engagement in the public provision of a nonpublic good, even at the trivial level, or what Kevin Williamson defines as socialism, is rendered meaningless or impossible. In fact, in space, I fail to see how any government could even try to legally compel collectivism in the way Simberg fears. Similar to many economic distinctions, however, it appears that many laws, both the good and the bad, will also be rendered meaningless as soon as we begin to utilize the resources within our solar system. For example, if every human being is given access to the resources that allows them to replicate anything anyone else has, or replace anything “taken” from them instantly, what would be the point of theft laws? If you had virtually infinite space in which you can build what we would now call luxurious livable quarters, all without exploiting human labor or fragile Earth ecosystems when you do it, what sense would most property, employment, or commercial law make? Again, this is not a pipe dream, no matter how much our population grows for the next several millennia, the amount of resources within our solar system can sustain such an existence for every human being. Rather than panicking about the future, we should try embracing it, or at least meaningfully preparing for it. Currently, the Outer Space Treaty, or as some call it “the Magna Carta of Space,” is silent on the issue of whether private individuals or corporate entities can own territory in space. Regardless of whether governments allow it, however, private citizens are currently obtaining the ability to travel there, and if human history is any indicator, private homesteading will follow, flag or no flag. We Americans know this is how a Wild West starts, where most regulation becomes the impractical pipe dream. But again, this would be a Wild West where the exploitation of human labor and fragile Earth ecosystem makes no economic sense, where every single human can be granted access to resources that even the wealthiest among us now would envy, and where innovation and imagination become the only things we would recognize as currency. Only a libertarian-type system, that guarantees basic individual rights to life, liberty, and the pursuit of happiness could be valued and therefore human fidelity to a set of laws made possible, in such an existence.

### Method

#### Non UQ – squo debris thumps –

Orwig 16 [(Jessica, MS in science and tech journalism from Texas A&M, BS in astronomy and physics from Ohio State) “Russia says a growing problem in space could be enough to spark a war,” Insider,’ January 26, 2016, <https://www.businessinsider.com/russia-says-space-junk-could-spark-war-2016-1>] TDI

NASA has already [warned that](https://www.businessinsider.com/space-junk-at-critical-density-2015-9) the large amount of space junk around our planet is growing beyond our control, but now a team of Russian scientists has cited another potentially unforeseen consequence of that debris: War.

Scientists estimate that anywhere from 500,000 to 600,000 pieces of human-made space debris between 0.4 and 4 inches in size are currently orbiting the Earth and traveling at speeds over [17,000 miles per hour](https://www.nasa.gov/mission_pages/station/news/orbital_debris.html).

If one of those pieces smashed into a military satellite it "may provoke political or even armed conflict between space-faring nations," Vitaly Adushkin, a researcher for the Institute of Geosphere Dynamics at the Russian Academy of Sciences, reported in a paper set to be published in the peer-reviewed journal [Acta Astronautica](https://www.sciencedirect.com/science/article/pii/S0094576515303416), which is sponsored by the International Academy of Astronautics.

**No space war. Insurmountable barriers and common interests**

Bohumil **Doboš**, scholar at the Institute of Political Studies, Faculty of Social Sciences, Charles University in Prague, Czech Republic, and a coordinator of the Geopolitical Studies Research Centre, **’19**, Geopolitics of the Outer Space, Chapter 3: Outer Space as a Military-Diplomatic Field, Pgs. 48-49)

Despite the theorized potential for the achievement of the terrestrial dominance throughout the utilization of the ultimate high ground and the ease of destruction of space-based assets by the potential space weaponry, the utilization of space weapons is with current technology and no effective means to protect them far from fulfilling this potential (Steinberg 2012, p. 255). **In current global international political and technological setting, the utility of space weapons is very limited**, even if we accept that the ultimate high ground presents the potential to get a decisive tangible military advantage (which is unclear). This stands among the reasons for the lack of their utilization so far. Last but not the least, it must be pointed out that the states also develop passive defense systems designed to protect the satellites on orbit or critical capabilities they provide. These **further decrease the utility of space weapons**. These systems include larger maneuvering capacities, launching of decoys, preparation of spare satellites that are ready for launch in case of ASAT attack on its twin on orbit, or attempts to decrease the visibility of satellites using paint or materials less visible from radars (Moltz 2014, p. 31). Finally, we must look at the main obstacles of connection of the outer space and warfare. The first set of barriers is comprised of **physical obstructions**. As has been presented in the previous chapter, the outer space is very challenging domain to operate in. Environmental factors still present the largest threat to any space military capabilities if compared to any man-made threats (Rendleman 2013, p. 79). A following issue that hinders military operations in the outer space is the predictability of orbital movement. If the reconnaissance satellite's orbit is known, the terrestrial actor might attempt to hide some critical capabilities-an option that is countered by new surveillance techniques (spectrometers, etc.) (Norris 2010, p. 196)-but the hide-and-seek game is on. This same principle is, however, in place for any other space asset-any nation with basic tracking capabilities may quickly detect whether the military asset or weapon is located above its territory or on the other side of the planet and thus mitigate the possible strategic impact of space weapons not aiming at mass destruction. Another possibility is to attempt to destroy the weapon in orbit. Given the level of development for the ASAT technology, it seems that they will prevail over any possible weapon system for the time to come. Next issue, directly connected to the first one, is the utilization of weak physical protection of space objects that need to be as light as possible to reach the orbit and to be able to withstand harsh conditions of the domain. This means that their protection against ASAT weapons is very limited, and, whereas some avoidance techniques are being discussed, they are of limited use in case of ASAT attack. We can thus add to the issue of predictability also the issue of easy destructibility of space weapons and other military hardware (Dolman 2005, p. 40; Anantatmula 2013, p. 137; Steinberg 2012, p. 255). Even if the high ground was effectively achieved and other nations could not attack the space assets directly, there is still a need for communication with those assets from Earth. There are also ground facilities that support and control such weapons located on the surface. Electromagnetic communication with satellites might be jammed or hacked and the ground facilities infiltrated or destroyed thus rendering the possible space weapons useless (Klein 2006, p. 105; Rendleman 2013, p. 81). This issue might be overcome by the establishment of a base controlling these assets outside the Earth-on Moon or lunar orbit, at lunar L-points, etc.-but this perspective remains, for now, unrealistic. Furthermore, **no contemporary actor will risk full space weaponization in the face of possible competition and the possibility of rendering the outer space useless.** No actor is dominant enough to prevent others to challenge any possible attempts to dominate the domain by military means. To quote 2016 Stratfor analysis, "(a) war in space would be devastating to all, and preventing it, rather than finding ways to fight it, will likely remain the goal" (Larnrani 20 16). This stands true unless some space actor finds a utility in disrupting the arena for others.

**Doesn't escalate – vulnerability leads to restraint.**

**Pavur 19** [James, DPhil Researcher at the Cybersecurity Centre for Doctoral Training at Oxford University, and Ivan Martinovic, Professor of Computer Science in the Department of Computer Science at Oxford University, “The Cyber-ASAT: On the Impact of Cyber Weapons in Outer Space”, 2019 11th International Conference on Cyber Conflict: Silent Battle, <https://ccdcoe.org/uploads/2019/06/Art_12_The-Cyber-ASAT.pdf>]

Limited Accessibility Space is difficult. Over 60 years have passed since the first Sputnik launch and only nine countries (ten including the EU) have orbital launch capabilities. Moreover, a launch programme alone does not guarantee the **resources** and **precision required** to **operate a meaningful ASAT capability**. Given this, one possible reason why **space wars have not broken out** is simply because only the US has ever had the ability to fight one [21, p. 402], [22, pp. 419–420]. Although launch technology may become cheaper and easier, it is unclear to what extent these advances will be distributed among presently non-spacefaring nations. **Limited access to orbit** necessarily reduces the scenarios which could plausibly escalate to ASAT usage. Only major conflicts between the handful of states with ‘space club’ membership could be considered possible flashpoints. Even then, the **fragility of an attacker’s own space assets** creates **de-escalatory pressures** due to the **deterrent effect of retaliation**. Since the earliest days of the space race, dominant powers have recognized this dynamic and demonstrated an inclination **towards de-escalatory space strategies** [23]. B. Attributable Norms There also exists a **long-standing normative framework** favouring the **peaceful use of space**. The effectiveness of this regime, centred around the Outer Space Treaty (**OST**), is highly contentious and many have pointed out its serious legal and political shortcomings [24]–[26]. Nevertheless, this status quo framework has somehow supported over **six decades of relative peace** in orbit. Over these six decades, **norms have become deeply ingrained** into the way states describe and perceive space weaponization. This de facto codification was dramatically demonstrated in 2005 when the US found itself on the short end of a 160-1 UN vote after opposing a non-binding resolution on space weaponization. Although states have occasionally pushed the boundaries of these norms, this has typically occurred through incremental legal re-interpretation rather than outright opposition [27]. Even the most notable incidents, such as the 2007-2008 US and Chinese ASAT demonstrations, were couched in rhetoric from both the norm violators and defenders, depicting space as a peaceful global commons [27, p. 56]. Altogether, this suggests that **states perceive real costs** to breaking this normative tradition and may even **moderate their behaviours** accordingly. One further factor supporting this norms regime is the **high degree of attributability** surrounding ASAT weapons. For kinetic ASAT technology, **plausible deniability** and **stealth** are essentially **impossible**. The literally explosive act of launching a rocket cannot evade detection and, if used offensively, retaliation. This imposes **high diplomatic costs** on ASAT usage and testing, particularly during peacetime. C. Environmental Interdependence A third stabilizing force relates to the **orbital debris consequences** of ASATs. China’s 2007 ASAT demonstration was the largest debris-generating event in history, as the targeted satellite dissipated into thousands of dangerous debris particles [28, p. 4]. Since debris particles are indiscriminate and unpredictable, they often threaten the attacker’s own space assets [22, p. 420]. This is compounded by Kessler syndrome, a phenomenon whereby orbital debris ‘breeds’ as large pieces of debris collide and disintegrate. As space debris remains in orbit for hundreds of years, the **cascade effect** of an ASAT attack can constrain the attacker’s long-term use of space [29, pp. 295– 296]. Any state with kinetic ASAT capabilities will likely also operate satellites of its own, and they are necessarily exposed to this collateral damage threat. Space debris thus acts as a strong strategic deterrent to ASAT usage.

#### 1AC Scoles is about government missions --- public sector thumps

#### No Kessler effect– debris vaporizes on impact

John **O’Gorman** **18**, MA in Science, Technology, and Public Policy, “The Cost of Clean Space- A Study of the Additional Fuel Costs of Launching Above Low Earth Orbit”, A Thesis Submitted in partial fulfillment of the requirements for the degree of Master of Science in Science, Technology, and Public Policy Department of Public Policy College of Liberal Arts Rochester Institute of Technology 5-18-2018, https://pdfs.semanticscholar.org/d703/101d657334d2e1575d08005e290578770cd1.pdf?\_ga=2.12182772.1105117366.1567799127-1625925356.1567799127

However the self-propagation of space debris is not mentioned by all studies on the subject. To clarify, not all sources agree that there is enough proliferation of debris to drastically change the scope of the problem. All sources recognize the basic physics that collisions with debris will produce more debris. Crowther reports that impacts from space debris, natural and manmade, are common due to the visible pitting and corroding on satellites (Crowther, 2002). But Crowther goes on to mention that most collisions are from very small particles that **vaporize** **on impact.** Collisions with objects greater than 1 cm, which can cause serious structural damage and are impossible to shield against, **are far less common,** and merely planning smarter flight paths to avoid areas of high debris density is mitigation enough. Percy also agrees that the debris environment has more to do with high traffic orbits and makes no mention of the selfpropagation of debris (Percy, 2014). Again, there is the argument that without sufficient density of objects, which is what managing orbits would do, there is not enough mass in orbit to proliferate enough chain reactions of debris collisions in order to dramatically change the scope of the problem.

#### No debris risk - 0.1% chance of a collision.

Alexander William **Salter**, **Economics Professor at Texas Tech**, **’16**, “SPACE DEBRIS: A LAW AND ECONOMICS ANALYSIS OF THE ORBITAL COMMONS” 19 STAN. TECH. L. REV. 221 \*numbers replaced with English words

The probability of a collision is currently low. Bradley and Wein estimate that the maximum probability in LEO of a collision over the lifetime of a spacecraft remains below one in one thousand, conditional on continued compliance with NASA’s deorbiting guidelines.3 However, the possibility of a future “snowballing” effect, whereby debris collides with other objects, further congesting orbit space, remains a significant concern.4 Levin and Carroll estimate the average immediate destruction of wealth created by a collision to be approximately $30 million, with an additional $200 million in damages to all currently existing space assets from the debris created by the initial collision.5 The expected value of destroyed wealth because of collisions, currently small because of the low probability of a collision, can quickly become significant if future collisions result in runaway debris growth.

Russians switched to ground based radar

Hans M. Kristensen et al, director of the Nuclear Information Project at the Federation of American Scientists, Matthew McKinzie, director of the Nuclear Program of the Natural Resources Defense Council (NRDC), &Theodore A. Postol, rofessor emeritus of Science, Technology, and International Security at the Massachusetts Institute of Technology, ’17, “How US Nuclear Force Modernization Is Undermining Strategic Stability: The BurstHeight Compensating Super-Fuze” http://futurefastforward.com/wp-content/uploads/2017/05/How-US-Nuclear-Force-Modernization-Is-Undermining-Strategic-Stability.pdf

Detailed analyses, initially stimulated by questions about why the alert went on for so long, showed that a specialized space-based Russian early warning system called Prognoz was then under development. Analysis of the Prognoz satellite constellation and of available Russian infrared sensor technologies indicated that even if the satellite system had been working, it would not have been able to provide surveillance of the North Atlantic. Today, Russia has stopped launching satellites into this constellation and has instead focused enormous resources exclusively into building a highly robust and redundant network of ground-based radars. It is now very clear that Russia’s extreme de-emphasis on satellite early warning systems and its extreme focus on building numerous, technologically varied ground-based radar warning systems is due to the lack of critical technologies needed to implement a spacebased ballistic missile warning system.

US switched to ground based radar - no miscalc

Tech Sergeant Robbie Arp, 4-25-2018, "Air Force Tech Report: Ground Based Radar Early Warning System," https://www.af.mil/News/Article-Display/Article/1503094/air-force-tech-report-ground-based-radar-early-warning-system/, video transcribed by Raam.

The United States Air force maintains seven ground based early warning radar systems to monitor the skies for any potential threats. These systems, located in seven separate locations around the globe are capable of detecting attacks and conducting general space surveillance as well as satellite tracking. The unique aspect of the radars is their phased array antenna technology. Phased array antenna aiming, or beam steering, is done in millionths of a second by electronically controlling the timing, or phase, of the incoming and outgoing signals. Controlling the phase allows the beam to be rapidly projected in different directions, allowing tracking of multiple targets while maintaining the surveillance responsibility. The ground based early warning radar system helps U-S forces stand ready to respond in a moments notice.

#### Kessler syndrome is far off – no impact to space debris

Corrinne **Burns 13**. Staff writer, citing NASA astrophysicist Donald Kessler. "Space junk apocalypse: just like Gravity?," 11-15-2013, The Guardian, https://www.theguardian.com/science/blog/2013/nov/15/space-junk-apocalypse-gravity.

What Cuarón is showing us is a phenomenon called Kessler syndrome – a chain reaction of collisions between orbital technology. Under Kessler conditions, each collision generates a swarm of debris fragments, and each of those fragments then goes on to trigger further collisions. In the hypothetical doomsday scenario, this runaway cascade continues until all satellites in an orbit have been destroyed. That would dramatically impact our way of life back on Earth – no mobile phones, no GPS, no accurate weather forecasting, no satellite broadcasting. It makes for a good movie sequence, but is **Kessler syndrome** **a genuine threat?** I asked Donald Kessler himself. A former Nasa astrophysicist, it was Kessler who, in 1978, first proposed that a runaway cascade of collisions was a possibility. He'd been studying meteorite collisions and, out of personal curiosity, decided to apply his algorithm to satellites, too. "The results of those calculations surprised me – I didn't realise it could be that bad," he tells me over a crackly telephone line. (Through the wonder of satellite technology, he is speaking to me from the deck of a boat charting the waters of eastern Europe.) "But it's building up as I expected. The cascade is happening right now – the Kosmos-Iridum collision was the start of the process. It has already begun." Now? **Are we in trouble?** **Not yet.** Kessler syndrome **isn't an acute** **phenomenon,** as depicted in the movie – it's a **slow**, **decades-long process**. "It'll happen throughout the **next 100 years** – **we have time to deal with it**