**The standard is maximizing expected well-being—to clarify, saving lives. Calc indicts don’t link—our impacts are bad because as far as we know, it would cause death.**

**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.

**Prefer:**

**1] Bindingness-- I could put my hand on a hot stove and I’d automatically pull it back before a signal is sent to my brain-- Anything else fails to be morally binding because one could always ask “why not?”**

**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] Only consequentialism explains degrees of wrongness—if I break a promise to meet up for lunch, that is not as bad as breaking a promise to not kill because its intuitive. Outweighs—a) parsimony—metaphysics relies on long chains of questionable claims that make conclusions less likely b) hijacks—intuitions are inevitable since even every framework must take some unjustified assumption as a starting point.**

**1] Extinction outweighs:**

**A] Structural violence- death causes suffering because people can’t get access to resources and basic necessities**

**B] Moral uncertainty flows extinction Bostrom 12:**

**Nick Bostrom. Faculty of Philosophy & Oxford Martin School University of Oxford. “Existential Risk Prevention as Global Priority.” Global Policy (2012)**

These reflections on moral uncertainty suggest an alternative, complementary way of looking at existential risk; they also suggest a new way of thinking about the ideal of sustainability. Let me elaborate. Our present understanding of axiology might well be confused. We may not now know — at least not in concrete detail — what outcomes would count as a big win for humanity; we might not even yet be able to imagine the best ends of our journey. If we are indeed profoundly uncertain about our ultimate aims, then we should recognize that there is a great option value in preserving — and ideally improving — our ability to recognize value and to steer the future accordingly. Ensuring that there will be a future version of humanity with great powers and a propensity to use them wisely is plausibly the best way available to us to increase the probability that the future will contain a lot of value. To do this, we must prevent any existential catastrophe.

**First the DA**

**Asteroid mining is key to platinum.**

Steven **Melendez**, 6-27-**17**, (Steven Melendez is an independent journalist living in New Orleans, “Forget Coal: Asteroid Mining Is Coming Sooner Than You Think”, Fast Company, https://www.fastcompany.com/40419405/theres-gold-and-platinum-and-cobalt-in-them-thar-asteroids)

President Donald Trump is obsessed with returning America to its coal mining past—but scientists and entreprenurs have far more ambitious plans. As the planet’s **precious metal reserves tap out,** big business and NASA are looking to the skies. The race to mine asteroids swirling around the solar system is on. Space mining may sound like science fiction, **but it’s real**, and big developments are on tap in the next decade. Asteroids are essentially massive rocks that orbit the sun, and many are thought to consist of **platinum**, gold, iron, and more. **A single** 500-meter-wide **asteroid** can contain almost **175 times** Earth’s annual **platinum** mining output, according to Massachusetts Institute of Technology research. The metal, worth about $930 per ounce, is used in jewelry and is a byword for luxury—think platinum credit cards—but it’s also used in the **catalytic converters** installed in every modern car, in industrial chemical processes, and in many electronics. SPACE MINING ECONOMICS Conventional wisdom may be that going to space to bring back what is needed on terra firma is economically nuts. Not so, analysts insist. “While the psychological barrier to mining asteroids is high, the actual financial and technological barriers are far lower,” says a recent report prepared on the subject by Goldman Sachs. Proponents say that before long, robots could be traveling to asteroids to extract platinum and other valuable minerals to haul back to Earth or even one day to use in space-based manufacturing plants. A 2012 Caltech study found that it could cost just $2.6 billion to capture an asteroid and bring it into orbit near Earth, making human exploration and robotic mining that much easier. “We expect that systems could be built for less than that given trends in the cost of manufacturing spacecraft and improvements in technology,” the Goldman report says. It also predicts the eventual result would be far lower costs: “Successful asteroid mining would likely crater the global price of platinum” by dramatically increasing the supply. “The market is a big unknown because of things like platinum,” says Jay McMahon, an assistant professor at the University of Colorado’s Center for Astrodynamics Research. “You don’t know what’s going to happen if you bring back a big haul of platinum, what that would do to the market on Earth or how much demand there is.”

**Key to hydrogen energy.**

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Hydrogen as a clean energy source for fuel cells in the transportation and power generation sectors, as well as an effective reducing agent for transforming carbon dioxide to value-added chemicals and fuels, could solve some of the adverse consequences of burning fossil fuels that release greenhouse gas into the atmosphere and chemicals that pollute the environment [1, 2]. Today, hydrogen is produced by steam reforming, gasification and electrolysis. Most of hydrogen is produced from fossil fuels (48% natural gas, 30% oil, 18% coal) while electrolysis of water accounts for only 4%. The electricity to enable water electrolysis has traditionally come from fossil and nuclear sources, which are increasingly being replaced by clean, renewable electrical energy from solar, hydro and wind. The practical realization of the full environmental and security benefits of clean and renewable hydrogen for use in fuel cells and conversion of carbon dioxide to chemicals and fuels, will necessitate the development of large-scale, low-cost hydrogen generation methods from renewable resources with a minimal carbon footprint. Amongst the different options for generating hydrogen, the photo-electrochemical approach, which utilizes sunlight to directly split water is considered to be amongst the most promising technologically and economically. Nevertheless, efficiency, figures-of-merit and longevity issues, requiring basic-directed research to improve loss mechanisms and increase electrodes, materials and device performance and stability, ultimately to develop operationally safe systems, remain the most challenging and critically important issues to enable advances in the field [3]. Photo-electrochemistry is an electrochemical technique, which employs light harvesting catalysts most often based on specialized semiconductor and metal nanostructures and combinations thereof. It is a truism that many research scientists, who recognize the axiom of the ‘**materials dilemma’**, remain skeptical of finding a practical and efficient photo-catalyst that can enable the light-assisted electrochemical H2 evolution reaction from H2O at a sufficiently large scale to facilitate a TW H2 economy. This refers to the challenge often confronted by scientists, engineers, industry and manufacturers trying to discover champion materials for a large scale catalytic process, where **the best** performers are comprised of elemental compositions **in short supply** and **too pricey** while inferior performers consist of earth abundant low cost elemental compositions. This is certainly true for the catalytically active **platinum group metals** Ru, Os, Rh, Ir, Pd and Pt in nanostructured forms as well as the catalytic sites of diverse classes of molecules, clusters, polymers and materials. In the case of the photo-electrochemical H2 evolution reaction from aqueous phase H2O, the champion catalyst remains Pt [Platinum] **despite** **much research devoted** to find a more **abundant cheaper alternative**. This is simply because Pt [platinum] as a H2 evolution catalyst still has the **world-record exchange current density** and **low Tafel slope**. Moreover, Pt is reported to be more durable in acidic environments, which is the common case in photo-electrochemical devices. This illustrates the difficult choice one has to make in translating solar fuels materials science to a technology that could be implemented on a large scale. Should one continue to focus attention on bringing down the cost of rare and expensive superior performance materials like Pt or devote time and effort to improving the poorer performance of common cheap materials? It turns out not surprisingly that the efficiency of the H2 evolution reaction sensitively depends on the loading and size of the nanostructured Pt catalyst integrated with the photon harvesting, electron transporting photocathode. In this context, it is pertinent that a recent study has quantified how much Pt is actually required to optimise the H2 evolution rate in a photo-electrochemistry experiment using an exceptionally well-defined Pt-TiO2-Ti-pn+Si composite photocathode [4]. In this experiment, the size and loading of Pt nanoparticles were controlled using a sophisticated supersonic molecular beam source that was able to deposit mass-selected Pt nanoparticles from the gas-phase, with retention of their size, onto the photocathode. From detailed materials characterization measurements and in depth photo-electrochemistry experiments, it was found that the size of the most active Pt nanoparticles for the H2 evolution reaction was 5 nm at a loading level of 100 ng/cm2 on the photocathode. For a state-of-the-art over-potential of 50 mV this translated to about 54 tons of Pt in order to create a TW scale photo-electrochemical H2 generation infrastructure. How often this 54 tons have to be replaced is a crucial question. The issue of a well-designed Pt recycling system is clearly advisable. This tonnage amounts to around 30% of the current global annual production of Pt most of which is currently used in automobile catalytic converters and jewellery. In terms of known Pt mineral resources (earth abundance 3.7×10-6 %) this does not seem like an insurmountable obstacle if it was decided by policy makers, the renewable energy industry and process engineers to establish an economically and environmentally viable TW H2 clean and green global technology founded upon the photo-electrochemical splitting of H2O using Pt as the metal of choice. It is pertinent to note that it may prove possible to reduce this amount of Pt by many orders of magnitude if the size of the Pt nanoparticles could be reduced from 5 nm to the atomically dispersed state and the catalytic activity for the H2 evolution reaction maintained if not improved [5]. Encouragingly in this context, a recent report revealed that the readily accessible, nanoporous layered material carbon nitride (C3N4), can anchor individual Pd atoms at the N sites and is able to function as a thermally stable hydrogenation catalyst for the production of many organic substances [6]. If this breakthrough can be extended to Pt atoms on C3N4-based photocathodes, this has the potential to reduce the Pt catalyst tonnage requirement by orders of magnitude. For photo-electrochemical hydrogen generating systems, besides the availability and cost of Pt, techno-economic challenges will also be encountered by constraining the area for water splitting to that of the light harvesting units and the area and cost of required land. The overall cost analysis of this kind of integrated photo-electrochemistry system will have to be compared with the cost efficiency of competing hydrogen producing technologies that employ Pt electro-catalysts based upon electrically integrated photovoltaic-electrolysis systems and grid integration of decoupled photovoltaics and electrolysis systems [7]. It is worth noting that the production of Pt since the early 2000s has varied between just over 150 tons to about 220 tons. Obviously there is scope for further production if necessary. **The price has been volatile**. It was stable from 1992 to 2000 and then steadily rose until it touched about $2,252 per ounce in 2008. It then fell off a cliff later in 2008 falling to $774 per ounce. It has since gone up and down, as high as $1,900 per ounce and today stands at about $950 per ounce [8]. The price of Pt seems to be related to the fortunes of the economy, when the economy is good and growing so does the price of Pt. A big question is, do we want to base a H2 economy on a rare element like Pt, where countries could be held to ransom on either the price or supply rather like the current situation with oil? Perhaps, when more research scientists challenge the doctrine of the ‘materials dilemma’ by using new value propositions with economic models for producing Pt, they may entice business and industry leaders to produce Pt as if it were a ‘common element’, one that was absolutely essential for creating a sustainable future. Currently, fossil fuel industry methods remain economically advantageous, despite the adverse consequences on our environment and climate. A transition to clean energy technologies **will take time,** nevertheless many companies have already realized the benefits of this ground-breaking change. An impressive example of the conversion from fossil to H2 fuel is seen with Toyota. After more than twenty years of rigorous research and development they have manufactured automobiles with H2 fuel-cell powered engines to become commercially available later this year [9]. To enable this transition, H2 fuel stations as well as H2 generators integrated into automobiles will have to be rapidly developed. It seems that we should not yet write off rare expensive Pt [platinum] as the catalytic metal of choice for making solar H2 on an industrially significant scale to power a global hydrogen economy. If Pt is selected as the catalyst of choice, there should as well be alternative choices of cheap and abundant elemental compositions, which can quickly take the place of Pt as a photo-catalyst. We shouldn’t stop looking for cheaper alternatives as there’s a whole bunch of interesting alternative materials out there. To invoke the wisdom of the American novelist, Mark Twain: “It ain’t what you don’t know that gets you into trouble. It’s what you’re sure you know that does.” If we’re so sure that Pt [platinum] is too **rare** and expensive to process on a global industrial scale, we may be adding to our troubles, rather than resolving them with this nano solution.

**Hydrogen energy production is try-or-die to solve 2°C warming – negative emissions AND solves oceans.**

Sarah **DeWeerdt**, 6-26-**18**, (Seattle-Based Science author specializing in biology, medicine and the environment as a contributor to Anthropocene magazine's Daily Science blog, and her work has appeared in a variety of other publications including Nature, Newsweek, Conservation and Nautilus, “Could the hydrogen economy throw us a climate-change lifeline?”, Anthropocene, http://www.anthropocenemagazine.org/2018/06/could-hydrogen-economy-throw-climate-change-lifeline/)

According to scientists who track humanity’s greenhouse gas budget, it’s looking more and more likely that we will emit more carbon dioxide than is compatible with limiting global warming to **2 °C**, let alone 1.5 °C, as envisioned in the Paris Agreement. That reality has focused more attention on negative emissions – technologies for pulling carbon dioxide out of the air and sequestering it more or less permanently. Many attempts to model different emissions pathways and predict future climate now assume that negative emissions will be necessary to plug the hole in our carbon budget. So far, most attention has focused on a method called bioenergy with carbon capture and storage (BECCS): grow certain trees or grasses on large plantations, harvest and burn them for energy, capture the resulting carbon dioxide, and inject it underground. The problem is that **this might not be feasible in practice**. For one thing, **the scale** of carbon removal needed **is so massive** that there may not be enough land to grow bioenergy crops without putting natural ecosystems or food production at risk. And scientists aren’t sure that storing huge quantities of carbon dioxide underground will be safe and secure over the long term. But **there may be other options**. According to an analysis published yesterday in Nature Climate Change, negative-emissions methods to produce hydrogen fuel could have **even greater power generation** and **carbon storage potential** than BECCS, and cost less. What’s more, negative-energy hydrogen would yield **byproducts** that **fight ocean acidification.** The process uses renewable energy to split water to yield hydrogen fuel. Meanwhile, a series of additional chemical reactions convert dissolved carbon dioxide to bicarbonate. Scientists have recently developed several different methods that are variations on this same basic theme. Bicarbonate is an important component of seawater and is used as raw material by shell-forming organisms. One effect of ocean acidification is that bicarbonate is in shorter supply, making it more difficult for marine organisms to make shells. Negative-emissions hydrogen would **replenish the ocean’s stock of bicarbonate while sequestering** **carbon**. It’s essentially an accelerated version of a natural process, called mineral weathering, that has kept ocean chemistry in balance across geologic time scales. In the new analysis, researchers evaluated the potential of negative-emissions hydrogen energy production and carbon dioxide removal. They calculated that the global energy system could produce between 300 and 3,000 exajoules of negative-emissions hydrogen energy per year. (One exajoule is equivalent to the amount of energy contained in 174 million barrels of oil.) The method could remove between 90 and **900 gigatonnes of carbon dioxide** from the air annually. Anthropogenic carbon dioxide emissions are currently about 41 gigatonnes per year. By comparison, other scientists have calculated that **BECCS could** produce as much as 300 exajoules of energy yearly, and **sequester up to 12 gigatonnes** of carbon per year. The new analysis also suggests that negative-emissions hydrogen is more efficient than BECCS, in that it removes about seven times more carbon dioxide per unit of energy generated. How much this would all cost depends on what form of renewable electricity is used. The researchers estimate that using hydropower to split water would cost 7 per kilowatt hour of hydrogen fuel produced, while using high-cost solar electricity would cost 64 cents. Carbon removal would cost between $3 and $161 per tonne, again depending on the form of energy used. Overall, these estimates are less than or roughly equal to the cost of carbon capture and storage in fossil fuel-based systems. They are also equivalent to or much lower than the costs associated with BECCS. On the other hand, a downside of negative-emissions hydrogen is that hydrogen fuel is not as readily used by the global energy system as the electricity produced by BECCS is. But this could change in a future **“hydrogen economy”** as this fuel gets more integrated into the transportation system and the energy grid. Negative-emissions hydrogen could also have its own environmental impacts from mining minerals and water use. And it remains to be seen how well this would work in practice, especially at a large scale. But as an argument that it’s worth exploring alternatives to BECCS, negative-emissions hydrogen looks pretty compelling. “The negative-emissions energy field is in its infancy and therefore the methods discussed here are unlikely to be the only ones ultimately worth considering,” the researchers write.

**Warming causes extinction.**

**Torres 16** (Phil, PhD candidate @ Rice in tropical conservation biology, affiliate scholar @ Institute for Ethics and Emerging Technologies, July 22, 2016, “Op-ed: **Climate Change Is the Most Urgent Existential Risk**,” <http://ieet.org/index.php/IEET/more/Torres20160807>)

Humanity faces a number of formidable challenges this century. Threats to our collective survival stem from asteroids and comets, supervolcanoes, global pandemics, climate change, biodiversity loss, nuclear weapons, biotechnology, synthetic biology, nanotechnology, and artificial superintelligence. With such threats in mind, an informal survey conducted by the Future of Humanity Institute placed the probability of human extinction this century at 19%. To put this in perspective, it means that the average American is more than a thousand times more likely to die in a human extinction event than a plane crash.\* So, given limited resources, which risks should we prioritize? Many intellectual leaders, including Elon Musk, Stephen Hawking, and Bill Gates, have suggested that artificial superintelligence constitutes one of the most significant risks to humanity. And this may be correct in the long-term. But I would argue that two other risks, namely **climate change** and biodiveristy loss, **should take priority** right now over **every other known threat**. Why? Because **these** ongoing **catastrophes in slow-motion** will frame our **existential predicament** on Earth not just for the rest of this century, but for literally **thousands of years** to come. As such, they have the capacity to **raise** or lower the **probability of other risks scenarios** unfolding. Multiplying Threats Ask yourself the following: are **wars** more or less likely in a world marked by **extreme weather events**, **megadroughts**, **food supply disruptions**, and sea-level rise? Are **terror**ist attacks **more** or less **likely** in a world beset by **the collapse of global ecosystems**, **agricultural** failures, **econ**omic uncertainty, and political instability? Both government officials and scientists agree that the answer is **“more likely.”** For example, the current Director of the CIA, John Brennan, recently identified “the impact of **climate change**” as one of the “deeper causes of this rising instability” in countries like **Syria**, **Iraq**, **Yemen**, **Libya**, and **Ukraine**. Similarly, the former Secretary of Defense, Chuck Hagel, has described climate change as **a “threat multiplier”** with “the potential to exacerbate many of the challenges we are dealing with today — from infectious disease to terrorism.” The Department of Defense has also affirmed a connection. In a 2015 report, it states, “Global climate change will aggravate problems such as **poverty**, **social tensions**, environmental degradation, **ineffectual leadership** and **weak political institutions** that threaten stability in a number of countries.” **Scientific studies have further shown a connection between the environmental crisis and violent conflicts.** For example, a 2015 paper in the Proceedings of the National Academy of Sciences argues that climate change was a causal factor behind the record-breaking 2007-2010 drought in Syria. This drought led to a mass migration of farmers into urban centers, which fueled the 2011 Syrian civil war. Some observers, including myself, have suggested that this struggle could be the beginning of World War III, given the complex tangle of international involvement and overlapping interests. The study’s conclusion is also significant because the Syrian civil war was the Petri dish in which the Islamic State consolidated its forces, later emerging as the largest and most powerful terrorist organization in human history. A Perfect Storm The point is that climate change and biodiversity loss could very easily push societies **to the brink of collapse**. This will exacerbate **existing geopolitical tensions** and introduce entirely **new power struggles** between state and nonstate actors. At the same time, advanced technologies will very likely become increasingly powerful and accessible. As I’ve written elsewhere, the malicious agents of the future will have bulldozers rather than shovels to dig mass graves for their enemies. The result is a perfect storm of more conflicts in the world along with unprecedentedly dangerous weapons. If the conversation were to end here, we’d have ample reason for placing climate change and biodiversity loss at the top of our priority lists. But there are other reasons they ought to be considered urgent threats. I would argue that they could make humanity more vulnerable to a catastrophe involving superintelligence and even asteroids. The basic reasoning is the same for both cases. Consider superintelligence first. Programming a superintelligence whose values align with ours is a formidable task even in stable circumstances. As Nick Bostrom argues in his 2014 book, we should recognize the “default outcome” of superintelligence to be “doom.” Now imagine trying to solve these problems amidst a rising tide of interstate wars, civil unrest, terrorist attacks, and other tragedies? The societal stress caused by climate change and biodiversity loss will almost certainly compromise important conditions for creating friendly AI, such as sufficient funding, academic programs to train new scientists, conferences on AI, peer-reviewed journal publications, and communication/collaboration between experts of different fields, such as computer science and ethics. It could even make an “AI arms race” more likely, thereby raising the probability of a malevolent superintelligence being created either on purpose or by mistake. Similarly, imagine that astronomers discover a behemoth asteroid barreling toward Earth. Will designing, building, and launching a spacecraft to divert the assassin past our planet be easier or more difficult in a world preoccupied with other survival issues? In a relatively peaceful world, one could imagine an asteroid actually bringing humanity together by directing our attention **toward a common threat**. **But** if the “**conflict multipliers**” of climate change and biodiversity loss have already **catapulted civilization** into chaos and turmoil, I strongly suspect that humanity will become more, rather than less, susceptible to dangers of this sort. Context Risks We can describe the dual threats of climate change and biodiversity loss as “context risks.” Neither is likely to directly cause the extinction of our species. But **both will define the context in which civilization confronts all the other threats** before us. In this way, they could **indirectly** contribute to the **overall danger of annihilation** — and this worrisome effect could be significant. For example, according to the Intergovernmental Panel on Climate Change, the effects of climate change will be “severe,” “pervasive,” and “irreversible.” Or, as a 2016 study published in Nature and authored by over twenty scientists puts it, the consequences of climate change “will extend longer than the entire history of human civilization thus far.” Furthermore, a recent article in Science Advances confirms that humanity has already escorted the biosphere into the sixth mass extinction event in life’s 3.8 billion year history on Earth. Yet another study suggests that we could be approaching a **sudden**, **irreversible**, catastrophic **collapse of the global ecosystem**. If this were to occur, it could result in “widespread social unrest, economic instability and loss of human life.” Given the potential for environmental degradation to elevate the likelihood **of nuclear wars, nuclear terrorism**, **engineered pandemics**, a **superintelligence takeover**, and perhaps even **an impact winter**, it ought to take precedence **over all other risk concerns** — at least in the near-term. Let’s make sure we get our priorities straight.

**1 – CP**

**Counterplan: Private appropriation in outer space except for the development and deployment of a solar shield is unjust.**

**Solar Shields prevent blackouts through early detection**

Timon **Singh**, 11/15/**10** (Timon Singh is a graduate of Liverpool University where he received a degree in Social and Economic History. He has previously worked for BBC Magazines on BBC Who Do You Think You Are? Magazine, the publication for the popular genealogy show. He has written extensively on the portrayal of history in cinema, worldwide construction projects and film.<http://inhabitat.com/nasa-devises-solar-shield-to-protect-us-national-grid/solarstorm/>

There are many things threatening the [US National Grid](http://inhabitat.com/2010/11/05/8gw-of-geothermal-energy-to-be-added-to-national-grid/geothermal-6/) at the moment – rolling blackouts, lack of funding and problems integrating renewable energy; but [NASA](http://science.nasa.gov/) is working on their defense against another threat: solar storms**. NASA’s scheme, dubbed** the [Solar Shield](http://science.nasa.gov/science-news/science-at-nasa/2010/26oct_solarshield/), will **aim to** prevent blackouts caused by solar storms through a forecasting system that would enable the Space Agency to pinpoint certain high-risk transformers**.** The Solar Shield would then warn grid operators, giving them enough time to isolate the problem and prevent widespread damage**.** Solar **storms have become a major concern for utility providers and the national military in recent years**. Although major solar storms only occur every 100 years or so, when a storm cloud from the sun (or coronal eruption) makes the Earth’s magnetic field shake**,  it sends electrical currents all over the planet, disturbing systems on the ground and in the air. These events even have the potential to melt transformer parts**.The last major solar storm was the [Carrington Event](http://science.nasa.gov/science-news/science-at-nasa/2008/06may_carringtonflare/), which occurred in 1859, disrupting the telegraph services. More recently, mild storms in 1989 and 2003 caused ‘power fluctuations’ in transformers in the US, Canada, Great Britain and other countries. **Today, if a solar storm** the size of the Carrington Event **was to occur, it would cause major damage to the National Grid as well as affected electronic systems all over the world**. As a result, **NASA scientists believe** an early warning system **would give utility companies time to disconnect major transformers in time,** preventing damage and even fire. A lack of an effective system could result in blackouts and very expensive repairs.In addition to acting as an ‘early warning system’, the Solar Shield would take images of any coronal eruptions via NASA spacecraft and satellites, and would order and assess the size and potential impact. While the Solar Shield is still in the experimental stages, NASA has recruited a number of utility companies to install monitors at their transformers. This stage should give the agency time to devise a suitable defense as the next major solar storm event is predicted for 2013.

**Solar superstorm is likely in the next few years and will cause catastrophic internet and electricity outages and global chaos.**

**Sparks** 9/22/**21** (Hannah, “Solar ‘superstorm’ could prompt ‘internet apocalypse,’ global outages”; New York Post; https://nypost.com/2021/09/22/solar-superstorm-could-prompt-internet-apocalypse-global-outages/)

Ninety-three million miles away, a solar storm brews with the power to prompt an “internet apocalypse,” according to recent findings. University of California Irvine assistant professor Sangeetha Abdu Jyothi presented the new research last month during the Association for Computing Machinery’s annual conference for their Special Interest Group on Data Communication (SIGCOMM). In [the report](https://www.ics.uci.edu/~sabdujyo/papers/sigcomm21-cme.pdf), Jyothi warned that an unmitigated solar “superstorm” could “cause large-scale Internet outages covering the entire globe and lasting several months” — pointing to inadequacies in submarine cables, a major component of internet infrastructure. Most of the time, we’re protected from the sun’s constant littering of radiation, called “solar wind,” thanks to the ionosphere, otherwise known as Earth’s magnetic shield. With nowhere to go, those magnetic particles are pulled to the North and South Poles, producing awe-inspiring auroras before dissipating. But sometimes, solar flares kick up what’s called a coronal mass ejection (CME), a solar storm strong

enough to penetrate our shield and wreak havoc on just about anything powered with electromagnetism — which just about runs the world. It has [been estimated](https://www.eurekalert.org/news-releases/653733) that the potential damage caused by a disastrous CME in 2012, which only narrowly missed Earth, would have cost the US alone up to $2.6 trillion. “Our [internet] infrastructure is not prepared for a large-scale solar event,” Jyothi [told Wired](https://www.wired.com/story/solar-storm-internet-apocalypse-undersea-cables/) recently, ticking off the consequences: widespread blackouts, mass traffic jams and a breakdown in the global supply chain, to name a few. Local and regional internet infrastructure often relies on optical fiber, which isn’t affected by geomagnetic currents, or grounded short-span cables, which are by nature protected from an electromagnetic surge. But it’s a different story with undersea cables, which connect continents via the internet. While the cables themselves aren’t vulnerable, the electronic repeaters therein, which help amplify the optical signal, are susceptible to damage by geomagnetically induced currents. If enough repeaters blow out, the whole line could be shot. For some countries, damage to these mainline cables may cut their connectivity at the source — not to mention potential damage to satellites, which enable internet for many. It’s happened before, researchers have said. In 1921, a solar storm sparked fires in electrical equipment across the world, from train station control rooms to telegraph dispatch centers. Again, in 1989, a solar storm of moderate severity knocked the power out in northeast Canada for nine hours — still before the rise of internet-based infrastructure. Jeffrey Love, a geophysicist in the geomagnetism program of the US Geological Survey, [told the Independent](https://www.independent.co.uk/life-style/gadgets-and-tech/solar-storm-2021-internet-apocalypse-cme-b1923793.html) that the impact of that 1921 New York Railroad Storm would be much greater today. “When we look back at this time, anything that’s related to electricity wasn’t as important in 1921 as it is today,” he said. In an interview [for NextGov.com](https://www.nextgov.com/ideas/2021/05/racing-sun-protect-america/174029/) in May, Dr. Scott McIntosh, deputy director of the National Center for Atmospheric Research, told Dana A. Goward, president of the Resilient Navigation and Timing Foundation, that the sun’s current electromagnetic cycle, which lasts about 11 years, is projected to be a doozy. “We have every reason to believe that the current solar cycle which began in December 2019 could be the most active since the 1970s. This is a particular concern for the GPS,” said McIntosh, who estimated a **35% to 45% chance a CME will disrupt Global Positioning System service, for potentially several days, sometime during the next decade**. He continued, “Strong solar storms can charge the atmosphere and prevent signals from getting through for days. The strongest can damage or even destroy satellites.” Researchers, as well as lawmakers, have discussed GPS alternatives in the past, prompting Congress to pass the National Timing Resilience and Security Act in 2018, asking the Department of Transportation to devise terrestrial backup for global navigation services, in the event satellites are rendered useless. Despite concerns, no progress has been made, according to RNT’s Goward. “Even with the most concerted government efforts, five or six years will be needed to establish systems and encourage, or where needed, require, users to protect themselves and vital services,” warned Goward. “Such a timeline will take us well into the coming solar danger zone.”

**Electricity shortages causes civilization collapse and extinction—cascades down and wrecks every single industry.**

Weiss and **Weiss 19** [Matthew Weiss, American Jewish University, 15600 Mulholland Drive, Bel Air, CA, 90077, USA. Martin Weiss, UCLA-Olive View Medical Center, 1444 Olive View Drive, Sylmar, CA, 91342, USA. Weiss, Matthew, and Martin Weiss. “An Assessment of Threats to the American Power Grid.” Energy, Sustainability and Society, vol. 9, no. 1, May 2019, p. 18, doi:[10.1186/s13705-019-0199-y](https://doi.org/10.1186/s13705-019-0199-y).]//Anton

Consequences of a sustained power outage

The EMP Commission states “Should significant parts of the electrical power infrastructure be lost for any substantial period of time, the Commission believes that the consequences are likely to be catastrophic, and many people will die for the lack of the basic elements necessary to sustain life in dense urban and suburban communities.” [[67](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y)].

Space constraints preclude discussion on how the loss of the grid would render synthesis and distribution of oil and gas inoperative. Telecommunications would collapse, as would finance and banking. Virtually all technology, infrastructure, and services require electricity.

An EMP attack that collapses the electric power grid will collapse the water infrastructure—the delivery and purification of water and the removal and treatment of wastewater and sewage. Outbreaks that would result from the failure of these systems include cholera. It is problematic if fuel will be available to boil water. Lack of water will cause death in 3 to 4 days [[68](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y)].

Food production would also collapse. Crops and livestock require water delivered by electronically powered pumps. Tractors, harvesters, and other farm equipment run on petroleum products supplied by an infrastructure (pumps, pipelines) that require electricity. The plants that make fertilizer, insecticides, and feed also require electricity. Gas pumps that fuel the trucks that distribute food require electricity. Food processing requires electricity.

In 1900, nearly 40% of the population lived on farms. That percentage is now less than 2% [[69](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y)]. It is through technology that 2% of the population can feed the other 98% [[68](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y)]. The acreage under cultivation today is only 6% more than in 1900, yet productivity has increased 50 fold [[69](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y)].

As stated by Dr. Lowell L Wood in Congressional testimony:

“If we were no longer able to fuel our agricultural machine in the country, the food production of the country would simply stop, because we do not have the horses and mules that used to tow agricultural gear around in the 1880s and 1890s”.

“So the situation would be exceedingly adverse if both electricity and the fuel that electricity moves around the country……… stayed away for a substantial period of time, we would miss the harvest, and we would starve the following winter” [[70](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y)].

People can live for 1–2 months without food, but after 5 days, they have difficulty thinking and at 2 weeks they are incapacitated [[68](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y)]. There is typically a 30-day perishable food supply at regional warehouses but most would be destroyed with the loss of refrigeration [[69](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y)]. The EMP Commission has suggested food be stockpiled for a possible EMP event.

A prescription for failure

Even if all the recommendations of the Congressional EMP Commission were implemented, there is no guarantee that the grid will not sustain a prolonged collapse. There should therefore be contingency plans for such a failure.

There is also another consideration. The foundational pillars of prior American nuclear defense policy, in today’s climate, are of uncertain validity. Mutual assured destruction is the Maginot line of the 21st century. Nonproliferation will prove difficult to resurrect.

**A new era of space means NASA is losing its power. It’s up to the private space sector to lead space projects now.**

Christian **Davenport** 5/6/**21** (“As private companies erode government’s hold on space travel, NASA looks to open a new frontier”; The Washington Post; https://www.washingtonpost.com/technology/2021/02/25/nasa-space-future-private/)

The four astronauts who will fly on a SpaceX mission by the end of the year will be a [bunch of private citizens](https://www.washingtonpost.com/technology/2021/02/01/spacex-st-jude-fundraising-flight/?itid=lk_inline_manual_2) with no space experience. One’s a billionaire funding the mission; another is a health care provider. The third will be selected at random through a sweepstakes, and the last seat will go to the winner of a competition. In the new Space Age, you can buy a ticket to orbit — no need to have been a fighter pilot in the military or to compete against thousands of other overachievers for a coveted spot in NASA’s astronaut corps. In fact, for this mission, the first composed entirely of private citizens, NASA is little more than a bystander. It does not own or operate the rocket that will blast the astronauts into space or the capsule they will live in for the few days they are scheduled to circle Earth every 90 minutes. NASA has no say in selecting the astronauts, and it will not train or outfit them — that will all be done by Elon Musk’s SpaceX. The money to pay for the flight also will not come from NASA — or any other government account. The cost of the project is being borne by a billionaire, Jared Isaacman, who has set it up as a fundraiser for St. Jude’s Research Hospital and a promotional device for his business, [Shift4Shop](https://www.shift4shop.com/?utm_term=shift4&utm_campaign=Product_Brand_Campaign_%5BKNOWN%5D&utm_source=adwords&utm_medium=ppc&hsa_acc=4516218500&hsa_cam=12263139112&hsa_grp=116935590466&hsa_ad=497758599975&hsa_src=g&hsa_tgt=kwd-304285625492&hsa_kw=shift4&hsa_mt=e&hsa_net=adwords&hsa_ver=3&gclid=Cj0KCQiA7NKBBhDBARIsAHbXCB5Tj74ZYo0YYuVh5NT5L3j0dYXlKbLrRC4e-1ilUTxRbUMfA7-OtVkaAnuyEALw_wcB), which helps businesses set up websites and process payments. This is the new look of human space exploration as government’s long-held monopoly on space travel continues to erode, redefining not only who owns the vehicles that carry people to space, but also the very nature of what an astronaut is and who gets to be one. And it comes as NASA confronts some of the largest changes it has faced since it was founded in 1958 when the United States’ world standing was challenged by the Soviet Union’s surprise launch of the first Sputnik into orbit. Now it is NASA’s unrivaled primacy in human spaceflight that is under challenge. Thanks to NASA’s investments and guidance, the private space sector has grown tremendously — no entity more than SpaceX, which [according to CNBC](https://www.cnbc.com/2021/02/16/elon-musks-spacex-raised-850-million-at-419point99-a-share.html) is now worth $74 billion. The commercial space industry is taking on ever more roles and responsibilities — flying not just cargo and supplies to the International Space Station, but even NASA’s astronauts there. The private sector will launch some of the major components of the space station NASA wants to build in orbit around the moon, and private companies are developing the spacecraft that will fly astronauts to and from the lunar surface. Space enthusiasts, including NASA, see enormous benefit in the shift — a new era of space exploration that will usher in a more capable and efficient space industry. But the changing dynamic also has left NASA, which for decades has set the pace for the American space project, with an uncertain role, a development NASA’s Safety Aerospace Safety Advisory Panel warns could have consequences for years to come. The growth of companies like SpaceX has "tremendous upside potential — and are accompanied by equally tremendous challenges for managing the risk of human space exploration,” [it said in its annual report](https://oiir.hq.nasa.gov/asap/documents/2020_ASAP_Report-TAGGED.pdf), released last month. “NASA leadership in human space exploration is still preeminent, but the agency’s role is evolving with critical implications for how risk and safety will

be managed.” So far, NASA has done well “as it shifts from principally executing its programs and missions to commercially acquiring significant key elements and services,” it said. But as the agency continues to evolve, “NASA must make some strategically critical decisions, based on deliberate and thorough consideration, that are necessary because of their momentous consequences for the future of human space exploration and, in particular, for the management of the attendant risks.” In an interview, Steve Jurczyk, NASA’s acting administrator, said the agency is well aware of how its identity and role are changing, and he likened the agency’s role to how the U.S. government fostered the commercial aviation industry in the early 20th century. NASA’s predecessor, NACA, or the National Advisory Committee for Aeronautics, “did research, technology development to initially support defense … but also later on supporting a burgeoning commercial aircraft industry and aviation industry,” he said. “So that may be how we evolve, moving forward on the space side. We’re going to do the research and the technology development and be the enablers for continuing to support the commercial space sector.”

1. ON CASE  
   Lockean proviso fails
   1. Not all people are fundamentally morally equal, their stances on how the world OUGHT to operate ignores real world issues and misunderstands how the world works
   2. No warrant for the link of everyone being equal → everyone has equal access to land

Rest will be extempt