## Nebel

#### Interpretation: “the appropriation of outer space” is a generic indefinite singular. The aff may not defend a subset of appropriation of outer space by private entities being unjust.

#### The definite article “the” makes the rez a definite singular – it’s generic

CCC n.d. [Capital Community College, a nonprofit 501 c-3 organization that supports scholarships, faculty development, and curriculum innovation.] “Articles, Determiners, and Quantifiers.” Capital Community College. <http://grammar.ccc.commnet.edu/grammar/determiners/determiners.htm#articles> TG

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

#### The upward entailment test and adverb test determine the genericity of a definite singular

Leslie 16 [Sarah-Jane Leslie, Ph.D., Princeton, 2007. Dean of the Graduate School and Class of 1943 Professor of Philosophy. Served as the vice dean for faculty development in the Office of the Dean of the Faculty, director of the Program in Linguistics, and founding director of the Program in Cognitive Science at Princeton University.] “Generic Generalizations.” Stanford Encyclopedia of Philosophy. April 24, 2016. <https://plato.stanford.edu/entries/generics/> TG

1. Generics and Logical Form In English, generics can be expressed using a variety of syntactic forms: bare plurals (e.g., “tigers are striped”), indefinite singulars (e.g., “a tiger is striped”), and definite singulars (“the tiger is striped”). However, none of these syntactic forms is dedicated to expressing generic claims; each can also be used to express existential and/or specific claims. Further, some generics express what appear to be generalizations over individuals (e.g., “tigers are striped”), while others appear to predicate properties directly of the kind (e.g., “dodos are extinct”). These facts and others give rise to a number of questions concerning the logical forms of generic statements. 1.1 Isolating the Generic Interpretation Consider the following pairs of sentences: (1)a.Tigers are striped. b.Tigers are on the front lawn. (2)a.A tiger is striped. b.A tiger is on the front lawn. (3)a.The tiger is striped. b.The tiger is on the front lawn. The sentence pairs above are prima facie syntactically parallel—both are subject-predicate sentences whose subjects consist of the same common noun coupled with the same, or no, article. However, the interpretation of first sentence of each pair is intuitively quite different from the interpretation of the second sentence in the pair. In the second sentences, we are talking about some particular tigers: a group of tigers in ([1b](https://plato.stanford.edu/entries/generics/#ex1b)), some individual tiger in ([2b](https://plato.stanford.edu/entries/generics/#ex2b)), and some unique salient or familiar tiger in ([3b](https://plato.stanford.edu/entries/generics/#ex3b))—a beloved pet, perhaps. In the first sentences, however, we are saying something general. There is/are no particular tiger or tigers that we are talking about. The second sentences of the pairs receive what is called an existential interpretation. The hallmark of the existential interpretation of a sentence containing a bare plural or an indefinite singular is that it may be paraphrased with “some” with little or no change in meaning; hence the terminology “existential reading”. The application of the term “existential interpretation” is perhaps less appropriate when applied to the definite singular, but it is intended there to cover interpretation of the definite singular as referring to a unique contextually salient/familiar particular individual, not to a kind. There are some tests that are helpful in distinguishing these two readings. For example, the existential interpretation is upward entailing, meaning that the statement will always remain true if we replace the subject term with a more inclusive term. Consider our examples above. In ([1b](https://plato.stanford.edu/entries/generics/#ex1b)), we can replace “tiger” with “animal” salva veritate, but in ([1a](https://plato.stanford.edu/entries/generics/#ex1a)) we cannot. If “tigers are on the lawn” is true, then “animals are on the lawn” must be true. However, “tigers are striped” is true, yet “animals are striped” is false. ([1a](https://plato.stanford.edu/entries/generics/#ex1a)) does not entail that animals are striped, but ([1b](https://plato.stanford.edu/entries/generics/#ex1b)) entails that animals are on the front lawn (Lawler 1973; Laca 1990; Krifka et al. 1995). Another test concerns whether we can insert an adverb of quantification with minimal change of meaning (Krifka et al. 1995). For example, inserting “usually” in the sentences in ([1a](https://plato.stanford.edu/entries/generics/#ex1a)) (e.g., “tigers are usually striped”) produces only a small change in meaning, while inserting “usually” in ([1b](https://plato.stanford.edu/entries/generics/#ex1b)) dramatically alters the meaning of the sentence (e.g., “tigers are usually on the front lawn”). (For generics such as “mosquitoes carry malaria”, the adverb “sometimes” is perhaps better used than “usually” to mark off the generic reading.)

#### It applies to “the appropriation of outer space” – 1] upward entailment test – “the appropriation of outer space is unjust” doesn’t entail that “the use of outer space is unjust” because it doesn’t mean compulsory voting in dictatorships, 2] adverb test – “the appropriation of outer space is usually unjust” doesn’t mean anything substantially different from the rez

#### Violation – they only defend lunar heritage sites

#### Vote neg:

#### 1] Precision is key – a) anything else justifies the aff arbitrarily jettisoning words in the resolution at their whim which decks negative ground and preparation because the aff is no longer bounded by the resolution, b) jurisdiction – the ballot asks the judge to vote aff if the aff proves the resolution true, the judge can’t vote aff if they aren’t defending the rez.

#### 2] Limits – they can pick any form of appropriation from internet satellites to asteroid mining to moon basing to Mars colonization and there’s no universal disad since they’re all different and require different uses space – explodes neg prep and leads to random appropriation of the week affs which makes cutting stable neg links impossible. PICs don’t solve – it’s absurd to say neg potential abuse justifies the aff being flat out not T, which leads to a race towards abuse. Limits key to reciprocal engagement since they create a caselist for neg prep.

#### 3] TVA – read the aff as an advantage to a whole rez aff.

#### Fairness- consittutive of comp activites, args presume

#### Edu- funded ny schools

#### DTD- dta illogical, time skew

#### No RVI’s- illogical, baiting

#### CI- intervention, race to bottom, collapses, yours vs best

## T appropriation

#### Interpretation: appropriation involves permanent, exclusive use of land and resource extraction. The aff must defend that appropriation of outer space by private entities is unjust.

Stephen Gorove, Stephen Gorove (1917-2001) was a space law education pioneer. He served as a professor of space law and director of space studies and policy, from 1991-1998, at the University of Mississippi., 1969 " Interpreting Article II of the Outer Space Treaty" Fordham Law Review, https://ir.lawnet.fordham.edu/cgi/viewcontent.cgi?article=1966&context=flr

With respect to the concept of appropriation the basic question is **what constitutes "appropriation,"** as used in the Treaty, especially in contradistinction to casual or temporary use. The term "appropriation" is used most frequently to denote the taking of property for one's own or exclusive use with a sense of permanence. Under such interpretation the establishment of a permanent settlement or the carrying out of commercial activities by nationals of a country on a celestial body may constitute national appropriation if the activities take place under the supreme authority (sovereignty) of the state. Short of this, if the state wields no exclusive authority or jurisdiction in relation to the area in question, the answer would seem to be in the negative, unless, the nationals also use their individual appropriations as cover-ups for their state's activities.5 In this connection, it should be emphasized that the word "appropriation" indicates a taking which involves something more than just a casual use. Thus a temporary occupation of a landing site or other area, just like the **temporary or nonexclusive use of property, would not constitute appropriation**. By the same token, any use involving consumption or **taking with intention of keeping for one's own exclusive use would amount to appropriation.**

#### Violation – the 1AC is not aout the appropriation of outer space but rather the DISRUPTION of heritage sites, specifically citing things like ‘selling rovers’

#### Plan text in a vacuum bad for fairness because it allows for incongruency between 99% of the aff and 1% of the aff – the worst version of their model is that the plan text is different from the advantage, so it makes no sense – hold them to reading a plan text defined contextually with the advantage

#### Vote neg –

#### 1] Ground – allowing affs to not defend permanent appropriation kills negative ground – we can’t read the innovation DA, since they can say innovative appropriation efforts are allowed, we can’t read asteroid mining or disads to specific types of appropriation since they can defend an exemption for that, etc. – Since the government gets to interpret whether or not the PTD applies to appropriation in specific instances, the negative can’t reasonably predict what the aff defends restricting and what it doesn’t. Ground controls the internal link to clash and fairness since the aff makes being neg impossible.

# Case

### 1NC

#### First, defense --

#### Their author concludes moon dust doesn’t mess with moon-based observation.

Hamill 16, Patrick. "Atmospheric observations from the moon: A lunar earth-observatory." 2016 Ieee International Geoscience and Remote Sensing Symposium (Igarss). IEEE, 2016. (Department of Physics and Astronomy at San Jose State University) SM

The lunar surface is covered in electrostatically charged fine dust particles of diameter 70 µm. This dust has sharp edges (not having been exposed to weathering) and is expected to cling to surfaces to which it is exposed. It is believed that the dust is disturbed by the changing electric field at the terminator and rises to heights of several meters [9]. This effect may have been observed by the Apollo astronauts. The dust may damage unshielded equipment [10]. Some investigators have even suggested that the presence of dust would make telescopic observations impossible, but the evidence from Chang’e 3 shows that this is not the case. (It might be mentioned that the Chang’e 3 instrumentation is protected during sunrise and sunset.) Furthermore, the retroreflectors placed on the lunar surface by NASA Astronauts and Soviet robotic rovers over forty years ago still reflect laser beams, indicating that even over long periods of time optical surfaces are not completely degraded by the lunar dust [11].

#### But dust definitely still stops moon basing.

Niiler 21 Eric Niiler “The Next Big Challenge for Lunar Astronauts? Moon Dust” 08.19.2021 <https://www.wired.com/story/the-next-big-challenge-for-lunar-astronauts-moon-dust/> SM

AS NASA AND private space companies prepare to send equipment—and eventually astronauts—back to the moon, they are facing a nearly invisible threat to any future lunar outpost: tiny particles of dust. Ground-up lunar rock, known as regolith, clogs drills and other delicate instruments, and it's so sharp that it scratches space suits. Because the dust absorbs sunlight, it can also overheat sensitive electronics.

Dust particles also pose a health risk. Even though Apollo-era astronauts only went outside during a few days on each mission, some reported burning eyes and stuffy nasal passages when they returned from moon walks and took off their dust-covered space suits inside the capsule. Images from the Apollo 17 mission, which focused on geology and featured seven-hour trips in the lunar rover, show astronaut Gene Cernan’s face covered in dust, like some outer space coal miner. During a technical briefing when he returned to Earth, Cernan told NASA officials that lunar dust was nothing to sneeze at. "I think dust is probably one of our greatest inhibitors to a nominal operation on the moon,” Cernan said. “I think we can overcome other physiological or physical or mechanical problems, except dust."

The grit clogged the radiators that removed heat and carbon dioxide from space suits and wore a hole in the knee of Cernan’s outer space suit, according to Phil Abel, who researches moon dust as manager of the Tribology and Mechanical Components Branch at NASA’s Glenn Research Center. (Tribology is the study of wear and friction.) The Apollo 17 astronauts brought dust into the capsule, where it smelled like gunpowder and caused lunar module pilot Harrison Schmitt to have hay fever symptoms, according to a report from a NASA workshop on lunar dust in 2020.

Here’s how one Apollo 12 astronaut described what happened when he returned to the lunar module after a walk on the moon: “The [module] was filthy dirty and had so much dust that when I took my helmet off, I was almost blinded. Junk immediately got into my eyes.” (The quote appears in a 2009 NASA report entitled “The Risk of Adverse Health Effects From Lunar Dust Exposure.”)

Researchers at Stony Brook University exposed human lung and brain cells to lunar dust and found that it killed 90 percent of the cells, according to a study published in the journal GeoHealth in 2018. In fact, respiratory health is a top concern if and when humans return to the moon, according to Abel. “These particles get lodged down deep in your lungs, and that’s a long-term health risk,” Abel says. “There was some concern at the time that if we had needed to do more on the moon’s surface, some of the space suits would have started to leak at too high a rate. It’s something we have been working on to improve.”

#### Not reverse causal – even if we’re aware extreme weather and warming are happening there’s no way to stop it – they haven’t read ev that we can stop super-volcanoes even if we know they’re erupting soon.

#### Hamill says that lunar observation lets us know when volcanic fumes are high enough to threaten aircraft, not predict when natural disasters occur – this ev is one line and does not grant a more generalized warrant about natural disasters

#### AI prediction methods coming now and solve.

Joshi 19 “How AI Can And Will Predict Disasters” NAVEEN JOSHI [Naveen Joshi, columnist, is Founder and CEO of Allerin, which develops engineering and technology solutions focused on optimal customer experiences. Naveen works in AI, Big Data, IoT and Blockchain.] 3/15/2019 <https://www.forbes.com/sites/cognitiveworld/2019/03/15/how-ai-can-and-will-predict-disasters/?sh=57a309075be2> SM

How AI Can And Will Predict Disasters

Recently, the regions around the Dead Sea in Jordan were flooded, causing the death of 21 children who were on a school trip, and injuring 35 more. Such disasters affect millions of people every year and cause property damage worth hundreds of billions. In 2017 alone, almost 335 natural disasters have affected more than 95.6 million people, and killed 9,697, costing around US $335 billion.

But, the impact of these phenomena can be reduced if we were able to predict their occurrence. AI-powered systems can already predict the prices of stocks, which involve the analysis of numerous variables. Likewise, researchers are applying artificial intelligence to accurately predict natural disasters. By predicting the occurrence of natural disasters, we can save thousands of lives and take appropriate measures to reduce property damage.

Using AI to predict natural disasters

Artificial intelligence has been helping us in various applications such as customer service, trading and healthcare. And now, researchers have found that AI can be used to predict natural disasters. With enormous amounts of good quality datasets, AI can predict the occurrence of numerous natural disasters, which can be the difference between life and death for thousands of people. Some of the natural disasters that can be predicted by AI are:

Earthquakes

Researchers are collecting enormous amounts of seismic data for analysis using deep learning systems. Artificial intelligence can use the seismic data to analyze the magnitude and patterns of earthquakes. Such data can prove beneficial to predict the occurrence of earthquakes. For example, Google and Harvard are developing an AI system that can predict the aftershocks of an earthquake. Scientists have studied more than 131,000 earthquakes and aftershocks to build a neural network. The researchers tested the neural network on 30,000 events, and the system predicted the aftershock locations more precisely when compared to traditional methods.

Similarly, multiple researchers are creating their own applications to predict earthquakes and aftershocks. In the future, we may be able to foresee earthquakes and authorities can start evacuation operations accordingly. Currently, Japan is using satellites to analyze images of the earth to predict natural disasters. AI-based systems look for changes in the images to predict the risk of disasters such as earthquakes and tsunamis. Moreover, these systems also monitor aging infrastructure. Artificial intelligence systems can detect deformations in structures, which can be used to reduce the damage caused by collapsing buildings and bridges, or subsiding roads.

Floods

Google is building an AI platform to predict floods in India and warn users via Google Maps and Google Search. The data for training the AI system is collected with the help of rainfall records and flood simulations. Similarly, researchers are developing AI-based systems that can learn from rainfall and climate records and tested with flood simulations, which can predict floods better than the traditional systems. Alternatively, AI can also be used to monitor urban flooding. Researchers at the University of Dundee in the United Kingdom are monitoring urban flooding by collecting crowd-sourced data with Twitter and other mobile apps. The data contains images and information about the location and situations in a locality, which is recognized by the AI. Such systems can be used to monitor and predict the damage done by floods along with other methods. Likewise, applications based on artificial intelligence and deep learning is useful for disaster management.

Volcanic eruptions

Researchers have always struggled with finding methods to effectively predict natural disasters such as volcanic eruptions. But now, scientists are training AI to recognize tiny ash particles from volcanoes. The shape of the ash particles can be used to identify the type of volcano. Such developments can help in predicting eruptions and creating volcanic hazard mitigation techniques.

IBM is developing Watson that will predict volcanic eruptions using seismic sensors and geological data. IBM is aiming to forecast the locations and the intensity of eruptions with the help of Watson. Such applications can help to prevent the loss of life in areas surrounding active volcanoes.

Hurricanes

Every year hurricanes cost property damage worth millions of dollars. Hence, meteorological departments are looking for better techniques to predict natural disasters like hurricanes and cyclones, and track their path and intensity. With more effective prediction techniques, the concerned authorities can save more lives and reduce property damage.

Recently, NASA and Development Seed tracked Hurricane Harvey using satellite images and machine learning. The method proved to be six times better than the usual techniques, as the hurricane can be tracked every hour instead of every six hours with the traditional methods. Therefore, the developments in technology are helping in monitoring hurricanes and foreseeing the path of hurricanes, which can assist in mitigation efforts.

#### Solves extreme weather predictions specifically.

NERSC 21 “Deep-learning model speeds extreme weather predictions” DECEMBER 8, 2021 National Energy Research Scientific Computing Center [National Energy Research Scientific Computing Center] <https://phys.org/news/2021-12-deep-learning-extreme-weather.html> SM

Deep-learning model speeds extreme weather predictions

A depiction of digital twin Earth adapted from the EU's Destination Earth project.

Climate change is one of the greatest challenges facing humanity today. To help address this, researchers from Lawrence Berkeley National Laboratory (Berkeley Lab), Caltech, and NVIDIA trained the Fourier Neural Operator (FNO) deep learning model—which learns complex physical systems accurately and efficiently—to emulate atmospheric dynamics and provide high-fidelity extreme weather predictions across the globe a full five days in advance.

The researchers used decades of data from ERA5, the European Center for Medium-range Weather Forecasts' high-resolution Earth dataset, to train the FNO model, which was scaled up to 128 NVIDIA A100 GPUs on Perlmutter, the new HPC system at the National Energy Research Scientific Computing Center (NERSC). The team developed a global FNO weather forecasting model at 30-km resolution, an order of magnitude greater resolution than state-of-the-art deep learning Earth emulators. The model predicts wind velocities and pressures at multiple levels in the atmosphere up to 120 hours in advance with high fidelity. In a case study on the massive 2016 hurricane Matthew, the model's predictions of the hurricane's winds and track were within the uncertainties of the NOAA National Hurricane Center's forecast cones. In addition, the model can predict the behavior of certain classes of extreme weather events across the globe days in advance in just 0.25 seconds on a single NVIDIA GPU.

Physics-informed deep learning models such as the FNO offer the potential for accurate predictions of the spatio-temporal evolution of the Earth system orders of magnitude faster than traditional numerical models. This is an ongoing effort, and the team is investigating the comparative accuracy of deep learning and traditional numerical weather models in collaboration with experts in atmospheric modeling and numerical weather prediction.

The FNO model developed through the Berkeley Lab/Caltech/NVIDIA collaboration is a significant step toward building a digital twin Earth, the researchers noted. Digital twin Earths are digital replicas of planet Earth—simulators grounded in physics, driven by AI, and constrained by real-time data. As described in the ambitious 10-year EU project Destination Earth, a digital twin Earth will give both expert and non-expert users tailored access to high-quality information, services, models, forecasts, and visualizations in the realms of climate monitoring, modeling, mitigation, and adaptation. This video shows a demonstration of digital twin Earth using the FNO model.

The FNO climate collaboration was one of several science success stories described by NVIDIA co-founder and CEO Jensen Huang during a keynote presentation at the recent GPU Technology Conference. In his talk, Huang emphasized that the combination of accelerated computing, physics, machine learning, and giant computer systems can provide "a million-x leap" to enable simulating and predicting climate change reliably and accurately.

#### Internal link to BioD is integrating heritage sides into the World Heritage Foundations – the aff does not do that and that process is completely different from the normal means ev they read

AC Westwood 15, Lisa D. "Historic preservation on the fringe: A human lunar exploration heritage cultural landscape." Archaeology and heritage of the human movement into space. Springer, Cham, 2015. 131-155. (Lecturer in the Department of Anthropology, Sociology, and Multicultural and Gender Studies)//Elmer

Allowing space heritage sites off of Earth to be included in the WHL may require changes to the Convention and to its Operational Guidelines.

#### They haven’t read uq ev that natural heritage sites are insufficient now

#### BioD terminal is about GLOBAL biosphere collapsing, not local ecosystems within heritage sites

#### No biod impact – humans can survive post-collapse and there’s no relationship between survival and biodiversity – their authors use flawed data analysis

Hough 14 [Rupert, Environmental Scientist with Expertise in Risk Modelling and Exposure Assessment and PhD from Nottingham University, February, “Biodiversity and human health: evidence for causality?” Biodiversity and Conservation, Vol. 23 No. 2, pg. 272-3/AKG]

Large country-level assessments (e.g. MEA 2005; Huynen et al. 2004; Sieswerda et al. 2001) must be interpreted with some caution. Data measured at country-level are likely to mask regional and local-level effects. Apart from the fact that there are limitations to regression analysis in providing any proof of causality, least squares regression models assume linear relationships between reductions in biodiversity and human health and thus imply a linear relationship between loss of biodiversity and the provision of relevant ecosystem goods and services. A number of authors, however, have suggested that ecosystems can lose a proportion of their biodiversity without adverse consequences to their functioning (e.g. Schwartz et al. 2000). Only when a threshold in the losses of biodiversity is reached does the provision of ecosystem goods and services become compromised. These models also tend to assume a positive relationship between socio-economic development and loss of biodiversity. One problem with this expectation is that the loss in biodiversity in one country is not per definition the result of socio-economic developments in that particular country, but could also be the result of socio-economic developments in other parts of the world (Wackernagel and Rees 1996). Furthermore, the use of existing data means researchers can only make use of available indicators. Unlike for human health and socio-economic development, there are no broadly accepted core-set of indicators for biodiversity (Soberon et al. 2000). The lack of correlation between biodiversity indicators (Huynen et al. 2004) shows that the selected indicators do not measure the same thing, which hinders interpretation of results. Finally, there is likely to be some sort of latency period between ecosystem imbalance and any resulting health consequences. To date, this has not been investigated using regression approaches. Finally, it is thought that provisioning services are more crucial for human health and well-being that other ecosystem services (Raudsepp-Hearne et al. 2010). Trends in measures of human well-being are clearly correlated with food provisioning services, and especially with meat consumption (Smil 2002). While \*60 % of the ecosystem services assessed by the MEA were found to be in decline, most of these were regulating and supporting services, whereas the majority of expanding services were provisioning services such as crops, livestock and aquaculture (MEA 2005). Raudsepp-Hearne et al. (2010) investigated the impacts on human well-being from decreases in non-food ecosystem services using national-scale data in order to reveal human well-being trends at the global scale. At the global scale, forest cover, biodiversity, and fish stocks are all decreasing; while water crowding (a measure of how many people shared the same flow unit of water placing a clear emphasis on the social demands of water rather than physical stress (Falkenmark and Rockstro¨m 2004)), soil degradation, natural disasters, global temperatures, and carbon dioxide levels are all on the rise, and land is becoming increasingly subject to salinization and desertification (Bennett and Balvanera 2007). However, across countries, Raudsepp-Hearne et al. (2010) found no correlation between measures of wellbeing and the available data for non-food ecosystem services, including forest cover and percentage of land under protected-area status (proxies for many cultural and regulating services), organic pollutants (a proxy for air and water quality), and water crowding index (a proxy for drinking water availability, Sieswerda et al. 2001; WRI 2009) This suggests there is no direct causal link between biodiversity decline and health, rather the relationship is a ‘knock-on’ effect. I.e. if biodiversity decline affects mankind’s ability to produce food, fuel and fibre, it will therefore impact on human health and well-being. As discussed in the introduction, the fact that humans need food, water and air to live is an obvious one. All these basic provisions can be produced in a diversity-poor environment. Therefore, to understand whether there is a potential causality relationship between biodiversity in its own right and human health, we need to move beyond the basic provisioning services.

#### Second, offense --

#### 1] Moon basing causes US-China war due to competing property claims

Copp 21 If China and the US Claim the Same Moon-Base Site, Who Wins? TARA COPP [SENIOR PENTAGON REPORTER, DEFENSE ONE] AUGUST 8, 2021 <https://www.defenseone.com/technology/2021/08/if-china-and-us-claim-same-moon-base-site-who-wins/184352/> SM

If China and the US Claim the Same Moon-Base Site, Who Wins?

Relatively few craters are attractive, and there’s no consensus about avoiding conflict over them.

There’s a not-so-quiet race back to the moon underway, but the two largest factions, with China and Russia on one side, and the United States and its partners on the other, are not recognizing each others’ proposed rules on what’s allowed once they get there.

Lawmakers and space policy analysts are concerned: How do you avoid conflict in space if the international laws and policies on Earth no longer apply?

“Many terrestrial military doctrines are not applicable in space, or at least not as applicable. If you get beyond 50 miles, or at least 62 miles, suddenly different rules apply. We need to start being aware of that,” says Rep. Jim Cooper, D-Tenn.

There’s already some aggressive international elbowing over the rules of satellite operations. As with the moon, there’s no consensus yet on how to respond to aggression in Earth orbit, the head of U.S. Space Command Gen. James Dickinson told attendees at last week’s Sea Air Space conference.

“The behavior of some of our adversaries in space may surprise you,” Dickinson said. “If similar actions have been taken in other domains, they'd likely be considered provocative, aggressive, or maybe even irresponsible. And in response, the U.S. government would take corresponding actions using all levers of national power, a demarche, or a sanction or something to indicate we won't tolerate that type of behavior, but we're not quite there yet in space policy.”

In 1967, the U.N. General Assembly adopted a treaty on the use of outer space that promised cooperation and banned nuclear weapons, military maneuvers, and military installations off-planet. The agreement also requires countries to take “appropriate international consultations” before making any moves that would “cause potentially harmful interference” with other space programs, and allows countries to “request consultation” if they believe such interference is likely.

This treaty “forecasted very well” the issues that that might arise as space exploration expanded, said James Lake, a senior associate at Canyon Consulting who co-wrote an article on lunar security issues in this month’s Space Force Journal. “The question remains: is that text sufficient? That’s something we are going to find out fairly soon.”

Notably, a treaty annex that prohibits military activity on the moon went unratified by Russia, China, and the United States. It’s likely both the China-Russia and U.S.-led partnerships will begin their moon bases without any sort of agreement between them in place.

In June, the China National Space Agency and Russia’s Roscosmos announced they would begin surveying locations for their International Lunar Research Station this year, and pick a site by 2025.

In 2020, NASA, together with the nations partnering with the U.S. under the Artemis Accords, outlined its Artemis Base Camp project. The Artemis nations aim to to send astronauts back to the moon by 2024.

In addition to those two major alliances, private firms such as Blue Origin are also working on private moon bases.

But there may be only a few locations on the moon where it would make economic sense to build a base, said Bleddyn Bowen, a professor at the University of Leicester and author of War in Space: Strategy, Spacepower, Geopolitics.

“Water ice, for example, might be in limited pockets, for example, making the territories around certain craters on the polar regions, perhaps more desirable,” Bowen said.

So what happens if each decides on the same crater as the best spot to begin moon operations?

“If you have a situation like that, where you're trying to do something in the exact same spot, it’s essentially who gets there first,” said Alex Gilbert, a researcher and space resources doctoral student at the Payne Institute at the Colorado School of Mines. “And if you're not first, then the only alternative is to forcibly remove the current occupant.”

The Artemis nations have endorsed the idea of “safety zones” on the moon, to require communication between two space operations that want to operate in the same area.

“Even if you set up a base and you declare a safety zone, people can still go into that safety zone. It's just something that it's really to be used as a tool to get parties to talk to each other,” he said.

But there’s already a risk those zones will instead be used as a way to rope off sites from competitors, he said.

“One thing that is really kind of important to understand about safety zones is that everyone kind of has their own definition,” Gilbert said.

“Whoever gets there first can use the resources, but no nation can ‘claim’ the territory,” said Laura Duffy, a space systems engineer with Canyon Consulting who co-wrote “Cislunar Spacepower, The New Frontier,” with Lake with Lake in this month’s Space Force Journal.

It’s not just water, but rare earth metals and helium-3 that will be up for grabs on the moon, making a treaty for its peaceful use critical, Duffy said.

“The Moon must be available for open and free use, according to the Artemis Accords and Outer Space Treaty,” she said.

But neither Russia nor China are expected to join the Artemis Accords.

Until now, U.S. space defense has largely concentrated around the objects orbiting Earth. That changed this year, when the U.S. Space Force and U.S. Space Command were tasked with protecting U.S. assets up to 272,000 miles away, a volume called “cislunar space” that extends slightly beyond the Moon’s orbit.

They have some catching up to do, said Rep. Frank Lucas, R-Okla., the ranking member of the Science, Space and Technology Committee. Lucas believes the 2019 landing of China’s Chang'e-4 spacecraft on the far side of the moon should have been this generation’s Sputnik moment.

“But with all of the chaos in the world, and COVID-19, and all of this environment we're working in, we missed it,” he said.

Those far-side moon operations meant China had developed the technology to operate and communicate with its landed rover out of line of sight—and out of view of almost all of the U.S. ability to see what they’re doing.

The achievement allows China “to accomplish scientific, military, or other endeavors without observation or repercussion,” Duffy and Lake wrote. The authors urged that the U.S. needs to speed its monitoring efforts, such as the Cislunar Highway Patrol System, or CHPS, that is being developed by the Air Force Research Laboratory.

#### US-China war goes nuclear

Talmadge 18, Caitlin [**PoliSci PhD from MIT**, Government BA from Harvard, Prof of Security Studies at Georgetown’s Walsh School of Foreign Service.] “Beijing’s Nuclear Option.” Foreign Affairs. October 15, 2018. <https://www.foreignaffairs.com/articles/china/2018-10-15/beijings-nuclear-option> TG

As China’s power has grown in recent years, so, too, has the risk of war with the United States. Under President Xi Jinping, China has increased its political and economic pressure on Taiwan and built military installations on coral reefs in the South China Sea, fueling Washington’s fears that Chinese expansionism will threaten U.S. allies and influence in the region. U.S. destroyers have transited the Taiwan Strait, to loud protests from Beijing. American policymakers have wondered aloud whether they should send an aircraft carrier through the strait as well. Chinese fighter jets have intercepted U.S. aircraft in the skies above the South China Sea. Meanwhile, U.S. President Donald Trump has brought long-simmering economic disputes to a rolling boil.

A war between the two countries remains unlikely, but the prospect of a military confrontation—resulting, for example, from a Chinese campaign against Taiwan—no longer seems as implausible as it once did. And the odds of such a confrontation going nuclear are higher than most policymakers and analysts think.

Members of China’s strategic com­munity tend to dismiss such concerns. Likewise, U.S. studies of a potential war with China often exclude nuclear weapons from the analysis entirely, treating them as basically irrelevant to the course of a conflict. Asked about the issue in 2015, Dennis Blair, the former commander of U.S. forces in the Indo-Pacific, estimated the likelihood of a U.S.-Chinese nuclear crisis as “somewhere between nil and zero.”

This assurance is misguided. If deployed against China, the Pentagon’s preferred style of conventional warfare would be a potential recipe for nuclear escalation. Since the end of the Cold War, the United States’ signature approach to war has been simple: punch deep into enemy territory in order to rapidly knock out the opponent’s key military assets at minimal cost. But the Pentagon developed this formula in wars against Afghanistan, Iraq, Libya, and Serbia, none of which was a nuclear power.

China, by contrast, not only has nuclear weapons; it has also intermingled them with its conventional military forces, making it difficult to attack one without attacking the other. This means that a major U.S. military campaign targeting China’s conventional forces would likely also threaten its nuclear arsenal. Faced with such a threat, Chinese leaders could decide to use their nuclear weapons while they were still able to.

As U.S. and Chinese leaders navigate a relationship fraught with mutual suspicion, they must come to grips with the fact that a conventional war could skid into a nuclear confrontation. Although this risk is not high in absolute terms, its consequences for the region and the world would be devastating. As long as the United States and China continue to pursue their current grand strategies, the risk is likely to endure. This means that leaders on both sides should dispense with the illusion that they can easily fight a limited war. They should focus instead on managing or resolving the political, economic, and military tensions that might lead to a conflict in the first place.

#### AC Hertzfeld and Pace doesn’t get them out of the impact turn – it says countries have no incentive to infringe upon foreign heritage sites BUT that doesn’t speak to contestation over more desirable regions on the remaining 99% of the moon

#### 2] Independently causes space militarization

O’Donnell 19 “The Political Realities behind Establishing a Moon Base” Wes O’Donnell [Managing Editor, Edge] 2/26/2019 <https://amuedge.com/the-political-realities-behind-establishing-a-moon-base/> SM

International Conflicts May Expand to Space

No nation has placed weapons in orbit, but some advanced military nations have become dependent on space-based systems for everything from weapons targeting and navigation to intelligence collection. As nations look to establish a semi-permanent presence on the moon, conflict will become inevitable with the lunar surface having a role in how events on Earth play out. In much the same way as the Wright brothers’ plane evolved into a strategic bomber, earthly conflict will expand to spacecraft and a manned presence on the moon.

It seems far-fetched to think in these terms, but mankind has proven adept at turning many scientific achievements into weapons of war. For example, during the past 30 years, Internet access has become nearly omnipresent. But the Internet also serves as a venue for disinformation campaigns and cyberattacks.

It’s also relevant to point out that the systems that maintain human life in space would work equally well for soldiers. All of these advancements to further scientific research and maintain life aboard the International Space Station can easily be adapted to military purposes. It’s now just a matter of funding to build military space systems based on established technology.

In 1959, the U.S. Army conducted a study called Project Horizon that considered establishing a moon base with construction occurring throughout the 1960s. The formal establishment of NASA in February 1958 shelved the project. However, the study demonstrated the military’s long-held desire for a permanent space presence.

Repairing and Protecting Technological Assets in Space

With space-based systems now ubiquitous, there is a need for platforms in space to protect technological assets and repair them when necessary. That will mean having humans in space to manage these systems.

The U.S., China and Russia have the capability to shoot down satellites. Replacing these satellites would require rocket launches with replacement equipment on board.

With space-based systems, however, those assets could be repaired or replaced faster from orbiting stock or from a lunar base. From a U.S. perspective, this would save time and money. Also, it would lessen the potential impact of losing launch centers at Vandenberg AFB and Cape Canaveral in an international conflict involving missile attacks.

Militarization of the Moon

It is certainly a possibility that the moon will be militarized in some fashion. China’s questioning the limits of national sovereignty in space puts in doubt Beijing’s adherence to the 1967 Outer Space Treaty.

That treaty defines the moon as the “province of all mankind” and reserves it for peaceful purposes. But the speed with which contemporary leaders have forsaken international treaties could throw this status into doubt.

Some Chinese legal scholars, for instance, claim that the space above China, at least that which is in geosynchronous orbit, is sovereign Chinese territory. Clearly, by including anything within that geosynchronous orbit, these scholars are referring to the moon in much the same way that China makes claims to nearby territorial waters.

Currently, there is no treaty that delineates the vertical extent of a nation’s sovereignty into space. However, the Chinese claim suggests that Beijing might ignore existing international norms if they conflict with China’s interests.

The Unspoken Moon Race

The first manned mission to the moon was for the benefit “of all mankind.” Today’s extension of military affairs into space suggests that the once-peaceful endeavor of a lunar landing will eventually take on a combat dimension.

Scientific breakthroughs are currently taking the headlines and attention away from the pressing matter of preventing space-based military moves. The U.S., Russia and China have lunar missions planned into the 2030s. Whether those missions will actually take place largely depends on political will and national budgets.

A conventional conflict involving the U.S., Russia or China would be an impetus for the expansion of space-based military assets. That would make the current ventures to the moon ever more pressing during peacetime.

In essence, the current race to the moon certainly appears peaceful. But the potential to use the lunar body for war is certainly not lost on political or military leaders.

#### Unknown legal thresholds make inadvertent space escalation highly likely

MacDonald ’18 – senior director of the Nonproliferation and Arms Control Project with the Center for Conflict Analysis and Prevention, Adjunct Lecturer at Johns Hopkins School of Advanced International Studies. Bruce MacDonald, “Chapter 2. Space and Escalation” in *Outer Space; Earthly Escalation? Chinese Perspectives on Space Operations and Escalation*, A Strategic Multilayer Assessment (SMA) Periodic Publication, August 2018, <https://nsiteam.com/social/wp-content/uploads/2018/08/SMA-White-Paper_Chinese-Persepectives-on-Space_-Aug-2018.pdf>

Another dimension of the problem is the issue of the scale of the attack, both qualitatively and quantitatively. While jamming one or two satellites in isolation appears unlikely to quickly escalate into all-out space war (given the longstanding role of electronic warfare in past conflicts), attacking multiple intelligence-gathering satellites would carry a far higher risk of escalation. Somewhere between these two extremes, however, is an uncertain and unknowable boundary that divides offensive space actions that modestly threaten stability from those that are clearly destabilizing and escalatory. In this unpredictable environment, a country with no desire to spark an all-out space war may still prompt rapid escalation with modest offensive actions that inadvertently cross an unknown threshold. In addition, for technological, commercial, and other reasons the space and cyber domains are evolving far more rapidly than the conventional and nuclear domains, potentially rendering space and cyber strategies ineffective or irrelevant within a few years. In both space and cyberspace, we may learn firsthand how much escalation is too much only after it is too late to stop. Evolving space dynamics could undermine whatever current understanding we may have of crisis and strategic stability in space, and this imperfect grasp of general principles can only add to our uncertainty about the space and cyber offensive capabilities of particular adversaries. Therefore, uncertainty, bluffs, and worst-case thinking are bound to remain prominent forces in the strategic landscape of space. For example, rendezvous and proximity operations on satellites will become more common in the years to come, but they could easily be viewed in a crisis as potentially hostile acts—or in fact be used to commit hostile acts.

#### 3] Lunar basing causes collisions and space junk – independently turns the aff.

Mann 13 “Space: The Final Frontier of Environmental Disasters?” Adam Mann 7/15/2013 <https://www.wired.com/2013/07/space-environmentalism/> SM

Commercial or scientific bases on the lunar surface will need satellites for communication and navigation. Because of the moon’s size and mass, there aren’t stable orbits that hover above a certain spot analogous to the geostationary orbits around Earth. In order to provide a continuous link or GPS-like triangulation, there will need to be a constellation of satellites around the moon. Multiple satellites with multiple operators increase the chance of collision.

Unlike our planet, the moon lacks an atmosphere and it isn’t covered in oceans. This means that nothing can burn up and there’s no good way to dispose of dead satellites. The atmospheric friction that naturally drags down objects around Earth doesn't exist around the moon. And anything that is commanded to fall down to the lunar surface will remain intact until it impacts the ground, potentially hitting an astronaut or Apollo-era artifact. Mars, with its very thin atmosphere, could have similar problems with orbital debris. If nothing is done, space junk might be exported beyond low-Earth orbit, potentially endangering our exploration of other worlds.

#### Collisions cause miscalc and go nuclear.

Blatt 20 [Talia, joint concentration in Social Studies and Integrative Biology at Harvard, specialization in East Asian geopolitics and security issues] “Anti-Satellite Weapons and the Emerging Space Arms Race,” Harvard International Review, May 26, 2020, <https://hir.harvard.edu/anti-satellite-weapons-and-the-emerging-space-arms-race/> TG

Despite their deterrent functions, ASATs are more likely to provoke or exacerbate conflicts than dampen them, especially given the risk they [pose](https://thebulletin.org/2019/06/arms-control-in-outer-space-the-russian-angle-and-a-possible-way-forward/) to early warning satellites. These satellites are a crucial element of US ballistic missile defense, capable of [detecting missiles](https://www.globalsecurity.org/space/world/japan/warning.htm) immediately after launch and tracking their paths.

Suppose a US early warning satellite goes dark, or is shut down. Going dark could signal a glitch, but in a world in which other countries have ASATs, it could also signal the beginning of an attack. Without early warning satellites, the United States is much more susceptible to nuclear missiles. Given the strategy of counterforcing—[targeting](https://www.belfercenter.org/sites/default/files/files/publication/isec_a_00273_LieberPress.pdf) nuclear silos rather than populous cities to prevent a nuclear counterattack—the Americans might believe their nuclear weapons are imminently at risk. It could be [twelve hours](https://books.google.com/books?id=ET8lDwAAQBAJ&pg=PA1&lpg=PA1&dq=%22Protecting+Space+Assets%22+johnson-freese&source=bl&ots=6Oq0IdeBjw&sig=ACfU3U1G6Hj8QdP4JlCRNxA6i5XplZwHyg&hl=en&sa=X&ved=2ahUKEwj1n-jT2YzpAhUugnIEHUuMCu4Q6AEwA3oECAkQAQ#v=onepage&q=%22Protecting%20Space%20Assets%22%20johnson-freese&f=false) before the United States regains satellite function, which is too long to wait to put together a nuclear counterattack. The United States, therefore, might move to mobilize a nuclear attack against Russia or China over what might just be a piece of debris shutting off a satellite.

Additionally, accidental warfare, or strategic miscalculation, is uniquely likely in space. It is [much easier](https://books.google.com/books?id=VyXTDwAAQBAJ&pg=PA339&lpg=PA339&dq=space+offense+dominant&source=bl&ots=Mw0bgJ51qf&sig=ACfU3U3DeZiEHpr9nfszlCbJZIoyyssIpg&hl=en&sa=X&ved=2ahUKEwjrs-WD3IzpAhVulHIEHbL0AE4Q6AEwCXoECAoQAQ#v=onepage&q=space%20offense%20dominant&f=false) to hold an adversary’s space systems in jeopardy with destructive ASATs than it is to [sustainably defend](https://www.cnas.org/publications/commentary/the-us-military-should-not-be-doubling-down-on-space) a system, which is expensive and in some cases not technologically feasible because of limitations on satellite movement. Space is therefore [considered](https://books.google.com/books?id=VyXTDwAAQBAJ&pg=PA339&lpg=PA339&dq=space+offense+dominant&source=bl&ots=Mw0bgJ51qf&sig=ACfU3U3DeZiEHpr9nfszlCbJZIoyyssIpg&hl=en&sa=X&ved=2ahUKEwjrs-WD3IzpAhVulHIEHbL0AE4Q6AEwCXoECAoQAQ#v=onepage&q=space%20offense%20dominant&f=false) offense-dominant; offensive tactics like weapons development are prioritized over defensive measures, such as [improving GPS](https://www.politico.com/story/2018/04/06/outer-space-war-defense-russia-china-463067) or making satellites more resistant to jamming.

As a result, countries are left with poorly defended space systems and rely on offensive posturing, which increases the risk that their actions are perceived as aggressive and incentivizes rapid, risky counterattacks because militaries cannot rely on their spaced-based systems after first strikes.

There are several hotspots in which ASATs and offensive-dominant systems are particularly relevant. Early warning satellites [play](https://www.politico.com/story/2018/04/06/outer-space-war-defense-russia-china-463067) a central role in US readiness in the event of a conflict involving North Korea. News of North Korean missile launches comes from these satellites. Given North Korea’s [history](https://www.bbc.com/news/world-asia-pacific-11813699) of nuclear provocations, unflinchingly hostile rhetoric towards the United States and South Korea, and diplomatic opacity, North Korea is always a threatening, unknowable adversary, but recent developments have magnified the risk. With the health of Kim Jong-un [potentially in jeopardy](https://apnews.com/f5d302ae65b03838173e40848223b771), a succession battle or even civil war on the peninsula [raises the chances](https://www.express.co.uk/news/world/1273890/Kim-Jong-un-dead-North-Korea-nuclear-weapon-news-latest-death-US) of loose nukes. If the regime is terminal, traditional MAD risk calculus will become moot; with nothing to lose, North Korea would have no reason to hold back its nuclear arsenal. Or China [might decide](https://foreignpolicy.com/2020/04/28/kim-jong-un-china-north-korea/) to seize military assets and infrastructure of the regime. If the US does not have its early warning satellites because they have been taken out in an ASAT attack, the US, South Korea, and Japan are all in imminent nuclear peril, while China could be in a position to fundamentally reshape East Asian geopolitics.

The South China Sea is another hotspot in which ASATs could risk escalation. China [is developing](https://missiledefenseadvocacy.org/missile-threat-and-proliferation/todays-missile-threat/china-anti-access-area-denial-coming-soon/) Anti-Access Area Denial (A2/AD) in the South China Sea, a combination of long range radar with air and maritime defense meant to deny US freedom of navigation in the region. Given the disputed nature of territory in the South China Sea, the United States and its allies do not want China to successfully close off the region.