# 1NC

## 1

#### Interpretation: debaters must disclose all constructive positions in cite boxes on the page with their name and school on the 2021-2022 NCDA LD wiki after the round in which they read them. To clarify, they can’t say to check open source.

#### Violation:

A screenshot of a computer

Description automatically generated

#### Standards

#### [1] Depth of clash – prep becomes more convoluted when we’re forced to sift through dozens of word docs. That distracts from pre-round prep, which decreases quality of arguments and clash.

#### [2] Inclusion – people with slower computers are prone to lag, and even 3 or 4 docs can crash the program. That’s a prereq to debate.

#### Disclosing in cite boxes solves – people get a quick summary of your position and can go to OS if they need more info.

#### Voters

#### Education is a voter—it’s the only takeaway from debate

#### Access is a voter—access is k2 fairness, not everyone has a fair shot and equitable education

#### DTD—its best for setting norms

#### No RVI a] debaters will bait theory for RVI’s making LD worse b] you don’t get a cookie for being fair

#### Competing interps a] Reasonability is arbitrary and requires judge intervention b] competing interps is a race to the top for the best norms

## 2

#### Commercial asteroid mining is coming now – lower costs and improving tech make it economically viable – and the legal basis is already in place in multiple countries– that helps acquire water for rocket fuel and rare earth metals

Gilbert 21 alex gilbert, is a complex systems researcher and a PhD student in space resources at the Colorado School of Mines. "Mining in Space Is Coming." Milken Institute Review, April 26, 2021, [www.milkenreview.org/articles/mining-in-space-is-coming](http://www.milkenreview.org/articles/mining-in-space-is-coming). [Quality Control]

Space exploration is back. after decades of disappointment, a combination of better technology, falling costs and a rush of competitive energy from the private sector has put space travel front and center. indeed, many analysts (even some with their feet on the ground) believe that commercial developments in the space industry may be on the cusp of starting the largest resource rush in history: mining on the Moon, Mars and asteroids.

While this may sound fantastical, some baby steps toward the goal have already been taken. Last year, NASA awarded contracts to four companies to extract small amounts of lunar regolith by 2024, effectively beginning the era of commercial space mining. Whether this proves to be the dawn of a gigantic adjunct to mining on earth — and more immediately, a key to unlocking cost-effective space travel — will turn on the answers to a host of questions ranging from what resources can be efficiently.

As every fan of science fiction knows, the resources of the solar system appear virtually unlimited compared to those on Earth. There are whole other planets, dozens of moons, thousands of massive asteroids and millions of small ones that doubtless contain humungous quantities of materials that are scarce and very valuable (back on Earth). Visionaries including Jeff Bezos imagine heavy industry moving to space and Earth becoming a residential area. However, as entrepreneurs look to harness the riches beyond the atmosphere, access to space resources remains tangled in the realities of economics and governance.

Start with the fact that space belongs to no country, complicating traditional methods of resource allocation, property rights and trade. With limited demand for materials in space itself and the need for huge amounts of energy to return materials to Earth, creating a viable industry will turn on major advances in technology, finance and business models.

That said, there’s no grass growing under potential pioneers’ feet. Potential economic, scientific and even security benefits underlie an emerging geopolitical competition to pursue space mining. The United States is rapidly emerging as a front-runner, in part due to its ambitious Artemis Program to lead a multinational consortium back to the Moon. But it is also a leader in creating a legal infrastructure for mineral exploitation. The United States has adopted the world’s first spaceresources law, recognizing the property rights of private companies and individuals to materials gathered in space.

However, the United States is hardly alone. Luxembourg and the United Arab Emirates (you read those right) are racing to codify space-resources laws of their own, hoping to attract investment to their entrepot nations with business-friendly legal frameworks. China reportedly views space-resource development as a national priority, part of a strategy to challenge U.S. economic and security primacy in space. Meanwhile, Russia, Japan, India and the European Space Agency all harbor space-mining ambitions of their own. Governing these emerging interests is an outdated treaty framework from the Cold War. Sooner rather than later, we’ll need new agreements to facilitate private investment and ensure international cooperation.

What’s Out There

Back up for a moment. For the record, space is already being heavily exploited, because space resources include non-material assets such as orbital locations and abundant sunlight that enable satellites to provide services to Earth. Indeed, satellite-based telecommunications and global positioning systems have become indispensable infrastructure underpinning the modern economy. Mining space for materials, of course, is another matter.

In the past several decades, planetary science has confirmed what has long been suspected: celestial bodies are potential sources for dozens of natural materials that, in the right time and place, are incredibly valuable. Of these, water may be the most attractive in the near-term, because — with assistance from solar energy or nuclear fission — H2O can be split into hydrogen and oxygen to make rocket propellant, facilitating in-space refueling. So-called “rare earth” metals are also potential targets of asteroid miners intending to service Earth markets. Consisting of 17 elements, including lanthanum, neodymium, and yttrium, these critical materials (most of which are today mined in China at great environmental cost) are required for electronics. And they loom as bottlenecks in making the transition from fossil fuels to renewables backed up by battery storage.

#### However, the legal framework that strikes the best balance of providing economic incentives for mining while preventing unbeneficial land claims requires a doctrine of appropriation – the plan prevents that

Meyers 15 Meyers, Ross. J.D. candidate at the University of Oregon Law School. "The doctrine of appropriation and asteroid mining: incentivizing the private exploration and development of outer space." Or. Rev. Int'l L. 17 (2015): 183. Italics in original. [Quality Control]

The doctrine of appropriation is a reasonable rule for adjudicating asteroid claims, and it could easily be modified to apply to asteroid mining. In the context of water rights, the doctrine of appropriation requires that the claimant be a landowner in order to claim the right to use a water source. It does not make sense, however, for the international community to grant complete ownership over asteroids toa single entity, so the landowner requirement of the rule should be removed. A similar modification would need to be made to the "beneficial use" language of the doctrine.

In the context of water rights, an appropriator obtains rights only to water that he or she can reasonably put to beneficial use. The metals contained in asteroids have a high level of marketability. For that reason, a mining entity could potentially put any amount of obtained metal to beneficial use, in the sense that the resources can be sold. This, however, would defeat the purpose of the rule, which is to limit such unreasonable claims. To ameliorate this problem, the doctrine of appropriation could be modified to define "beneficial use "constructively by providing that beneficial use is assumed for any resources that have been removed from the asteroid that the mining entity can reasonably hope to transport to market in a return journey. With the astronomical cost of undertaking a trip to such an asteroid, this modification would limit mining entities to only what they can carry back, thereby leaving the untapped resources available to other entities capable of making the same trip. Considering the size and profitability of metal deposits on asteroids, this modification to the doctrine of appropriation would not be overly burdensome to corporate interests. At the same time, it would satisfy the economic imperative of promoting the rapid development of asteroid resources.

By changing the landowner requirement, and qualifying the “beneficial use" language, the doctrine of appropriation would be essentially ready for application to asteroid mining claims. The only other changes necessary would be some additional requirements that are common to other space related provisions, like those found in the Outer Space Treaty of 1968. For example, a reporting requirement or clause guaranteeing asylum for other astronauts. A functional rule might read something like this:

*State parties or private entities may, upon actual possession, lay claim to natural resources found on or below the surface of asteroids. Rights to appropriate are given in order of seniority, starting with the first party to land on the surface of the asteroid and establish control over the resources, be it water, methane, metal, or any other beneficial substances. A party will be said to have established control over a resource once he has mined the substance and removed it from the asteroid. A senior appropriator may use as much of the asteroid's resources as he can take from the asteroid and put to beneficial use, and may continue to enlarge his share until another junior appropriator begins to appropriate resources from source for beneficial use. For the purposes of this Agreement, "beneficial use “refers to the amount of resources that an appropriator has removed from the asteroid that the actor may reasonably hope to bring home in a return voyage. Resources in excess of what an appropriator can reasonably hope to transport to market in a single voyage do not qualify as having a beneficial use, and are therefore not yet claimed. This means that the extraction of metal from an asteroid does not serve to provide ownership if the appropriator plans on letting the resources languish until another voyage is undertaken to secure the resources and bring them back to Earth. Junior appropriators receive rights in the source of resources (the asteroid) as they find it, and may prevent the senior appropriator from enlarging his share to the junior appropriator’s detriment under a no-injury rule. No state party will attempt to hinder other parties from landing on or using the asteroid, and parties will assist other entities on an asteroid, should they need emergency assistance. Mining claims on asteroids will be reported to the Secretary-General of the United Nations, and state parties agree to release the location of the asteroid, and any scientific findings to the United Nations, the general public, and the scientific community. In the event that the asteroid is on a collision course with any other celestial body, all state parties agree to follow the course of action suggested by the United Nations. Should the United Nations decide the asteroid must be destroyed, no state party may claim liability for resources contained within the asteroid, but not yet captured. This provision applies only to asteroids as classified by the scientific community, and does not apply to planets, comets, meteorites, or any other celestial body not mentioned.*

There is no doubt that asteroids may be extremely beneficial to mankind, both as a source of resources and as a jumping-off point to far off locations in space. The human-race has progressed scientifically and technologically to the point that space travel is within commercial reach, and the need for new international laws governing the ownership of space has never been more apparent. The Outer Space Treaty of 1968made great strides in developing rational rules for space and many of its provisions should be maintained in their original form. However, by allowing ownership of asteroids under the doctrine of appropriation, the international community can incentivize the exploration and development of space in a way that reflects the needs of society in general, without vesting an absolute monopoly in a single entity. The doctrine of appropriation helped drive American westward expansion, and its application to space mining would help drive the human race in its expansion into the space, the final frontier.

#### Space mining is the only way to solve climate change

Duran 21, (Paloma Duran is a journalist and industry analyst at Mexico Business News, “Is Space Mining the Best Option to Face Climate Change?”), 11-03-21, Mexico Business News, https://mexicobusiness.news/mining/news/space-mining-best-option-face-climate-change // MNHS NL

Going to net zero means that more mining is needed. Experts have said that the current supply cannot support the necessary metals demand for the green transition. As a result, new mining alternatives have gained greater relevance, among them is space mining. Several countries, including Mexico, have shown their interest in this alternative, creating a new space race. “The solar system can support a billion times greater industry than we have on Earth. When you go to vastly larger scales of civilization, beyond the scale that a planet can support, then the types of things that civilization can do are incomprehensible to us … We would be able to promote healthy societies all over the world at the same time that we would be reducing the environmental burden on the Earth,” said Dr. Phil Metzger, Planetary Scientist at the University of Central Florida. Currently, there are several attempts to address global warming and transition to a net zero carbon economy. There has been an increasing interest in renewable energy and infrastructure, which has increased demand for various minerals, especially lithium, cobalt, nickel, copper and rare earth elements. However, according to experts, the world is close to entering a metals supercycle, where demand will exceed available supply, causing prices to skyrocket. Consequently, the mining industry has sought alternatives to achieve the required supply. Options include recycling and improved mine waste management, sea mining and space mining. The latter is considered one of the alternatives with the greatest potential. However, a regulatory framework is still lacking and there is almost no experience in this regard. Despite the lack of knowledge regarding space mining, it has become a very attractive option since the planet is running out of resources. While some people believe that land-based mining is cheaper than space mining, experts believe this may change in the long term. Furthermore, within the solar system there are countless bodies rich in minerals, ores and elements that will accelerate the fight against climate change. “There will come a point when there is nothing left to mine on the surface, prompting mines to reach even further below. But even those resources are destined to run out and so we will aim toward ocean mining, which already has specific technologies that are being developed. Nevertheless, even those mines are limited as well. The mine of the future, which today may seem unlikely, will no longer be on our planet. There will be a time when space mining will be as common as an open leach mine,” Eder Lugo, Minerals Head at Siemens, told MBN. More than 150 million asteroids measuring approximately 100m are believed to be in the inner solar system alone. In addition, astronomers have also identified abundant minerals near the Earth’s space and the Main Asteroid Belt. There are three main groups into which asteroids are divided: C- type, S- type, and M- type. The last two groups are the most abundant in minerals such as gold, platinum, cobalt, zinc, tin, lead, indium, silver, copper and rare earth metals. "Energy is limited here. Within just a few hundred years, you will have to cover all of the landmass of Earth in solar cells. So, what are you going to do? Well, what I think you are going to do is you are going to move out in space … all of our heavy industry will be moved off-planet and Earth will be zoned residential and light-industrial,” said Jeff Bezos, Founder of Amazon and the Space Launch Provider Blue Origin.

#### Extinction – key tipping points are SOON

Ahmed 19 (Ahmed, Nafeez. “'High Likelihood of Human Civilization Coming to an End' in 2050, New Report Suggests.” VICE, 3 June 2019, [https://www.vice.com/en/article/597kpd/new-report-suggests-high-likelihood-of-human-civilization-coming-to-an-end-in-2050. [Nafeez Mosaddeq Ahmed is a British investigative journalist, author and academic. He is editor of the crowdfunded investigative journalism platform INSURGE intelligence. He is a former environment blogger for The Guardian from March 2013 to July 2014.])//LK](https://www.vice.com/en/article/597kpd/new-report-suggests-high-likelihood-of-human-civilization-coming-to-an-end-in-2050.%20%5bNafeez%20Mosaddeq%20Ahmed%20is%20a%20British%20investigative%20journalist,%20author%20and%20academic.%20He%20is%20editor%20of%20the%20crowdfunded%20investigative%20journalism%20platform%20INSURGE%20intelligence.%20He%20is%20a%20former%20environment%20blogger%20for%20The%20Guardian%20from%20March%202013%20to%20July%202014.%5d)//LK) [Accessed 11/30/21]

A harrowing scenario analysis of how human civilization might collapse in coming decades due to climate change has been endorsed by a former Australian defense chief and senior royal navy commander. The analysis, published by the Breakthrough National Centre for Climate Restoration, a think-tank in Melbourne, Australia, describes climate change as “a near- to mid-term existential threat to human civilization” and sets out a plausible scenario of where business-as-usual could lead over the next 30 years. The paper argues that the potentially “extremely serious outcomes” of climate-related security threats are often far more probable than conventionally assumed, but almost impossible to quantify because they “fall outside the human experience of the last thousand years.” On our current trajectory, the report warns, “planetary and human systems [are] reaching a ‘point of no return’ by mid-century, in which the prospect of a largely uninhabitable Earth leads to the breakdown of nations and the international order.” The only way to avoid the risks of this scenario is what the report describes as “akin in scale to the World War II emergency mobilization”—but this time focused on rapidly building out a zero-emissions industrial system to set in train the restoration of a safe climate. The scenario warns that our current trajectory will likely lock in at least 3 degrees Celsius (C) of global heating, which in turn could trigger further amplifying feedbacks unleashing further warming. This would drive the accelerating collapse of key ecosystems “including coral reef systems, the Amazon rainforest and in the Arctic.” The results would be devastating. Some one billion people would be forced to attempt to relocate from unlivable conditions, and two billion would face scarcity of water supplies. Agriculture would collapse in the sub-tropics, and food production would suffer dramatically worldwide. The internal cohesion of nation-states like the US and China would unravel. “Even for 2°C of warming, more than a billion people may need to be relocated and in high-end scenarios, the scale of destruction is beyond our capacity to model with a high likelihood of human civilization coming to an end,” the report notes. The new policy briefing is written by David Spratt, Breakthrough’s research director and Ian Dunlop, a former senior executive of Royal Dutch Shell who previously chaired the Australian Coal Association. Read More: Scientists Warn the UN of Capitalism's Imminent Demise In the briefing’s foreword, retired Admiral Chris Barrie—Chief of the Australian Defence Force from 1998 to 2002 and former Deputy Chief of the Australian Navy—commends the paper for laying “bare the unvarnished truth about the desperate situation humans, and our planet, are in, painting a disturbing picture of the real possibility that human life on Earth may be on the way to extinction, in the most horrible way.” Barrie now works for the Climate Change Institute at Australian National University, Canberra. Spratt told Motherboard that a key reason the risks are not understood is that “much knowledge produced for policymakers is too conservative. Because the risks are now existential, a new approach to climate and security risk assessment is required using scenario analysis.” Last October, Motherboard reported on scientific evidence that the UN’s summary report for government policymakers on climate change—whose findings were widely recognized as “devastating”—were in fact too optimistic. While the Breakthrough scenario sets out some of the more ‘high end’ risk possibilities, it is often not possible to meaningfully quantify their probabilities. As a result, the authors emphasize that conventional risk approaches tend to downplay worst-case scenarios despite their plausibility. Spratt and Dunlop’s 2050 scenario illustrates how easy it could be to end up in an accelerating runaway climate scenario which would lead to a largely uninhabitable planet within just a few decades. “A high-end 2050 scenario finds a world in social breakdown and outright chaos,” said Spratt. “But a short window of opportunity exists for an emergency, global mobilization of resources, in which the logistical and planning experiences of the national security sector could play a valuable role.”

## 4

#### CP Text: States ought to eliminate nuclear arsenals.

#### It results in a zero-treaty—solves prolif, rearm, and process concerns.

Koplow 14

[David, Professor of Law, Georgetown University Law Center “What Would Zero Look Like Look Like? A Treaty for the Abolition of Nuclear Treaty for the Abolition of Nuclear Weapons” 45 Geo. J. Int'l L. 683-781 (2014) // ishan]

Negotiators and drafters of the instruments designed to pursue nuclear disarmament will be compelled to confront a daunting array of challenges. Several of these choice-points are identified in multiple footnotes attached to the Zero Agreement and Zero Treaty in the subsequent sections of this article, but a few are so important and complex that further textual elaboration is required. This section will first describe the eleven characteristics necessary for an adequate elimination regime and will then continue by illuminating the critical problems of: (a) the definition of "zero"; (b) verification and enforcement of compliance; (c) timing and the negotiating process; and (d) collateral measures. A. Key Characteristics for a Valid Elimination Process Just as important as clarifying what the documents will attempt to incorporate is the articulation of what they will not undertake to do. In particular, the enterprise is decidedly not about "unilateral" or "immediate" disarmament, despite the (sometimes deliberate) mischaracter izations that too often proliferate.' 3 " Instead, the following provides a list of eleven key characteristics that a valid nuclear weapons elimination process must possess; it comprises the metrics against which the feasibility and acceptability of a new treaty package would have to be judged and is reflected in the preambles of the draft documents in Parts IV and V. 1. Global. A zero-agreement regime would ultimately have to be universal, covering (with varying degrees of intensity based upon the potential non-compliance risk they present) all countries and all physical environments in the world. Obviously, the states possessing nuclear weapons, as well as the states with advanced civil nuclear industries (and therefore the latent capacity to produce nuclear weapons relatively quickly), would have to be early participants. In addition, almost any country (as well as the high seas, outer space, and other locations outside the jurisdiction of any state) could potentially serve as a site for clandestine evasions of the treaty. Therefore, all would have to be subject, within some reasonable time period, to inclusion in the verification and enforcement regime. The various states need not participate immediately or in an equal or identical fashion, but proponents of abolition have repeatedly stressed that getting to zero will have to be a fully multilateral "joint enterprise." 3 5

## 5

#### NASA’s stuck in low orbit but the space race lets it extend further. Julie 21

Alyssa Julie, 12-9-2021, "How the private space race is allowing NASA to explore new frontiers ," Global News, <https://globalnews.ca/news/8408558/how-the-private-space-race-is-allowing-nasa-to-explore-new-frontiers/>, //hzheng

In February, NASA will launch the first un-crewed test flight of its Orion spacecraft and SLS rocket as it prepares to send astronauts back to the moon. Artemis I is the first in a series of increasingly complex missions to take place over the next few years. It will be followed by a second crewed test flight and a third flight that will land astronauts on the moon’s south-pole. NASA expects that will be in 2025, at the earliest. The agency says partnerships with private companies like SpaceX will build the lunar lander to ferry astronauts to the moon’s surface, making the Artemis program possible. The private space race has allowed NASA, and agencies like it, to turn their attention from Earth’s lower orbit and start planning for future missions, like Artemis. And as the agency plans to send astronauts to new frontiers, it is encouraging private industry to establish a greater presence in lower-Earth orbit — by collaborating with the private sector on a new space station. The International Space Station is now more than 20 years old, approved for use until 2024, with a likely extension only until the end of 2028 or 2030. NASA’s office of audits released a report at the start of December detailing the “costly repairs” to the orbiting laboratory that have been needed over time. It said maintenance and system upgrades to the ISS increased to approximately $169 billion in 2020. On Dec. 3, NASA announced three U.S. Companies that would receive over $400 million in government funding to develop commercial space stations — Jeff Bezos’ Blue Origin, Nanoracks and Northrop Grumman. Misty Snopkowski, Program Executive for the commercial LEO development program at NASA, says commercial stations, like the one’s these three companies are developing, will help the agency travel deeper into space. “We’re trying to go deeper into space and we can give this very well understood environment in LEO to commercial entities — for them to start establishing that LEO economy,” she says, adding that instead of owner and operator of a new space station, NASA would be one of many customers using the orbiting laboratory. With less of its funding tied up in the International Space Station, the agency will be free to throw more cash at deep space exploration, Snopkowski says. But there is still research that needs to be done in order to make these frontier missions possible. She says the agency has approximately 200 long-term experiments, most of which study the impact of space travel on the human body. The agency needs that work to continue after the International Space Station is decommissioned. “Those types of research, human research, [have] long lead times,” she explains. Such research not only helps further NASA’s ambitions in space, it is also helps us tackle big challenges on Earth, says York University astrophysicist Jesse Rogerson. “Going to the moon and going to Mars is going to push our understanding of how to do agriculture,” he says, as an example of how research in space can help us improve conditions on Earth. “Because we can’t do a permanent settlement on the moon or Mars without ‘living off the land.’ So pushing that science to the very edge so that we can grow something on Mars would inevitably help us do better on Earth.” Canadian astronaut Jeremy Hansen, who acts as CAPCOM at the Canadian Space Agency while he awaits his first flight assignment, says his agency is also involved in discussions about a future commercial space station. In addition to freeing-up funding for future deep space travel, he says such a partnership could reveal new ways to save money on research. “The space agency, we expect, will always be doing research in orbit. But the model on how we do that could change, could create more opportunities and could allow us to do more for less money,” he says. Hansen adds that collaborating with private industry will create more opportunities for astronauts to explore space, a boon for the Canadian Space Agency, whose astronauts have had to wait years to go to space as they wait for a seat to open on a mission. One upcoming mission Canada is taking part in will be Artemis II, the crewed test of the Orion spacecraft that will eventually transport astronauts to the moon. The private space race will also create more opportunities for scientists and astronomers hoping to conduct research in space, Rogerson adds.

#### We need to get off the rock – diversification ensures isolated populations prevent extinction and bolsters tech that mitigates existential threats. Reuter 21

Timothy Reuter (Head of Aerospace and Drones, World Economic Forum), 12-9-2021, "Why the human race must become a multiplanetary species," World Economic Forum, <https://www.weforum.org/agenda/2021/12/humans-multiplanetary-species/>, //hzheng

Supporters of space exploration sometimes suggest that sending robotic probes to the remote corners of the solar system and beyond can teach us what we need to know about the universe at less cost and risk than sending people. Yet, for the safety of our descendants and to reach humanity’s full potential, we must become a multiplanetary species. Humans have a one in six chance of going extinct this century according to Oxford Philosopher Toby Ord. In his book, The Precipice: Existential Risk and the Future of Humanity, Dr Ord lays out a variety of long-tail risks that are both existential and very difficult to mitigate. These include nature-based risks like asteroids, large-scale volcanic eruptions and stellar explosions. Although we can track many of these phenomena, we do not have the technology (nor are we likely to develop it anytime soon) to prevent large eruptions or redirect large asteroids. Initial efforts to nudge space objects are just beginning. This is to say nothing of the human-created risks of nuclear war or bioweapons intentionally or unintentionally released on the public, a scenario made easier to imagine by the current pandemic. As long as humanity is grouped together on a single planet there will always be a possibility that all of us can be killed at once. It is equivalent to having everyone in a single building: there is always a risk greater than zero of a collapse or fire that kills everyone. By establishing, at first, small outposts and eventually larger scale settlements on other planets, the risk of our species being destroyed is significantly curtailed. On a more positive note, human habitation in a greater variety of settings will radically expedite science and commerce. While we currently have small-scale experimentation with manufacturing items in micro and zero gravity on the International Space Station, the potential for us to set up large-scale industry in different physics requires us to have a presence on other celestial locations. Large-scale settlements of people are hubs of innovation and human flourishing. Just think of how many more discoveries and marvels could be created by 80 billion people in the future instead of today’s 8 billion. Our current planet has a limited carrying capacity but our solar system can accommodate many more people than any single planet can. Just as cultural and geographic variety contributes to the richness of our current society, further expanding the diversity of human settings would continue to expand the creativity of our species. Space travel itself has already been an incredible inspiration to numerous scientists, engineers and artists with many people citing seeing the moon landing as one of the most formative events of their lives. The technologies we develop on our way to becoming a multiplanetary species will also benefit us here on earth. Today, satellites are used to monitor carbon and other greenhouse gas emissions to give us a better picture of the causes of global warming and promote accountability. In her first speech devoted to space, US Vice-President Kalama Harris said: “I truly believe space activity is climate action.” In a recent report, the World Economic Forum's Global Future Council on Space laid out the many ways satellite data is being used to address climate change and suggests feeding data from space-based assets into an “Earth Operations Centre” to provide a real-time picture of activities and phenomena that contribute to warming. Less well known are the many other technologies developed on our way to space but used in our daily lives. The CMOS sensor was first invented at NASA’s Jet Propulsion Laboratory in the 1990s. No one could have predicted that this technology would eventually be part of all our phones, enabling high-quality digital images and affecting everything from how we document human rights abuses to how we present ourselves to potential mates on dating apps.

# Case