# Cap-&-Trade CP

#### [ROJ & Tichnor-Wagner] I negate. The Role of the Judge is to Promote Critical Global Education, or learning that helps students resist harm on an international scale.

Tichnor-Wagner: Tichnor-Wagner, Ph.D., Ariel. [Senior Fellow of Global Competence, ASCD] “Why Global Education Matters.” ASCD.org, March 8, 2018. CH

A group of second grade students huddle around their teacher as she reads Eight Days: A Story of Haiti. Down the hall, fourth grade math students are busy dissecting news articles to find real-world statistics that illustrate the human toll of the refugee crisis in Europe. Up the street at a nearby high school, students in science class are putting together a visual informational display about the Zika virus that illuminates the disease’s origins, transmission, global impact, surrounding policy debates, and social stigma. What do these students in the midst of reading, math, and science lessons have in common? They are engaged in global learning. At its core, global learning is about facilitating educational experiences that allow students to appreciate diverse perspectives, understand the connections they have to the wider world, respectively and effectively communicate and collaborate across cultures and countries, and use disciplinary and interdisciplinary knowledge to investigate and take action on issues that matter to them and the wider world. Global learning should not be an “extra” or “nice-to-have” course that only a handful of students can take, nor should it be relegated to a fun project the last few weeks of school. Why? Global issues and perspectives can easily be integrated as a lens for teaching any and all content areas. Furthermore, global learning can lead to the following holistic student outcomes that lead to academic success and overall well-being. Student Engagement. Research shows that when students learn content through authentic tasks and real-world experiences, they are more likely to engage, which in turn leads to higher attendance and achievement. Global education directly engages students with real-world issues and activities. What better way to entice students to practice Spanish than have them Skype with peers in Mexico, or to teach the skills of writing an argumentative essay by having them debate global current events pulled straight from the headlines? College and Career Readiness. Our economy is global, with over 40 million U.S. jobs tied to international trade. Employers today are desperate to higher graduates with cross-cultural skills that allow them to work in diverse teams and with clients all over the world. By providing students with opportunities to understand the wider world and the diversity of people, cultures, and perspectives in it, schools are also giving students a competitive edge in the marketplace. Social-Emotional Learning. Learning from and with the world doesn’t only benefit students’ academic development, but contributes to their social-emotional development as well. Global education helps develop self-awareness of one’s own identity, culture, beliefs and how those connect with the wider world, social awareness including empathy, perspective-taking, appreciating diversity, and respecting others, and relationship-building skills with diverse individuals and groups through effective communication and collaboration. Student Empowerment. Global learning enables students with agency to take purposeful action to improve their own lives and to positively influence the world around them. When students are provided opportunities to investigate issues they deem important (be it gun violence, access to clean water, or human rights violations), unpack why these issues exist, and come up with solutions to make them better, they become empowered to be the catalysts of the changes they wish to see. As numerous teachers and school administrators implementing global education initiatives I have worked with attest, once you open the door for students to take action, you will be amazed at the fundraisers, campaigns, projects, programs, and protests they will devise on their own to make the world a better place. Global education is an effective way to support students’ holistic academic, social, and emotional development. Teachers, school leaders, and community members all have a role to play in leading global initiatives that turn classrooms and schools into windows to the world. ASCD is here to help educators with resources to turn this global education vision into an everyday reality for each and every student.

#### [ROB & Flynn] The Role of the Ballot is to Endorse Exposure of Racism – i.e., to reward the debater with the better means of unmasking the harm, a bottom-up political strategy.

**Flynn:** Flynn, Molly. [University of North Carolina at Charlotte; Contributor, Study Breaks] “Covert Racism: How to Spot It and Stop It.” StudyBreaks.com, January 2017. CH

**If your white friend likes to remind you that they have a black friend after using offensive racial slurs, it’s a good sign that they are casually racist**. If they hate diversity conversations and say that racism doesn’t exist, they sound like the exact people who’ve prompted me to write this article. **These people, these covert racists, live among us. But rather than wear their racism on their swastika-cladded sleeves, they’re more discrete about it and attempt to disguise it. So, how do we unveil the bigots in sheep’s** clothing? Typically, it’s a lot easier to spot a covert racist than you might think. Recently, I was able to meet one of my own. I work in retail and I get to meet a plethora of beautiful people every single day. My job entails talking to people who a lot of times are the absolute worst, but I, like the coverts, have to disguise my true feelings when interacting with a jackass. And the worst type of jackass is the racist one. Last week, a lady and her two daughters came into my store. Like any other customer, I treated them with excitement and gratitude that they were stopping by. After a few minutes of shopping, my associate prepared a fitting room for this family. Right around the same time another manager in the store, Kayla, returned from break. She was working on reorganizing some things around the store and found her way to the fitting room. The lady had her door open and her two daughters were in the hallway. When Kayla entered the room, the lady quickly hushed her kids, shot a death glare at Kayla and told her daughters to quickly come back in while she slammed the door shut. This struck Kayla as very odd. This family had not treated any of the other staff in the same way but then again, Kayla was the only black associate they had interacted with. Before jumping to any conclusions, we decided to assume that maybe this mother was just startled that someone had entered the fitting room. But the attendant had been entering the fitting room frequently along with many other customers to whom she did not react as ostentatiously. Regardless, Kayla and I continued about our business and maintained an environment of acceptance for this family. However, Bigoted Brenda and her clan of two were not finished with their racist display. Whenever they completed their shopping and continued to the register, the cashier asked them who helped them. Shamelessly, she referred to my Mexican-American associate as the “not-American one.” What?? Did she really just call her the NOT American one? As she spoke those words, my mouth genuinely opened in a disbelieving gape. This confirmed to me that her previous act had been conducted with the same level of ignorance and racism that it took to claim that because my associate had brown skin, she was not American. And during it all, she maintained a pretentious smile and was so condescendingly polite. These are a few tells of covert racism. But, there are many other ways someone can display their biases in a nonchalant and inconspicuous way and not all are fueled by hatred, just ignorance. A few years ago, I was driving around with my aunt. As we were crossing through the parking lot, a family crossed the street in front of us. My aunt kindly said, “ That little black girl is so pretty.” This was a fairly innocent comment about the cutest little kid either of us had seen in a while, but why was race even mentioned? This was the only family in the parking lot a part from us and a racial indicator was completely irrelevant. I asked my aunt, “If she was a white girl, would you have mentioned her race?” This started a very engaging conversation between us about how we interact with races different than our own. As pure as the intention was to this comment, it still registers on the covert racism scale. But hey, not as high as people who pretend to be [colorblind](http://www.teenvogue.com/story/trevor-noah-shuts-down-tomi-lahren-on-her-racist-comments-about-black-lives-matter), so I can at least appreciate my aunt for that. **While spotting covert racism might not be too difficult, dealing with it sometimes is. Especially because when people wrap up their racism in pretty packaging, they think they** a**re actually doing the world a favor.** So, now that we’ve sheered the sheep and uncovered the bigots, what do we do? It depends on context. Remember Bigoted Brenda? Well, because I was in my place of employment, I had to keep my mouth shut. But, her level of ignorance in any other environment would’ve encouraged me to very directly call her out. I tend to be confrontational about things I that feel are injustices, so I would have gladly asked her, “Who exactly are you referring to as not-American? Oh, the one who looks different than you? What does it mean then to be American? Also, where does your next KKK meeting take place, ya little shit?!” But again, context is very important. Like how my aunt and I were able to analyze why race was mentioned and like how my coworker and I were able to talk about why she calls security any time a black person comes into the store. There are existing threads of racism that still pump through the veins of the American conscious, and while we may not be able to cut every single one, we can at least confront them and acknowledge them. **Through mindful assessment, we can make changes to** not only the biases people around us possess, but also the **biases we** ourselves **possess. When we commit to divulging discrimination that’s intended to be shrouded with euphemism, we** will start not just combating covert racists but converting them**.** While Bigoted Brenda infects the world with smiley-faced hatefulness, you don’t have to sit by and listen. Whether it’s your neighbor, your coworker or even a family member, call out covert racism when you hear it and please, let your buddies know that having a token black friend does not permit them to claim racism is dead.

## A. Text

#### [Trapp 1] Instead of banning private space appropriation [OR: affirming], states should set up a cap-and-trade system. This entails:

**A] imposing a global limit on allowable space debris;**

**B] regularly recalculating that limit; and**

**C] creating a database to track all space objects.**

**Trapp 1:** Trapp, Timothy Justin. [J.D., University of Illinois Urbana-Champaign School of Law; tax associate] “Taking Up Space By Any Other Means: Coming to Terms with the Nonappropriation Article of the Outer Space Treaty.” *University of Illinois Law Review*, Vol. 2013, No. 4, August 2013. https://www.illinoislawreview.org/wp-content/ilr-content/articles/2013/4/Trapp.pdf JP/CH

**To effectively combat** the **space debris** problem**, a cap-and-trade system should be set up** that will both be effective and withstand scrutiny under the nonappropriation article of the Outer Space Treaty**. As such, an international regulatory agency should be created to serve two functions: first,** the agency should **impose an international limit to** the addition of **debris and** should then **apportion** these **allowances to nations based on their current use of space. The total allowable debris addition should be recalculated yearly based on the state of the space environment**, and individual allowances should also be recalculated annually to account for changes in the abilities and needs of different nations**.** Second, the agency should allot specific LEO area orbital trajectories, such as the ITU allots GEO orbital slots.294 Though this will be more difficult than allocating GEO slots, since those slots appear stationary while LEO orbital paths are constantly in motion, it can be done. **First, an international electronic database should be produced which tracks** the current location of **all space objects registered in the Space Object Registry, which should include all spacecraft** launched into space. It should also record, to the greatest extent possible, the location and trajectory of any debris. **This database should be updated daily** to represent the most accurate portrayal of the location and trajectory of space objects by the nations responsible for those space objects. Second, this database should be used to calculate predictions of where spacecraft will be in the future, and LEO orbital slots should be defined both in time and space, as opposed to being defined purely by location. This may seem difficult, but it is actually made quite simple by the use of computers. Though these calculations will become less accurate over longer periods of time, the constant updating of the database will allow these predictions to be constantly updated as well, so that they will be accurate for at least the immediate future. When a nation applies for a trajectory slot, the agency should only allocate that slot if it can be entered into and sustained for a certain amount of time without requiring a trajectory modification of any other spacecraft. **With a workable allocation system in place, the agency should be in conformity with the nonappropriation article of the Outer Space Treaty.** To ensure this, it is important that, in allocating slots, both the interests of current space-faring nations, as well as those without the capability to get into space, are provided for. To do so, the agency should only allow actual physical entry into trajectory slots to those who comport with the cap-and-trade regime, while allowing claims to such slots to all nations, on bases similar to those of the ITU.299 This will ensure that this agency will not run into some of the problems that the ITU did when it began.300 In doing this, the agency will be comporting to the ideal that space be preserved for all mankind. **Furthermore, since the purpose of the agency would be to mitigate the debris problem, its purpose would be ensuring future access to space**. This, in connection to the fact that this is an international agency responding proportionately to an international problem,301 will allow the agency to withstand scrutiny under the nonappropriation article of the Outer Space Treaty.302

## B. Competition

#### [Competition] It’s mutually exclusive – private entities can still appropriate outer space under the CP, but can’t under the aff – makes perms impossible.

## C. Solvency

#### [Trapp 2] WE SOLVE 100% OF THE AFF – the CP follows the Outer Space Treaty’s ban on state appropriation, but doesn’t let private entities pollute.

**Trapp 2:** Trapp, Timothy Justin. [J.D., University of Illinois Urbana-Champaign School of Law; tax associate] “Taking Up Space By Any Other Means: Coming to Terms with the Nonappropriation Article of the Outer Space Treaty.” *University of Illinois Law Review*, Vol. 2013, No. 4, August 2013. https://www.illinoislawreview.org/wp-content/ilr-content/articles/2013/4/Trapp.pdf JP/CH

Space debris poses a threat to future open access to the space environment. Without some sort of action, the problem will continue to escalate, putting at risk the sustainability of the space around our planet. **An international regulatory authority that operated under the U.N. to institute a cap-and-trade regulation system and to allocate LEO orbital trajectories is the best way to curb** the **space debris** problem **while staying within the** mandate of the **nonappropriation article of the O**uter **S**pace **T**reaty**. The allotment of trajectories would ensure that everyone has fair access to the resource, as well as facilitate the reduction of** space **debris caused by** collision.3 A cap-and-trade system would make sure that the proliferation of further debris is curbed, as well as incentivize actors to contribute to cleaning up the space resource. Since **such an agency would operate under** the authority of **the U.N.,** it would be of an international character, similar to the ITU. Moreover, since the purpose of the regulation would be to curb the space debris problem, it would fall directly in line with the principle of ensuring continued access to the space resource for all mankind.308 Final**ly, since the regulation would benefit** those **nations currently acting in space as well as those who will explore space in the future, without unduly favoring one or the other as some have claimed the ITU allocation procedures have done, it** i**s a proportional response to an international** concern. Thus, the suggested system represents the best way to handle the debris problem without effecting a prohibited appropriation of space.

## Extra

#### [Trapp] STATE-LED APPROPRIATION IS INFINITELY WORSE THAN PRIVATE APPROPRIATION – MASSIVELY INCREASES VIOLENCE.

**Trapp:** Trapp, Timothy Justin. [J.D., University of Illinois Urbana-Champaign School of Law; tax associate] “Taking Up Space By Any Other Means: Coming to Terms with the Nonappropriation Article of the Outer Space Treaty.” *University of Illinois Law Review*, Vol. 2013, No. 4, August 2013. https://www.illinoislawreview.org/wp-content/ilr-content/articles/2013/4/Trapp.pdf JP/CH

In general, nations have appropriated areas by some sort of physical ceremony, such as establishing colonies or planting a flag.167 There have been no decent standards set up, however, for determining whose claim was superior in instances in which claims competed.168 Instead, these claims would only survive if they were backed up by military power, and the superior claim would belong to the victor of the struggle over the disputed territory.169 From this, it is clear that any nation which tried to exclude other nations from any portion of space through use of force would be considered to have appropriated, or at least attempted to appropriate, that portion of space, and it would be prohibited from doing so.170 In fact, there is a good chance that the possibility of such a scenario, multiplied by the number of interested parties in space, helped to inspire the drafters of the Outer Space Treaty to include the nonappropriation article.171 Also, the classical version of property law gives dominion to the owner of an article of land from the center of the earth to the reaches of the heavens.172 While this presents obvious problems for objects in LEO, which move over large amounts of landspace very quickly and thus would go through many different parcels of property,173 it seems like it could be applied to objects in geostationary orbit, since they stay over one piece of land indefinitely.174 If this were the case, would countries that lie under the orbit of a geostationary satellite already have claim to that area that predated the Outer Space Treaty, or would they be subject to having satellites hanging over them against their wills?

With a workable allocation system in place, the agency should be in conformity with the nonappropriation article of the Outer Space Treaty. To ensure this, it is important that, in allocating slots, both the interests of current space-faring nations, as well as those without the capability to get into space, are provided for. To do so, the agency should only allow actual physical entry into trajectory slots to those who comport with the cap-and-trade regime, while allowing claims to such slots to all nations, on bases similar to those of the ITU.299 This will ensure that this agency will not run into some of the problems that the ITU did when it began.300 In doing this, the agency will be comporting to the ideal that space be preserved for all mankind. Furthermore, since the purpose of the agency would be to mitigate the debris problem, its purpose would be ensuring future access to space. This, in connection to the fact that this is an international agency responding proportionately to an international problem,301 will allow the agency to withstand scrutiny under the nonappropriation article of the Outer Space Treaty.302

# Asteroid Mining DA

#### [Gilbert 21] Asteroid mining is starting now. New legal frameworks and massive investments bring it closer than you think-but we need to focus on maintaining progress.

**Gilbert 21:** Alex Gilbert, 4-26-2021, "Mining in Space Is Coming," Milken Institute Review, https://www.milkenreview.org/articles/mining-in-space-is-coming//SJJK

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](https://payneinstitute.mines.edu/wp-content/uploads/sites/149/2020/09/Payne-Institute-Commentary-The-Era-of-Commercial-Space-Mining-Begins.pdf). 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](https://www.fastcompany.com/90347364/jeff-bezos-wants-to-save-earth-by-moving-industry-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](https://nationalinterest.org/feature/geostrategic-importance-outer-space-resources-154746) 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](https://issues.org/new-policies-needed-to-advance-space-mining/) to facilitate private investment and ensure international cooperation.

#### [Myers 16] Prohibitions on appropriation prevent asteroid mining despite growing space industries

**Myers 16:** Ross Myers (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, 2016, Oregon Review of International Law, https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/19850/Meyers.pdf?sequence=1

Despite a decrease in national space program funding, corporate space missions are on the rise. In 2010, President Obama proposed that NASA exit the business of flying astronauts from Earth to low Earth orbit and move it to private companies.52 Several companies have stepped up to bat, and corporate space programs now include space tourism, supply missions, and in one case a one-way colonization mission to Mars.53 Corporate interest in space tourism and development demonstrates a strong private commercial interest in space as an industry, which could serve to finance the exploration of space in a period where national governments do not have an active financial interest in space. However, under current international treaties, the ownership of asteroids is prohibited, preventing corporations willing to invest in asteroid mining from having a secure claim.

Relegating at least some mining companies to near-Earth asteroids would reduce the negative effects of future mining levels on Earth. The economic benefits of mining need not be sacrificed for the sake of the environment.38

#### [Reich 22] Prohibitions on appropriation prevent asteroid mining despite growing space industries

**Reich 22:** Aaron Reich, 1-6-2022, "Asteroids can destroy the Earth, asteroid mining can help save it," The Jerusalem Post | JPost, https://www.jpost.com/science/article-691731//SJJK

An asteroid impact has the potential to cause worldwide cataclysms and extinction-level events, but they could be mined as an alternative to heavily polluting mining on Earth. [Asteroids](https://www.jpost.com/tags/asteroid) make up one of the most numerous types of objects in the solar system. Currently, 1,113,527 asteroids are known to exist in the solar system, according to NASA, but those are just the ones definitively identified, with experts always finding more. These large space rocks vary in size, some less than a meter wide, others stretching several kilometers. Some of these just orbit around the sun, never approaching anything else. Others skirt dangerously close to planets, including several close brushes with our own planet – and on a few occasions, actually hitting us, causing an impact event. These impacts are incredibly destructive and have the potential to be the cause of major catastrophes, destroying cities, continents or even a global disaster. The destructive nature of asteroids, even small ones, is something well known to experts, with space agencies around the world monitoring for potential catastrophic impacts, as well as researching potential means of identifying them and stopping them. It is something that has also long permeated the realm of popular culture, whether it be from now classic films like Armageddon or the very recent Don’t Look Up. BUT ASTEROIDS are not necessarily just the harbingers of destruction we have long considered them. Rather, they may just be able to help save the Earth. Asteroids are, essentially, rocky remnants of the formation of the solar system. Sometimes called minor planets, these rocks are made of various materials and minerals from those early days. Billions of years ago, many of these asteroids are thought to have collided together to eventually form planets, and the minerals and materials support this. So what kinds of minerals could we find on asteroids? According to the Weizmann Institute of Science’s Dr. David Polishook, who is also a member of [NASA’s Double Asteroid Redirection Test (DART) Mission](https://www.jpost.com/science/nasas-iron-dome-dart-takes-off-to-test-asteroid-deflection-686826) which seeks to test asteroid deflection in order to avert an impact, there are three categories we need to care about. First, he told the Magazine, there are strong metals, such as iron and nickel. These are relatively common on Earth and can be used in a variety of applications. Second, there are the rarer metals such as platinum and iridium. These minerals are very rare and extremely expensive. As such, there is definitely a profit to be made by bringing these to Earth. The third isn’t a mineral exactly but is still something extremely important: water. “Yes, the same H2O we all drink,” Polishook clarified. This itself isn’t unsurprising. Scientists have long known water and ice to be present on various asteroids throughout the solar system. In fact, it is commonly theorized that asteroid impacts are what ended up bringing water to Earth in the first place. The scientific community is well aware of the potential value of this field, as while the collective mass of asteroids may not seem like much compared to a planet – indeed, according to NASA, the combined mass of all asteroids in the asteroid belt between Mars and Jupiter is actually less than the Earth’s Moon – they are still filled with valuable materials in extremely high quantities. Indeed, there is even a large resurgence in asteroid exploration in recent years. Several recent missions have already been launched to bring back samples of asteroids. These include the Hayabusa and Hayabusa2 missions from the Japan Aerospace Exploration Agency (JAXA) and NASA’s ongoing Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) mission. Hayabusa managed to bring back a sample from 25143 Itokawa, Hayabusa2 brought back a sample from [162173 Ryugu](https://www.jpost.com/science/article-689341) and OSIRIS-REx is currently bringing back a sample from [101955 Bennu](https://www.jpost.com/health-science/will-500-meter-asteroid-bennu-hit-earth-in-next-century-nasa-investigates-676537). Interest hasn’t waned either. In October, NASA launched its latest probe, known as [Lucy](https://www.jpost.com/science/nasa-to-launch-first-space-probe-to-study-jupiters-trojan-asteroids-682158), to study Trojan asteroids near Jupiter in a first-of-its-kind mission. Later, NASA plans to send a probe to [16 Psyche](https://www.jpost.com/health-science/what-is-a-10000-quadrillion-asteroid-the-size-of-cyprus-really-made-of-676243), a massive asteroid 227 kilometers in diameter – longer than the maximum length of Cyprus – rich in iron and nickel that was once believed to be worth around $10 quintillion, which is more valuable than the entire global economy, though this exact value is still up for debate. Even the United Arab Emirates, coming off the success of its recent Mars mission, is planning to [land a spacecraft on an asteroid](https://www.jpost.com/science/uae-to-launch-mission-to-explore-venus-land-on-asteroid-681622). Ostensibly, these missions are less about mining and more about scientific curiosity, as asteroids hold keys to understanding the formation of the solar system and, by extension, our very planet. However, that is not to say asteroid mining has not generated interest elsewhere. In fact, there are already laws on the books about it. Asteroid mining is specifically mentioned in the United Nations-mediated Outer Space Treaty, signed by over 100 countries worldwide, and some countries like Luxembourg have already legislated local laws about it. Economically, there are other benefits to this as well. “Mining materials rare on Earth could make the miner rich,” Polishook explained, comparing it to the boom of the 19th-century California gold rush. Yes, launching mining missions to asteroids is expensive, but the returns could be worth it. Especially since asteroids have materials there that astronauts could use. This includes water, which can be used for drinking, creating oxygen for astronauts to breathe, or creating hydrogen for spacecraft to use as fuel. It could also be possible to mine a certain type of helium isotope known as helium 3. A thin layer of this light material that originates from the Sun can be found on the surface of any atmosphere-less body, including asteroids, and it could be possible to turn this into energy through nuclear fission. In other words, economically, the cost of these missions could be negligible. There is also great interest in identifying asteroids that would be prime targets for these missions, with many prioritizing large and close-by asteroids. One website, the asteroid value database [Asterank](https://www.asterank.com/), has even begun estimating the value of various asteroids as well as the estimated profit of these missions. Right now, according to Asterank, a number of asteroids are valued over $100 trillion, but in terms of cost-effectiveness, the most profitable is Ryugu, with an estimated value of $82.76 billion and an estimated profit of $30.08b. Another ideal target, though much more difficult, is Ceres, the largest asteroid in the asteroid belt, with a diameter of around 980 kilometers – in fact, it is so large that, according to some scientists, it should actually be considered a planet in its own right – which is rich in ice water. This could serve as an ideal hub of sorts for these mining missions. HOWEVER, THERE are obstacles in the way of asteroid mining succeeding. According to Polishook, there are three major obstacles in the way. “First, identifying the composition of an asteroid using a telescope and determining if it is rich with water, iron or platinum is still not straightforward. This is especially true for platinum, which was only recognized in meteorites that reached the Earth. It is only reasonable you can find these in asteroids, since meteors come from asteroids, but platinum was never seen in them before. “A close look at an asteroid using a spacecraft can identify these materials, but one can’t send thousands of probes to thousands of asteroids to look for platinum while keeping their budget balanced,” he explained. “Second, reaching the relevant asteroid is also a challenge, though it has been done before. To do this commercially, you will have to invest much more in R&D for your vehicles and equipment. “Third, digging in an asteroid or dismantling it or vaporizing it and carefully collecting the ore you need, whether platinum or even water, is not an easy task when you need to work in zero-gravity,” he added. “While it is a lot of material to sift, these bodies are not large enough to have a strong gravity of their own. Thus, you cannot land on them or stand on them and mine. The miners, whether humans or robots, will have to hook themselves in some way to the surface in order to work while the asteroid rotates at a few hours per circle.” And it isn’t as though NASA hasn’t tried to do this before. “Some years ago, NASA developed a tool to capture an asteroid, but with these many hard-to-solve technological issues, this tool became relevant to only lift a 2-meter-wide rock from an asteroid surface, and eventually this program was canceled. So, objectively, this issue is hard to solve,” Polishook said. Even the promise of helium 3 isn’t enough, because while it is theoretically possible to turn it into energy through nuclear fission, scientists currently have no way or even an idea of how to actually do this, putting it firmly in the realm of science fiction at the moment. Despite their further planned asteroid missions, Polishook doesn’t think NASA or other national space agencies will get into mining operations in the near future – they have enough on their plate as it is, he said. Most likely, asteroid mining would fall into the realm of the private sector. However, people have already tried and have paid the price.