

COSMIC BONANZA

MINING IN OUTER SPACE

ARTICLE BY

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Is an end to scarcity in sight? American companies are preparing to tap a vast source of raw materials on celestial bodies. But space mining is also a source of conflict, as the global commons of outer space are being enclosed, repeating patterns of appropriation of our own planet's resources.

For the genuine pioneering spirit, America is still the place to be. In 2015, President Obama signed a space mining bill into law. Under the Space Resource Exploration and Utilization Act, American companies can get permission to mine raw materials on planets, moons, and other celestial bodies. The act guarantees that companies actually own the materials they dig there.



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GRONDSTOFFEN UIT DE RUIMTE

Nu Amerikaanse bedrijven zich opmaken voor mijnbouw in de ruimte, ontstaan er conflicten over de privatisering van dit mondiale gemeengoed.

The *Space Act* came into effect after a lobby of enterprises focused their activities on space mining. These companies bear names such as *Moon Express*, *Planetary Resources*, and *Deep Space Industries*. They develop spacecraft and robots for unmanned mining missions and are backed by investors with deep pockets. Google's billionaire co-founder Larry Page, for example, is one of the financiers of Planetary Resources.

Frontrunner in the race to space is Moon Express. In 2016, the American administration granted the company permission for the first commercial landing on the Moon. This lunar exploration mission is planned for 2017. In ten years' time, Moon Express wants to be able to bring raw materials such as metals back to Earth and sell them.

Other space miners look towards asteroids, the numerous lumps made up of rocks and metals orbiting the Sun. Some of these asteroids get close to Earth during their orbit. High concentrations of metals thinly sown in the Earth's crust, like platinum, can be found at their surface.

An asteroid with a 100-metre diameter may contain billions of Euros worth of precious metals. The gravitational pull of these planetoids is negligible, offering an advantage over the Moon: much less fuel is needed for soft landings and take-offs.

Following the US, the United Arab Emirates and Luxembourg are working on space mining legislation. Both countries are looking for new business models now that fossil fuels and tax evasion are on the way out. In 2016, the Luxembourg government announced it would allocate two hundred million Euros for the development of space mining technology. Deep Space Industries and Planetary Resources decided to set up a branch in the grand duchy in order not only to acquire government funding, but gain legitimacy as well. That is to say, the American Space Act is controversial.

TRAGEDY

The only ‘constitution’ that pertains to space is the 1967 *Outer Space Treaty*. This UN treaty states that space and all its celestial bodies are the province of all mankind and bans countries from appropriating them. The American Space Act appears to be at odds with this treaty. How can a country grant ownership of an asteroid’s resources to a company, if the country doesn’t own the asteroid?

In 2016, the Space Act was strongly criticised within the legal subcommittee of the UN Committee for the Peaceful Uses of Outer Space. Russia stated that all resources in space fell under the non-appropriation clause and called the American act unacceptable. Belgium adopted the same stance as well. National legislation was not the solution for the lack of international rules, the Belgian representative said. “Do we really want a situation of ‘first come, first served’, whereby some countries lay their hands on the resources while others are left with the crumbs?”

“The problem is that the Outer Space Treaty neither forbids nor allows the appropriation of resources”, says Tanja Masson-Zwaan, who teaches space law at Leiden University. “Alongside the ban on the appropriation of celestial bodies, there is another provision: countries have the freedom to use space. I, myself, infer from this that the Space Act is not in contravention of the Outer Space Treaty. Indeed, with this act, the US lives up to an essential condition in the treaty: private activities in space require the approval and the supervision of a state.”

Proponents of the Space Act often draw an analogy with fishing in international waters. Even if no one owns the high seas, each country is allowed to catch fish. Likewise, every country should be free to mine raw materials in space. But this is a misplaced comparison,

according to space expert Erik Laan. “Free fishery has led to overfishing and fishing wars. Eventually, countries have been compelled to set up numerous fishing treaties. Don’t forget that fish are a renewable natural resource: if you don’t catch too many fish, stocks will remain stable. Raw materials in space on the other hand are not renewable: what you take away cannot be replenished. I would prefer to compare space to the deep seabed.”

Since 1994, the mining of minerals in the seabed below international waters has been supervised by the International Seabed Authority. It gives out licences to companies and has to ensure that all countries benefit from the proceeds. Although plans for deep sea mining met with resistance from environmentalists, the part of the United Nations Convention on the Law of the Sea (UNCLOS), which called the International Seabed Authority into being, bears witness to progressive thinking. It incorporates the principle of the ‘common heritage of mankind’. This implies that global commons, such as the seabed, cannot be anyone’s property and should be managed by the international community; the proceeds have to be shared by all countries and the commons must be passed on to future generations in good condition. All of this is in a bid to prevent a ‘tragedy of the commons’, whereby the collective resources are exhausted as a result of overexploitation.

FAIR SHARE

One would wish there were such a treaty for space. In fact, there is one, but it has remained a dead letter. The 1979 Moon Treaty identifies the Moon and all other celestial bodies as the common heritage of mankind. It contains an explicit ban on the appropriation of resources. It requires an ‘international regime’ to be set up for the management of the resources and sharing of the benefits. But the space powers, such as the US and Russia, recoiled from this fair share deal. They didn’t sign the Moon Treaty. Only sixteen countries, including the Netherlands, Belgium, and Austria, have ratified it.

“With its poor backing, the Moon Treaty cannot be seen as part of international customary law. It is only binding for the countries who are party to it”, says Tanja Masson-Zwaan. “The Netherlands is trying to reanimate the treaty, but is looking for alternatives at the same time. That is why we have founded the *The Hague Space Resources Governance Working Group*, alongside universities, governments, space mining companies, and one NGO. Jointly, we are trying to formulate building blocks for international rules on space mining. Those rules can later be laid down in a new treaty, but in non-binding guidelines as well. If enough countries embed such guidelines in their laws, they can acquire the status of binding international customary law. Even the US government may be open to

discussion. It agreed that the UN space committee put space mining on the agenda for 2017 as a separate item.”

CONFLICTS

Even undaunted optimists expect it will take another ten years before space mining is a reality. There is yet sufficient time

to formulate international rules, both Masson and Laan assert. But the history of the International Seabed Authority shows that time is running out, argues Bas Eickhout, a Dutch Green Member of the European Parliament. “It took twenty-five years before the world community agreed on the Seabed Authority. The US still does not recognise its powers. We must prevent space from becoming a new divisive issue in world politics. That is why I have asked the European Commission to work towards a moratorium on space mining. Such a moratorium is already in place for Antarctica.”

Doesn't the abundance of resources in space make it pointless to quarrel about them? In 2014, the American astrophysicist Martin Elvis published some eye-opening maths. On the basis of the size, composition and orbit of known asteroids, he estimated that there are only ten near-Earth asteroids on which the mining of platinum and related metals might be profitable.

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“That number of ten is a lower limit”, Laan explains. “More and more, asteroids are being discovered. But there is every reason to fear conflict. One lucrative asteroid best reached from Earth may give rise to competition. If two governments give out licences to two companies to mine the same asteroid, you have a conflict in space, which can only be prevented by international rules.”

In addition to the property aspect of outer space mining, other issues need to be clarified, Eickhout says. “How can we prevent celestial bodies from being infected with earthly microbes? Who cleans up the space debris if accidents occur? Are mining companies allowed to change the orbit of an asteroid to get it closer to Earth? Let us beware of a cosmic gold rush. After all, the most urgent problems on Earth, such as climate change, will not be solved by space mining.”

SCARCITY

An all too firm belief in space mining might take a wrong turn for Earth, were mankind to declare the end to scarcity prematurely. In a leaked 2013 video, Deep Space Industries asserts: “Our world is at its limits and

yet, we all want more. And why not? Our tiny planet sits in a vast sea of resources.” Will space mining become an excuse for the continuation of a wasteful Western lifestyle?

“We must indeed be careful with such marketing stories,” Laan believes. “Meanwhile, Deep Space Industries admits it will not be bringing raw materials to Earth. The resources in space are mainly going to be used in space itself.”

The costs involved in launching matter into space from the Earth are steep. With the energy it takes to escape the Earth’s gravity, millions of kilometres can be covered in space. That is why it is appealing to build spacecraft and space stations in space, using off-world metals. Fuel for spacecraft can be produced in space as well, out of water found on asteroids and with the use of sunlight. As yet, that is where the biggest opportunities lie for space miners.

In the short run, Laan suspects, only rhodium is valuable enough to be asteroid-mined and taken to Earth. “That could be feasible in ten years’ time. This platinum-like metal is very rare in the Earth’s crust and hard to mine. It has numerous valuable applications, in *clean-tech* among other fields. The price of rhodium once peaked at 200,000 Euros per kilogramme.”

INSURANCE

In the 2014 science-fiction film *Interstellar*, space travel has come to lie idle, what with the tremendous burden it imposes on the Earth’s already exhausted resources. That is not an attractive scenario. Even if we cannot solve scarcity with it, space mining opens up an interesting perspective: a space sector that is self-supporting in materials and energy.

The exploration of space provides valuable knowledge about the origin of the universe, the Earth and life. In addition, space travel is an insurance policy should our planet become uninhabitable. This might not only be brought about by humans, but also by a meteorite hitting Earth or a supervolcano erupting. By spreading across our galaxy, we can at least protect part of future generations, both people and other species, from cosmic catastrophe. If we find that a worthwhile goal, can we allow ourselves to reject mining in space – provided rules are in place to prevent both a tragedy and an enclosure of the cosmic commons? Or do we resign ourselves to the fact that Shakespeare’s works and the theory of relativity, friendship, and love, will all one day be lost?



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GLOSSARY

RAW MATERIALS FROM SPACE

During the formation of planet Earth, gravity pulled many metals to its core. These are only found sporadically in the Earth's crust. However, on many asteroids these metals lie at the surface. These so-called metallic asteroids – once the cores of celestial bodies that have fallen apart – largely consist of metal. Other asteroids are rich in water, in the form of ice, which is found on the Moon, too.

PRECIOUS METALS

Asteroid mining corporations have set their eyes on platinum and related metals such as palladium and rhodium, which are rare on Earth and costly. Platinum metals are used in catalysts and electronics.

BASE METALS

Metals such as iron and zinc coming from asteroids can be used in the construction of spacecraft and space stations. When the recoverable stock of these metals on Earth is depleted – zinc reserves could be exhausted by 2100 – it may be profitable to transport them to Earth.

WATER

Water extracted in space stays in space: as drinking water for astronauts and for growing crops. With the use of solar panels water can be split up into hydrogen and oxygen. Thus creating fuel for spacecraft.