

Issue Overview: Space mining

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An image mosaic of the asteroid Eros, with sunlight coming from the northeast, taken by the robotic NEAR Shoemaker space probe on March 3, 2000, from a distance of 204 kilometers (127 miles).

Swirling through the cosmos are thousands of extraordinarily valuable rocks. At least, that's the theory: Asteroids, known to science since 1801, have lately become a potential money-maker. At least two companies plan to mine asteroids near Earth for precious metals, and many scientists think their resources could be key to future space travel. Yet who would rightfully own them is an open question under international law. Plenty of skeptics think the whole idea is just ridiculous.

The Situation

In August 2015, the number of near-Earth asteroids topped 13,000, with an average of three more being confirmed every day. The month before, a spacecraft built by Planetary Resources took off from the International Space Station on a mission to test the instruments and software needed for a robotic mining expedition. Many asteroids are rich in water and precious metals, notably platinum, an important ingredient in everything from dental equipment to cellphones.

NASA is planning its own mission to visit an asteroid and bring rocks back home. The U.S. Congress has passed a law that lets companies own the resources they extract in outer space. The U.S. Federal Aviation Administration also has been quietly encouraging aerospace companies that want to make money from the universe.

Peter Diamandis, a co-founder of Planetary Resources, estimates that a single asteroid 30 meters in diameter could yield \$50 billion of platinum, and there are thousands that are larger. In 10 years, the company hopes to have produced its first liter of extraterrestrial water. Deep Space Industries, a competitor, says it plans to use 3-D printing to build a zero-gravity manufacturing plant. In space, as in Silicon Valley, exaggeration is not unknown.

The Background

Asteroid mining is a fairly old idea. The Russian physicist Konstantin Tsiolkovsky proposed something similar in 1903 as part of a plan to develop space. More than a century of science fiction writers, from Jules Verne to Antoine de Saint-Exupery, wrote about different variations on that idea. As the Space Age dawned in the 1960s, asteroid mining gained more real-world supporters – President Lyndon Johnson was reportedly an enthusiast – and scientists proposed a series of mining schemes. Some were practical and some were otherwise.

More recently, rocket technology has improved, satellite parts have grown cheaper and asteroid research has progressed. Commercial mining has inched closer to reality. In the near future, it might have larger scientific benefits than economic ones, by making human space travel more feasible. The water on asteroids could theoretically be used as a propellant and as shielding to absorb space radiation. It could also be used for hydration, although you probably do not want to be the first to drink it, or to fuel communications satellites.

The Argument

According to some, all this adds up to a trillion-dollar industry in the making, while for others it is a galactic mistake. A recent study by a Harvard University astrophysicist concluded that a grand total of 10 near-Earth asteroids would be worth even trying to mine. Most are either too small, too far away or too barren to make the mission economically practical. The mining companies, unsurprisingly, dispute that estimate.

Other obstacles abound. Asteroids have different surface conditions, unstable interiors and hardly any gravity, so mining them will require new technology. Bringing back huge amounts of platinum could drive its market price down and likely reduce profits for mining companies. Plus, it all might well be illegal. International treaties clearly prohibit the taking of territory in outer space. However, they are not very clear about the legality of extracting natural resources or who owns any valuables dug up. That is one question, among many, that still requires an earthly answer.

Quiz

- 1 The central idea of the article is developed by:
- (A) debating the legality of mining natural resources from asteroids in space
 - (B) criticizing experts who oppose asteroid mining
 - (C) discussing the economic and scientific benefits of asteroid mining
 - (D) emphasizing the need for better technology so that asteroids can be mined

- 2 What is the relationship between the following selections from the article?

Many asteroids are rich in water and precious metals, notably platinum, an important ingredient in everything from dental equipment to cellphones.

Most are either too small, too far away or too barren to make the mission economically practical.

- (A) The first selection introduces an incentive for asteroid mining to counteract the significant financial expense described in the second selection.
 - (B) The first selection describes the potential value of asteroid mining, while the second selection implies that further research is needed.
 - (C) The first selection explains why companies want to mine asteroids and the second selection provides evidence of the feasibility of the process.
 - (D) The first selection supports an argument for asteroid mining, while the second selection introduces evidence to support an argument against it.
- 3 Which of the following options BEST describes the government's reaction to private companies mining asteroids for profit?
- (A) It has sanctioned the development of advanced technology to support efforts to mine asteroids.
 - (B) It has incentivized mining asteroids by creating legislation that gives companies ownership over the resources they extract in space.
 - (C) It has actively encouraged NASA, a public organization, to increase its efforts to mine asteroids for public profit.
 - (D) It has developed new legislation to explicitly protect the natural resources in outer space from private ownership.

- 4 Which of the following groups would MOST likely support the argument that asteroid mining is an investment with significant return?
- (A) Congress, because it would increase U.S. ownership over natural resources in outer space
 - (B) mining companies, because it would drive down the market prices of platinum
 - (C) scientists, because it would advance the efficiency and feasibility of human space travel
 - (D) Harvard University, because 10 near-Earth asteroids would have a large yield of resources