

## Mining asteroids: Going platinum Worksheet

### A Before you read

Discuss these questions. Use your dictionary or other resources, if necessary.

1. What is an asteroid?
2. Where are asteroids?
3. Many businesses use rare metals like platinum in manufacturing. Are these rare metals becoming cheaper or more expensive?

### B Gist comprehension

Read the complete article quickly. Choose the best summary below.

1. James Cameron plans to make a film about travelling to asteroids to collect rare metals, like platinum. Many famous people have invested their money in this film project.
2. Scientists believe that asteroids contain rare metals. They believe we could collect these rare metals bring them back to Earth, but nobody is interested in investing money in this project.
3. Planetary Resources, a company supported by many famous business people, plans to launch space telescopes which will search for asteroids which could be mined for rare metals.
4. James Cameron and the bosses of Google plan to launch space telescopes to look for metal rich NEAs which may destroy the Earth.

### C Vocabulary

Choose the correct option to complete the sentences below. Look carefully at the words in *italics*. Use your dictionary and the context of the text to help you. The numbers in square brackets indicate the paragraph where to can find the word.

- 1) A *bonkers* idea is ... [headline]
  - a) a crazy idea.
  - b) an imaginative idea.
  - c) a good business idea.
- 2) Can France *trump* Brazil in the World Cup? [1]
  - a) play against
  - b) beat
  - c) eliminate
- 3) A *cast-list* is ... [2]
  - a) the shareholders in a business.
  - b) the list of actors in a play or film.
  - c) the directors of a business.

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- 4) *A pie in the sky* is ... [3]
  - a) food which falls from space.
  - b) an idea which you dream about.
  - c) a type of space rocket.
- 5) *Rubble* is ... [3]
  - a) rock which contains valuable metals.
  - b) a mixture of different gases.
  - c) the waste material left after a building or other object has been broken.
- 6) Where do you *dwell*? [4]
  - a) work
  - b) live
  - c) go
- 7) We can communicate easily *courtesy of* emails. [5]
  - a) thanks to
  - b) with respect
  - c) by using
- 8) Hand waving is ... [6]
  - a) a call for help.
  - b) a welcome.
  - c) a way to clean your hands.
- 9) All the delegates at the conference received a bag of *goodies*. [7]
  - a) gifts
  - b) documents
  - c) candies
- 10) The *feasibility* study ... [8]
  - a) showed that the project was impossible.
  - b) showed that the project would be unpopular.
  - c) showed that the project had been completed.
- 11) It would need to be capitalised *to the tune of* \$100 billion. [8]
  - a) to the sound of
  - b) to the music of
  - c) to the amount of
- 12) A *venture capitalist* ... [9]
  - a) is a scientist who makes new things.
  - b) is a government official.
  - c) is an investor in new businesses.

## D Detailed comprehension

Read each paragraph carefully. Mark these statements TRUE or FALSE.

- 1) An asteroid was hovering over the Museum of Flight on April 24<sup>th</sup>. T/F
- 2) The backers of Planetary Resources include a film director, space and software engineers. T/F

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- 3) Many asteroids were formed after planets collided with each other. T/F
- 4) Asteroids are piles of rubble on Mars and Jupiter. T/F
- 5) In 2014, Planetary Resources plans to put telescopes on an asteroid. T/F
- 6) Ten years later, they will send rockets to examine the asteroids. T/F
- 7) The company will either mine the asteroids in their current orbit or move them into orbit around the earth. T/F
- 8) They will have to invent robots which can refine the metals in space. T/F
- 9) If they succeed, the price of these rare metals will increase. T/F

## E Initials

Match the initials of people and companies mentioned in the text with their roles and write their full names in the table.

Initials	Role	Full name
SA	a founder of PR	
PR	asked for feasibility study	
PD	Chairman of Google	
PA & BR	Chief Executive of Google	
LP	film director	
KISS	offers private space flights	
JC	owner of SA	
ES	passengers on first private space flight	
EA	will get metals from asteroids	
CS	Worked on Microsoft Office	

## F Follow up discussion

Think about people investing in Planetary Resources. Discuss the questions below.

- 1) Is the project going to be expensive?
- 2) How long will the project take?
- 3) Do they know if it will succeed?
- 4) What will happen to platinum prices if they succeed?
- 5) Are they likely to earn a fortune?

Would YOU invest in Planetary Resources? Why? Why not?

## Mining asteroids Going platinum

### Mining metals from asteroids seems a bonkers idea. But could it work?

From *The Economist* print edition 28<sup>th</sup> April 2012

- 1) Can reality trump art? That was the question hovering over the launch on April 24th, at the Museum of Flight in Seattle, of a plan by a firm called Planetary Resources to mine metals from asteroids and bring them back to Earth.
- 2) It sounds like the plot of a film by James Cameron—and, appropriately, Mr Cameron is indeed one of the company's backers. The team behind the firm, however, claim they are not joking. The company's founders are Peter Diamandis, instigator of the X Prize, awarded in 2004 to Paul Allen and Burt Rutan for the first private space flight, and Eric Anderson, another of whose companies, Space Adventures, has already shot seven tourists into orbit. Larry Page and Eric Schmidt, respectively the chief executive and the chairman of Google, are also involved. So, too, is Charles Symonyi, the engineer who oversaw the creation of Microsoft's Office software (and who has been into space twice courtesy of Mr Anderson's firm). With a cast-list like that, it is at least polite to take them seriously.
- 3) As pies in the sky go, some asteroids do look pretty tasty. A lot are unconsolidated piles of rubble left over from the beginning of the solar system. Many, though, are pieces of small planets that bashed into each other over the past few billion years. These, in particular, will be high on Planetary Resources' shopping list because the planet-forming processes of mineral-melting and subsequent stratification into core, mantle and crust will have sorted their contents in ways that can concentrate valuable materials into exploitable ores. On Earth, for example, platinum and its allied elements, though rare at the surface, are reckoned more common in the planet's metal-rich core. The same was probably true of the planets shattered to make asteroids. Indeed, the discovery of a layer of iridium-rich rock (iridium being one of platinum's relatives) was the first sign geologists found of the asteroid impact that is believed to have killed the dinosaurs.
- 4) Most asteroids dwell between the orbits of Mars and Jupiter. But enough of them, known as near-Earth asteroids, or NEAs, come within interplanetary spitting distance of humanity for it to be worth investigating them as sources of minerals—if, of course, that can be done economically.

### First catch your hare

- 5) The first thing is to locate a likely prospect. At the moment, about 9,000 NEAs are known, most of them courtesy of ground-based programmes looking for bodies that might one day hit Earth. That catalogue is a good start, but Planetary Resources plans to go further. In 2014 it intends to launch, at a cost of a few million dollars, a set of small space telescopes whose purpose will be to seek out asteroids which are easy to get to and whose orbits return them to the vicinity of Earth often enough for the accumulated spoils of a mining operation to be downloaded at frequent intervals.

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- 6) That bit should not be too difficult. But the next phase will be tougher. In just over a decade, when a set of suitable targets has been identified, the firm plans to send a second wave of spacecraft out to take a closer look at what has been found. This is a significantly bigger challenge than getting a few telescopes into orbit. It is still, though, conceivable using existing technology. It is after this that the handwaving really starts.
- 7) Broadly, there are two ways to get the goodies back to Earth. The first is to attempt to mine a large NEA in its existing orbit, dropping off a payload every time it passes by. That is the reason for the search for asteroids with appropriate orbits. This approach will, however, require intelligent robots which can work by themselves for years, digging and processing the desirable material. The other way of doing things is for the company to retrieve smaller asteroids, put them into orbit around Earth or the moon, and then dissect them at its leisure. But that limits the value of the haul and risks a catastrophic impact if something goes wrong while the asteroid is being manoeuvred.
- 8) Either way, the expense involved promises to be out of this world. A recent feasibility study for the Keck Institute for Space Studies reckoned that the retrieval of a single 500-tonne asteroid to the moon would cost more than \$2.5 billion. Earlier research suggested that, to have any chance of success, an asteroid-mining venture would need to be capitalised to the tune of \$100 billion. Moreover, a host of new technologies will be required, including more-powerful solar panels, electric-ion engines, extraterrestrial mining equipment and robotic refineries.
- 9) All of which can, no doubt, be done if enough money and ingenuity are applied to the project. But the real doubt over this sort of enterprise is not the supply, but the demand. Platinum, iridium and the rest are expensive precisely because they are rare. Make them common, by digging them out of the heart of a shattered planet, and they will become cheap. The most important members of the team, then, may not be the entrepreneurs and venture capitalists who put up the drive and the money, nor the engineers who build the hardware that makes it all possible, but the economists who try to work out the effect on the price of platinum when a mountain of the stuff arrives from outer space.

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## Teacher's Notes & Key

The article is written in a colloquial style even though it is about a serious scientific topic. Focus the comprehension on the risks involved in venture capital as well as the scientific information.

It might be necessary to explain two idiomatic phrases:

*Pie in the sky* refers to a pie imagined whilst feeling hungry, but the phrase is most frequently used to refer to a ridiculous, unachievable ambition.

*First catch your hare* refers to a famous old recipe book. It includes a recipe for cooking a hare, an animal like a large rabbit. The recipe begins "First catch your hare."

## Key

- A Open answers
- B Best summary (3).
- C 1a, 2b, 3b, 4b, 5c, 6b, 7a, 8a, 9a, 10a, 11c
- D 1F, 2T, 3T, 4F, 5F, 6T, 7T, 8T, 9F.
- E

Initials	Role	Full name
PD	a founder of PR	Peter Diamandis
KISS	asked for feasibility study	Keck Institute for Space Studies
ES	Chairman of Google	Eric Schmidt
LP	Chief Executive of Google	Larry Page
JC	film director	James Cameron
SA	offers private space flights	Spaces Adventures
EA	owner of SA	Eric Anderson
PA & BR	passengers on first private space flight	Paul Allen and Burt Ratan
PR	will get metals from asteroids	Planetary Resources
CS	Worked on Microsoft Office	Charles Symonyi

- F Open answers