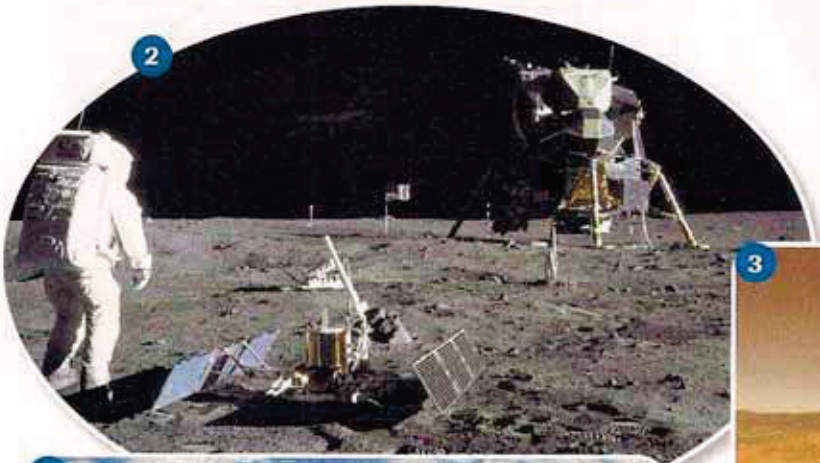
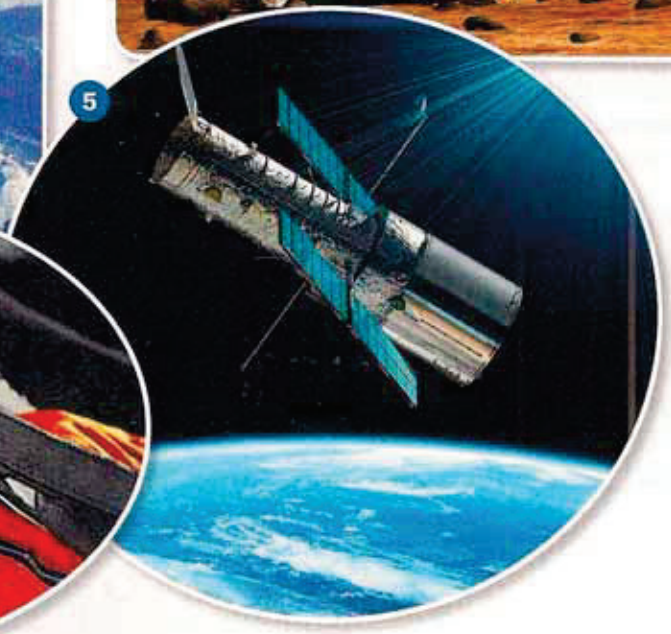
# Unit 8 Across the universe

## Starting off

1. What aspect of space exploration does each of these photos show?
2. What importance has each of them had for humanity?




## Reading Section 3

**1** **Work in small groups. You are going to read a passage about an international charity called the Earth and Space Foundation. First discuss this question.**

What are the advantages of international collaboration in space exploration?

**2** **Quickly glance through this section to see what types of questions you will have to answer.**

**3** **Before you deal with the questions, spend two minutes skimming the passage to get an overview of the type of passage and its contents. When you have finished, compare your ideas with a partner.**

# The Earth and Space Foundation

The community that focuses its efforts on the exploration of space has largely been different from the community focused on the study and protection of the Earth's environment, despite the fact that both fields of interest involve what might be referred to as 'scientific exploration'. The reason for this dichotomous existence is chiefly historical. The exploration of the Earth has been occurring over many centuries, and the institutions created to do it are often very different from those founded in the second part of the 20th century to explore space. This separation is also caused by the fact that space exploration has attracted experts from mainly non-biological disciplines – primarily engineers and physicists – but the study of Earth and its environment is a domain heavily populated by biologists.

The separation between the two communities is often reflected in attitudes. In the environmental community, it is not uncommon for space exploration to be regarded as a waste of money, distracting governments from solving major environmental problems here at home. In the space exploration community, it is not uncommon for environmentalists to be regarded as introspective people who divert attention from the more expansive visions of the exploration of space – the 'new frontier'. These perceptions can also be negative in consequence because the full potential of both communities can be realised better when they work together to solve problems. For example, those involved in space exploration can provide the satellites to monitor the Earth's fragile environments, and environmentalists can provide information on the survival of life in extreme environments.

In the sense that Earth and space exploration both stem from the same human drive to understand our environment and our place within it, there is no reason for the split to exist. A more accurate view of Earth and space exploration is to see them as a continuum of exploration with many interconnected and mutually beneficial links. The Earth and Space Foundation, a registered charity, was established for the purposes of fostering such links through field research and by direct practical action.

Projects that have been supported by the Foundation include environmental projects using technologies resulting from space exploration: satellite communications, GPS, remote sensing, advanced materials and power sources. For example, in places where people are faced with destruction of the forests on which their livelihood depends, rather than rejecting economic progress and trying to save the forests on their intrinsic merit, another approach is to enhance the value of the forests – although these schemes must be carefully assessed to be successful. In the past, the Foundation provided a grant to a group of expeditions that used remote sensing to plan eco-tourism routes in the forests of Guatemala, thus providing capital to the local communities through the tourist trade. This novel approach is now making the protection of the forests a sensible economic decision.

The Foundation funds expeditions making astronomical observations from remote, difficult-to-access Earth locations, archaeological field projects studying the development of early civilisations that made significant contributions to astronomy and space sciences, and field expeditions studying the way in which views of the astronomical environment shaped the nature of past civilisations. A part of Syria – 'the Fertile Crescent' – was the birthplace of astronomy, accountancy, animal domestication and many other fundamental developments of human civilisation. The Foundation helped fund a large archaeology project by the Society for Syrian Archaeology at the University of California, Los Angeles, in collaboration with the Syrian government that used GPS and satellite imagery to locate mounds,

or 'tels', containing artefacts and remnants of early civilisations. These collections are being used to build a better picture of the nature of the civilisations that gave birth to astronomy.

Field research also applies the Earth's environmental and biological resources to the human exploration and settlement of space. This may include the use of remote environments on Earth, as well as physiological and psychological studies in harsh environments. In one research project, the Foundation provided a grant to an international caving expedition to study the psychology of explorers subjected to long-term isolation in caves in Mexico. The psychometric tests on the cavers were used to enhance US astronaut selection criteria by the NASA Johnson Space Center.

Space-like environments on Earth help us understand how to operate in the space environment or help us characterise extraterrestrial environments for future scientific research. In the Arctic, a 24-kilometre-wide impact crater formed by an asteroid or comet 23 million years ago has become home to a Mars-analogue programme. The Foundation helped fund the NASA Haughton–Mars Project to use this crater to test communications and exploration technologies in preparation for the human exploration of Mars. The crater, which sits in high Arctic permafrost, provides an excellent replica of the physical processes occurring on Mars, a permafrosted, impact-altered planet. Geologists and biologists can work at the site to help understand how impact craters shape the geological characteristics and possibly biological potential of Mars.

In addition to its fieldwork and scientific activities, the Foundation has award programmes. These include a series of awards for the future human exploration of Mars, a location with a diverse set of exploration challenges. The awards will honour a number of 'firsts' on Mars that include landing on the surface, undertaking an overland expedition to the Martian South Pole, undertaking an overland expedition to the Martian North Pole, climbing Olympus Mons, the highest mountain in the solar system, and descending to the bottom of Valles Marineris, the deepest canyon on Mars. The Foundation will offer awards for expeditions further out in the solar system once these Mars awards have been claimed. Together, they demonstrate that the programme really has no boundary in what it could eventually support, and they provide longevity for the objectives of the Foundation.

*adapted from* Fostering links between environmental and space exploration: The Earth and Space Foundation, *Cockell, C., White, D., Messier, D. and Dale Stokes, M., Elsevier Science Ltd, 2002*

**4 Work in pairs. Quickly look at Questions 1–9. You worked on 'Yes / No / Not Given' and multiple-choice questions in Units 3 and 6.**

1 What are the best techniques for dealing with these tasks in the exam?
2 How long should you spend on each of them?
3 Check your answers by reading the Exam advice on pages 32 and 65.
4 Now try to answer Questions 1–9 in the time you decided on above.

**Questions 1–5**

Do the following statements agree with the views of the writer in the reading passage?

*Write*

| | |
|---|---|
| ***YES*** | *if the statement agrees with the views of the writer* |
| ***NO*** | *if the statement contradicts the views of the writer* |
| ***NOT GIVEN*** | *if it is impossible to say what the writer thinks about this* |

1 Activities related to environmental protection and space exploration have a common theme.
2 It is unclear why space exploration evolved in a different way from environmental studies on Earth.
3 Governments tend to allocate more money to environmental projects than space exploration.
4 Unfortunately, the environmental and space exploration communities have little to offer each other in terms of resources.
5 The Earth and Space Foundation was set up later than it was originally intended.

**Questions 6–9**

*Choose the correct letter, **A**, **B**, **C** or **D**.*

6 What was the significance of the 'novel approach' adopted in the Guatemala project?

- **A** It minimised the need to protect the forests.
- **B** It reduced the impact of tourists on the forests.
- **C** It showed that preserving the forests can be profitable.
- **D** It gave the Foundation greater control over the forests.

7 GPS and satellite imagery were used in the Syrian project to

- **A** help archaeologists find ancient items.
- **B** explore land that is hard to reach.
- **C** reduce the impact of archaeological activity.
- **D** evaluate some early astronomical theories.

8 One of the purposes of the Foundation's awards is to

- **A** attract non-scientists to its work.
- **B** establish priorities for Mars exploration.
- **C** offer financial incentives for space exploration.
- **D** establish the long-term continuity of its activities.

9 What is the writer's purpose in the passage?

- **A** to persuade people to support the Foundation
- **B** to explain the nature of the Foundation's work
- **C** to show how views on the Foundation have changed
- **D** to reject earlier criticisms of the Foundation's work

**5 Work in pairs.**

1 Quickly look at Questions 10–14.
2 Decide on the best techniques for dealing with this task in the exam, and how long the task should take you.
3 Check your answers by reading the Exam advice on page 34.
4 Answer Questions 10–14 in the time you decided.

**Questions 10–14**

*Complete the summary using the words, **A–I**, below.*

**Field research: Applying the Earth's environment to the settlement of space**

Some studies have looked at how humans function in **10** ..... situations. In one project, it was decided to review cave explorers in Mexico who tolerate **11** ..... periods on their own.

It is also possible to prepare for space exploration by studying environments on Earth that are **12** ..... to those on Mars. A huge crater in the Arctic is the **13** ..... place to test the technologies needed to explore Mars and gather other relevant **14** ..... information.

| | | |
|---|---|---|
| **A** comparable | **D** ideal | **G** scientific |
| **B** extreme | **E** unexpected | **H** extended |
| **C** connected | **F** beneficial | **I** individual |

**6 Find these five phrases in the passage. What do they refer to, and which questions did they help you answer?**

1 both fields of interest
2 this dichotomous existence
3 both communities
4 These collections
5 Together, they demonstrate

**7 Work in small groups.**

1 Why do you think Mars has become an important focus for space exploration?
2 If scientists found life on other planets, how would this change the way we see the world and ourselves?

## Vocabulary

*Verbs and dependent prepositions*

**1 Complete these extracts from the reading passage with the correct preposition.**

1 The community that focuses its efforts ..... the exploration of space has largely been different from ...
2 ... both fields of interest involve what might be referred to ..... 'scientific exploration'.
3 The separation between the two communities is often reflected ..... attitudes.
4 ... it is not uncommon for space exploration to be regarded ..... a waste of money, distracting governments ..... solving major environmental problems here at home.
5 In the sense that Earth and space exploration both stem ..... the same human drive to understand our environment ...
6 Projects that have been supported by the Foundation include environmental projects using technologies resulting ..... space exploration ...

**2 Complete these sentences using the correct prepositions.**

1 I do not believe ..... spending money ..... space exploration.
2 With regard to the rocket launch, the team agreed ..... a six-hour delay.
3 Being away from family and friends for long periods must be hard to cope ..... .
4 The cloud cover prevented observers ..... seeing the eclipse.
5 A team of experts will be involved ..... setting up the space mission.
6 The astronaut said that he had devoted the past four years ..... preparing himself for the mission.
7 Galileo is recognised worldwide ..... having been an exceptional scientist.

**3 Work in pairs. Complete the sentences any way you wish.**

1 As a hobby, astronomy appeals ...
2 An interest in science can stem ...
3 The newspaper editor decided to devote the front page ...
4 People can be very divided ...
5 The course will provide me ...
6 Mars is often referred to ...
7 Journalists need to reflect carefully ...

## Listening Section 4

**1 Circle the correct option in *italics* so that the sentences offer good advice for students doing the Listening test.**

1 Use the preparation time to *relax / decide what you need to listen for.*
2 If you lose your place, *wait for the next section to begin / listen for key ideas in the questions.*
3 It *matters / does not matter* how clearly you write your answers on the question paper, because you will transfer them to the answer sheet later.
4 Standard abbreviations (e.g. *km* for *kilometre*) are acceptable in answers; they *count / do not count* as words.
5 If you miss an answer, *leave a blank / make a guess.*
6 If you go over the word limit, you *will / will not necessarily* lose the mark for the question.

**2 Work in small groups. You are going to hear a lecturer in physical sciences talking about space observation. Before you listen, discuss this question.**

How has our understanding of the universe changed over the last 500 years?

**3** **Work in pairs. Look at Questions 1–10. What are the best techniques for dealing with this task? (You practised it in Units 4 and 6.)**

**Questions 1–10**

*Complete the notes below.*

*Write* ***NO MORE THAN TWO WORDS*** *for each answer.*

**Space observation**

***Early days***

First telescopes – started the 1 '.....'

Galileo's telescope – moved the focus from 2 ..... to the sky

First 3 ..... – by John William Draper (1839)

***Present day***

Professional astronomers – aim to get 4 .....

Amateur astronomers – aim to photograph beautiful images, e.g. 5 ..... (Greece)

***Contribution of amateur astronomers***

*Specialised knowledge*

e.g. • recognise changes in the 6 ..... of a space object

• are able to produce 7 ..... of space

*Two main types of observation*

a new discoveries, e.g. an 8 ..... or a comet

b monitor the 9 ..... of objects in space

*Main advantages*

• great patience and passion

• can conduct 10 ..... observations

**4** 17 **Now listen and answer Questions 1–10.**

**5** **Discuss these questions in small groups.**

1 Would you like to travel into space one day? Why? / Why not?

2 What do you think the experience would be like?

## Speaking Parts 2 and 3

**1** **Circle the correct options in *italics* so that the sentences offer good advice for students doing the Speaking test.**

1 Answers to Part 1 questions should be *very short / about two or three sentences long.*

2 You will *have / not have* a choice of topics in Part 2.

3 You should aim to speak for *just one minute / the full two minutes* in Part 2.

4 Part 3 is worth *more marks than / the same marks as* the other two parts.

5 Part 3 questions are about *personal / general and abstract* topics.

6 Pronunciation is *just as / not as* important as vocabulary, grammar and fluency.

7 You *will / will not* lose marks if you give irrelevant answers to questions.

**2** **Take one minute to prepare your talk for this Part 2 topic.**

**Describe a story about space (real or fictitious) that you have read about or seen in a film or on TV.**

**You should say:**

**when you read about or saw the story**

**what happened in the story**

**whether the story has any significance today**

**and explain how you felt about this story.**

**3 Work in pairs.**

1 **Complete this checklist with four more good things to do when answering Part 2. Then check your ideas by looking back at the Exam advice in previous units.**

Did your partner ...

- ☐ introduce the topic clearly?
- ☐
- ☐
- ☐
- ☐

2 **Take turns to either give your talks or listen and complete the checklist. When your partner finishes, ask these short follow-up questions that an examiner might ask.**

- Have you told other people about this story?
- Do other people that you know like this story?

3 **Take turns to give each other feedback using the checklist.**

**4 Work in pairs. Read the questions below that a student, Pauline, answers in Speaking Part 3. For which question(s) is she likely to:**

**a** compare the present with the past?
**b** speculate / make predictions about the future?
**c** give reasons and/or examples?

**Attitudes towards space travel**

1 What do you think fascinates humans about outer space?
2 Do you think that's why some stories about space travel have been so 'imaginative'?
3 How do you think people's attitudes towards space exploration have changed since the first Moon landings?
4 To what extent do you think governments will continue to fund projects in search of life on other planets?

**5 (18) Listen to Pauline answering the questions in Exercise 4. In which answer(s) does she:**

**a** compare the present with the past?
**b** speculate / make predictions about the future?
**c** give reasons and/or examples?

**6 Read the recording script on page 160 and underline the phrases which:**

**a** compare the present with the past.
**b** speculate / make predictions about the future.
**c** give reasons and/or examples.
**d** you would find useful when answering these questions yourself.

Pronunciation: *Rhythm and chunking*

**7 Work in pairs. Look back at the Exam advice in previous units to remind yourselves of the best approaches to this part. Add any ideas you wish to this checklist.**

Did your partner ...

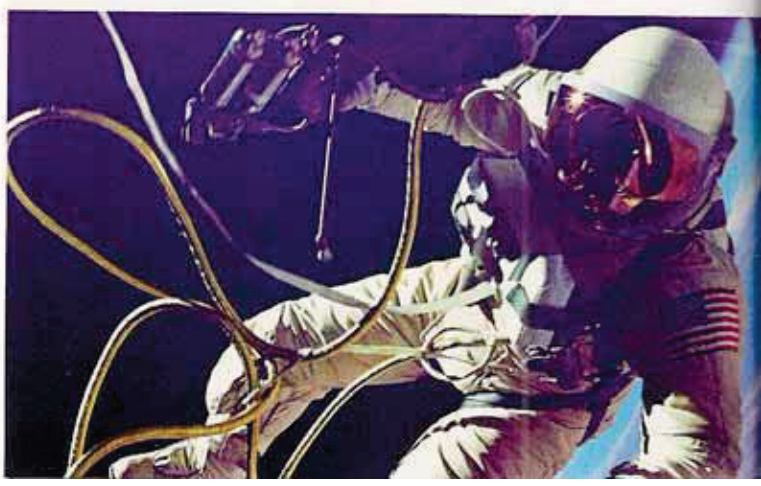
- ☐ answer the question clearly and relevantly?
- ☐ use appropriate expressions to introduce points?
- ☐ include some reasons and examples?
- ☐ use some advanced vocabulary?

**8 Work in pairs. Take turns to ask and answer the questions in Exercise 4 and these questions.**

**People and space**

- What qualities do you think you need in order to be selected for a space mission?
- What considerations have to be made before sending humans into space?
- To what extent is it better to use robots rather than humans to explore space?

**As you listen, prepare some feedback for your partner using the checklist in Exercise 7.**



## Pronunciation

*Rhythm and chunking*

Speakers divide their speech into groups of words, or chunks, and they deliver these with a natural-sounding rhythm. Some common phrases form natural 'chunks' and tend to be pronounced with a predictable rhythm.

**1** 19 **Work in pairs. Listen to the rhythm of the phrases in bold which is produced by stressing the underlined words and syllables. Then take turns to read the phrases aloud.**

*As far as I'm concerned, it's a waste of money.*

**2** 20 **Predict the rhythm in these phrases by underlining the stressed syllables. Then listen to check your answers.**

1 I've no idea
2 What's the point?
3 make both ends meet
4 It's like the time when ...
5 on the other hand
6 over the years

**3** **Look at these extracts from another student's answers to Part 3 questions. Underline the syllables that you think will be stressed in the phrases in bold.**

1 **Well, it's hard to say.** I think that, **over the decades**, people have **lost interest.**
2 **You know**, if you **go back to the time** of Galileo, no one even **thought about** travelling into space then.
3 **As far as space is concerned**, I don't think we have **any idea** what's out there.
4 **A lot of people say 'What's the point** in space exploration?', but **as far as I can see**, that's **a bit short-sighted.**
5 Actually, **I can't wait to see** what the Mars robot **comes up with**. I think **the whole space thing** is just **out of this world**!

**4** 21 **Work in pairs. Take turns to read the extracts in Exercise 3 aloud, then listen to the recording and check your pronunciation.**

## Writing Task 2

**1** **Work in pairs. Complete the sentences below using the words and phrases in the box so that they offer good advice for students doing Writing Task 2.**

~~40 minutes~~ grammar and spelling main ideas plan questions sentences view vocabulary

1 Make sure that you leave *40 minutes* to complete this task.
2 Study the task first and note how many ..... you must address, and how many aspects of these you must cover to give a complete answer to the task.
3 Quickly brainstorm ideas and examples. Then spend a minute or two writing a rough ..... where you organise your ..... into paragraphs.
4 Make sure all the ..... you write in a paragraph follow each other logically.
5 Use some advanced ..... .
6 End with a short conclusion that restates your personal ..... .
7 Leave two minutes at the end to check your ..... .

**2** **Work in pairs. Look at the Writing task below.**

1 How many questions do you need to cover in your answer, and what does each question require you to do?
2 What main ideas could you include for each question?

Write about the following topic.

***A new generation of entrepreneurs believe that privately funded space tourism will be the next exciting development in space exploration.***

***How true do you think this is?***

***How would space tourism affect space exploration as we know it today?***

Give reasons for your answer and include any relevant examples from your own knowledge or experience.

**3 Work in pairs. Read this sample answer and write a brief plan to show the writer's main and supporting points.**

I think it is very likely that space travel will become a popular activity in the private sector. There are wealthy people in the world who want to go into space, and there is the desire to take them there. All that these people need is the means to achieve their aims.

To a certain extent, that means is already available, and some wealthy business people have already paid millions of dollars to travel into space. If they have done it, others will follow. Human beings have a natural tendency to go beyond their limits; it is this desire to 'push the boundaries' that has motivated every explorer in the past.

In the same way, space is definitely where business people in the travel industry are setting their sights. In fact, newspapers say that millionaires like Richard Branson are in the process of doing test flights to the edge of space. So it is only a matter of time before space tourism becomes a reality for the population as a whole.

How that will change space exploration is an interesting question. As businesses will be concentrating on making profits and satisfying a general desire for adventure, it seems unlikely that they will have any influence on the work of space explorers. Essentially, the two activities are quite different; only by doing both would you make any link between them.

Having said that, if space tourism were to become popular, it is quite possible that it would raise extra money that could be channelled back into space exploration in the form of enhanced technology and communications systems. This, in turn, might speed up the process of space exploration.

**4 Answer these questions.**

1 How and where does the writer link the first question in the task to the second?
2 How does she link her main views across paragraphs?

**5 Work in pairs. The answer in Exercise 3 lacks a conclusion.**

1 Decide which of the conclusions below (1–3) is the best one, and say why.
2 Match the conclusions with the Teacher's comments (a–c) on page 96.

**1** In general, I think space tourism will become a reality and, like everything, it will become cheaper and more accessible as time goes by. At the moment, it is only millionaires who would be able to afford it, but that will obviously change in the long run. Commercial flights to the Moon could become a regular occurrence, but I doubt whether I would ever take one.

**2** Overall, space tourism seems an inevitable development. Whether or not it has an effect on the work of space explorers will depend on the level of success it has and the opportunities it opens up for scientific progress. Only time will tell.

**3** In conclusion, I would argue that both questions are difficult to answer. While millionaires might go into space, it seems unlikely that ordinary people will be able to afford it. Even if they can, they will be seeking their own entertainment, not contributing to the work of space explorers.

**6 Find words or phrases in the sample answer in Exercise 3 and the paragraphs in Exercise 5 which mean the following.**

1 a method or way of doing something
2 an instinctive likelihood to behave in a certain way
3 go beyond the limits of something
4 deciding to achieve something
5 it will definitely happen at some point in the future
6 over the days/months/years
7 something that happens repeatedly in a fixed pattern
8 we will know whether or not something will happen at some point in the future
9 looking for
10 helping with

**7 Use the phrases in Exercise 6 to complete these sentences. You may have to change the phrase slightly.**

1 It is ..... before we find life on another planet.
2 Adults, like children, often try to ..... and do more than they are capable of.
3 Sometimes we have to control our ..... to be over-optimistic about what we can achieve.
4 Richard Branson has ..... operating a space-tourism venture.
5 Rocket technology provided us with ..... to explore outer space.

Key grammar: *Emphasising*

**8 Work in pairs. Look at this task. Discuss your exam strategy for doing Writing task 2. Look back at the Exam advice in previous units. Then work alone and write your answer in at least 250 words.**

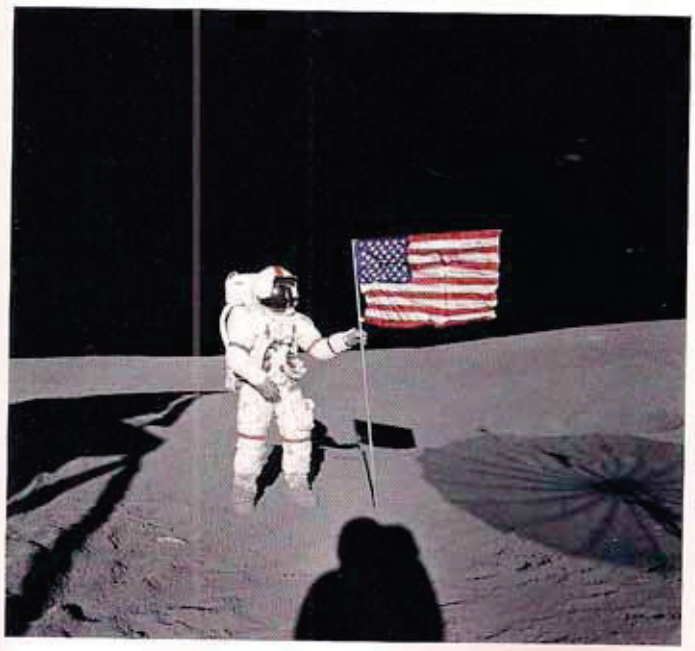
Write about the following topic.

***Some people argue that space exploration has had more to do with national pride than international effort.***

***To what extent do you agree with this?***

***How do you think space exploration will change in the future?***

Give reasons for your answer and include any relevant examples from your own knowledge or experience.



## Key grammar

*Emphasising*

**1 Complete each of these sentences from the sample answer on page 92 with one word.**

1 All that these people need ..... the means to achieve their aims.
2 ... it is this desire to 'push the boundaries' ..... has motivated every explorer in the past.
3 In the same way, space is definitely ..... business people in the travel industry are setting their sights.

**2 What is being emphasised in each sentence?**

page 112 *Emphasising*

**3 Rewrite these sentences so that the underlined words and phrases are emphasised.**

1 Yuri Gagarin was the first man in space, not Neil Armstrong.
It was ....., not Neil Armstrong.
2 The ISS shows how successfully nations can co-operate.
What ...
3 Some people consider Mars to be the most interesting planet.
Mars is ..... to be the most interesting planet.
4 I would find the sense of weightlessness rather unnerving.
It is ...
5 Clearly we won't get a better picture than this.
Cleary this picture ...
6 He spends long hours in his observatory.
What ...
7 Millionaires are the only people who can afford to travel into space.
It's ...

**4 Write sentences about these topics using the words in brackets to help you.**

1 a time when you were blamed for someone else's mistake (*it wasn't / it was*)
2 the most interesting person you know (*X is / what he/she does / is*)
3 the best way to prepare for a big change in life (*what you*)
4 an experience that you learned from (*what it taught me / X is the best way*)
5 something other people generally believe (*X is believed*)