

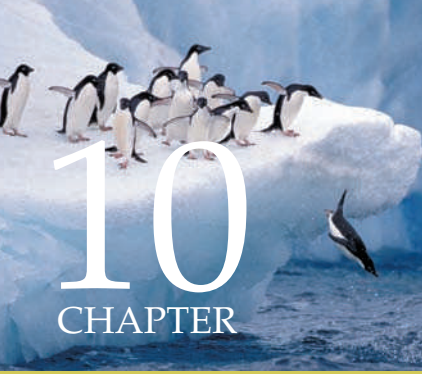
UNIT

# Science and Technology

# 4



181



# 10

CHAPTER

# Antarctica: Whose Continent Is It Anyway?

by Daniel and Sally Grotta, *Popular Science*

## Prereading Preparation



- 1 Where is Antarctica?
- 2 With a partner, discuss what you know about Antarctica, and fill in the chart below with your information.
- 3 Some scientists study Antarctica. What are possible reasons why?
- 4 Look at the title. What do you think this article will discuss?

Climate	Geography	People	Animals	Plants



# Antarctica: Whose Continent Is It Anyway?

1 Last February, the *World Discoverer*, our cruise ship, stopped in front of a white ice cliff higher than the ship's mast. As large as France, the Ross Ice Shelf of Antarctica extends unbroken along the Ross Sea for hundreds of miles.

5 Like other passengers on our cruise ship, we had been lured by an irresistible attraction: the chance to visit the most remote place on Earth, and the most unusual. The coldest place on Earth is also the subject of conflicting interests: scientists, tourists, environmentalists, oil and mineral seekers.

10 Scientists treasure the unparalleled advantages for research; tourists prize the chance to visit Earth's last frontier; environmentalists fear that increases in both activities will pollute the continent and jeopardize its fabulous creatures; others contend that preserving Antarctica as a kind of world park will deprive the rest of the world of much needed oil and mineral reserves.

15 Fears of Antarctica's ruin through commercial exploitation have been partly reduced by the October, 1991, 31-nation signing of the Madrid Protocol, which bans oil and gas exploration for the next 50 years. But Antarctica's unique attributes—it is the coldest, driest, and highest continent—will keep it at the focus of conflicting scientific and touristic interests.

20 Think of a place as remote as the far side of the moon, as strange as Saturn and as inhospitable as Mars, and that will give some idea of what Antarctica is like. A mere 2.4 percent of its 5.4 million-square-mile land mass is ice-free, and then, only for a few months a year. Scientists estimate that 70 percent of the world's fresh water is locked away in Antarctica's icecap; if it were ever to melt, sea levels might rise 200 feet. In Antarctica, winds can blow at better than 200 mph, and temperatures drop as low as minus 128.6°F. There's not a single village or town, not a tree, bush, or blade of grass on the entire continent.

25 But far from being merely a useless continent, Antarctica is vital to life on Earth. The continent's vast ice fields reflect sunlight back into space, preventing the planet from overheating. The cold water that the breakaway icebergs generate flows north and mixes with equatorial warm water, producing currents, clouds, and ultimately creating complex weather patterns. Antarctic seas teem with life, making them an important link in the world food chain. The frigid waters of the Southern Ocean are home to species of birds and mammals that are found nowhere else.

35 The National Science Foundation (NSF) is the government agency responsible for the U.S. stations in Antarctica. Because of the continent's extreme cold and almost complete isolation, the NSF considers it to be the best place to study and understand such phenomena as temperature circulation in the oceans, unique animal life, ozone depletion, and glacial history. And buried deep in layers of Antarctic ice lie clues to ancient climates, clues such as trapped bubbles of atmospheric gases, which can help predict whether present and future global warming poses a real threat.

40 Until scientists began the first serious study of the continent during the 1957–58 International Geophysical Year (IGY), a multicountry cooperative research project, Antarctica was dismissed as a vast, useless continent.

45 Based upon early explorations and questionable land grants, seven countries, including Great Britain, Chile, and Argentina, claim sovereignty over vast tracts of the continent. However, as IGY wound down, the question of who owns Antarctica came to a head. The 12 participating countries reached an international agreement, the Antarctic Treaty, which took effect in June 1961. 50 The number has since grown, making 39 in all. It established Antarctica as a "continent for science and peace," and temporarily set aside all claims of sovereignty for as long as the treaty remains in effect.

55 The rules of the treaty meant that as tourists to Antarctica, passengers on our cruise ship needed neither passports nor visas. Except for a handful of sites of special scientific interest, specially protected areas, and specially managed areas, there was nothing to restrict us from wandering anywhere we wanted.

60 Primarily because of its scientific and ecological importance, many scientists feel that Antarctica should be dedicated to research only. They feel that tourists should not be permitted to come. However, recent events have shown that the greatest future threat to Antarctica may not be tourism or scientific stations, but the worldwide thirst for oil and minerals. "The reason the Antarctic Treaty was negotiated and went through so quickly," geologist John Splettstoesser explains, "is that at the time, relatively few minerals were known to exist there."

65 By the early 1970s, however, there were some indications that there might be gas and oil in Antarctica. The treaty countries decided that no commercial companies would be permitted to explore for resources. The Madrid Protocol bans all exploration or commercial exploitation of natural resources on the continent for the next 50 years.

70 Like the Antarctic Treaty itself, the Madrid Protocol is binding only on the 39 treaty countries. There's nothing to stop non-treaty countries from establishing commercial bases anywhere on the continent and doing whatever they please.



Where do we go from here? So far, no non-treaty nation has expressed a serious interest in setting up for business in Antarctica. So far, none of the countries claiming sovereignty has moved to formally annex Antarctic territory.

75

So whose continent is Antarctica, anyway? Former Vice President Albert Gore best expresses the feelings of those of us who have fallen in love with this strange and spectacular land: "I think that it should be held in trust as a global ecological reserve for all the people of the world, not just in this generation, but later generations to come as well."



## A

### Fact-Finding Exercise

Read the passage again. Then read the following statements. Scan the article quickly to see if they are True (T) or False (F). If a statement is false, rewrite it so that it is true.

- 1 \_\_\_\_\_ T \_\_\_\_\_ F Most people agree that Antarctica should be used for research.

---

- 2 \_\_\_\_\_ T \_\_\_\_\_ F Antarctica is the coldest place on Earth.  
\_\_\_\_\_
- 3 \_\_\_\_\_ T \_\_\_\_\_ F Most of Antarctica is ice-free.  
\_\_\_\_\_
- 4 \_\_\_\_\_ T \_\_\_\_\_ F Antarctica is a useless continent.  
\_\_\_\_\_
- 5 \_\_\_\_\_ T \_\_\_\_\_ F Important information about the past may be buried under the Antarctic ice.  
\_\_\_\_\_
- 6 \_\_\_\_\_ T \_\_\_\_\_ F Thirty-nine countries have agreed to the Antarctic Treaty.  
\_\_\_\_\_
- 7 \_\_\_\_\_ T \_\_\_\_\_ F Most tourists feel that Antarctica should be dedicated to scientific research only.  
\_\_\_\_\_
- 8 \_\_\_\_\_ T \_\_\_\_\_ F The Madrid Protocol allows countries to explore Antarctica for natural resources.  
\_\_\_\_\_



# Reading Analysis

Read each question carefully. Circle the number or letter of the correct answer, or write your answer in the space provided.

- 1 a. Read lines 1–2. What is the **World Discoverer**?

---

- b. Who does **our** refer to?

---

- 2 Read lines 2–3. What is as large as France?

- a. The *World Discoverer*
- b. The Ross Ice Shelf
- c. Antarctica

- 3 Read lines 4–6.

- a. **Lure** means

- 1. invite
- 2. visit
- 3. attract

- b. What is **an irresistible attraction**?

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---

- c. What follows the **colon (:)**?

- 1. Additional information
- 2. An example
- 3. An explanation

- 4 In lines 6–7, what is the coldest place on Earth?

---

- 5 Read lines 8–12. In line 10, who does **others** refer to?

- a. Tourists
- b. Scientists
- c. Environmentalists
- d. Oil and mineral seekers

- 6 In lines 20–21, what does **a mere 2.4 percent** mean?
- a. only 2.4 percent
  - b. exactly 2.4 percent
  - c. approximately 2.4 percent
- 7 Read lines 30–31. Which one of the following examples represents a **food chain**?
- a. orange tree → oranges → people
  - b. insects → birds → cats
  - c. Farmer → supermarket → people
- 8 Read lines 42–44.
- a. What is **IGY**?
- 
- b. When was Antarctica thought of as a useless continent?
    - 1. Before IGY
    - 2. After IGY
  - c. When did scientists begin the first serious study of Antarctica?
    - 1. Before 1957
    - 2. 1957–1958
    - 3. After 1958
- 9 Read lines 47–48. “As IGY wound down, the question of who owns Antarctica came to a head.” What does **came to a head** mean?
- a. Started a big argument
  - b. Grew to a large size
  - c. Became very important
- 10 In line 52, what does **sovereignty** mean?
- a. Ownership
  - b. Boundaries
  - c. Continent



- 11 In line 54, what is a **handful**?
- A small number
  - A large number
- 12 Read lines 54–56. Which word is a synonym for **sites**?
- 
- 13 In lines 61–63, when does **at the time** refer to?
- 
- 14 In line 70, what are **non-treaty countries**?
- 
- 15 a. In lines 72–74, what does **so far** mean?
- In the future
  - Up to now
  - Never
- b. Why do the authors write **so far** twice in the same paragraph?
- For repetition
  - For contrast
  - For emphasis
- 16 Read lines 73–74, “So far none of the countries claiming sovereignty has moved to formally annex Antarctic territory.” This sentence means that none of the countries claiming sovereignty
- has moved to make Antarctica part of its own country
  - has moved to set up a government in Antarctica
  - has sent a number of people to settle in Antarctica
- 17 Read the last paragraph. Who thinks this way about Antarctica?
- Only Albert Gore
  - The authors
  - Everyone who loves Antarctica

# Information Organization

Read the article again. Underline what you think are the main ideas. Then scan the article and complete the following outline, using the sentences that you have underlined to help you. You will use this outline later to answer specific questions about the article.

## I. People with Conflicting Interests in Antarctica

A. \_\_\_\_\_

Reason: \_\_\_\_\_

B. Tourists \_\_\_\_\_

Reason: *They prize the chance to visit Earth's last frontier*

C. \_\_\_\_\_

Reason: \_\_\_\_\_

D. \_\_\_\_\_

Reason: \_\_\_\_\_

## II. The Madrid Protocol

A. Date: \_\_\_\_\_

B. Original number of participating nations: \_\_\_\_\_

C. Purpose: \_\_\_\_\_

## III. \_\_\_\_\_

A. \_\_\_\_\_

B. \_\_\_\_\_

C. *Winds blow at more than 200 mph*

D. \_\_\_\_\_

E. *There are no villages, towns, or plants*

**IV. Antarctica Is Vital to Life on Earth**

**A.** \_\_\_\_\_

**B.** \_\_\_\_\_

**C.** \_\_\_\_\_

**D.** \_\_\_\_\_

**V. The Antarctic Treaty's Purpose**

**A.** \_\_\_\_\_

**B.** \_\_\_\_\_

**C.** \_\_\_\_\_

**D**

## Information Organization Quiz and Summary

Read each question carefully. Use your notes to answer the questions. Do not refer back to the text. When you are finished, write a brief summary of the article.

**1** Why are there conflicting interests regarding Antarctica?

\_\_\_\_\_  
\_\_\_\_\_

**2** What is the Madrid Protocol?

\_\_\_\_\_  
\_\_\_\_\_

**3** Describe the continent of Antarctica.

\_\_\_\_\_  
\_\_\_\_\_

4 Is Antarctica necessary to life on Earth? Why, or why not?

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---

5 What is the purpose of the Antarctic Treaty?

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## Summary

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# E

## Dictionary Skills

Read the dictionary entry for each word. Then look at how the word is used in the sentence. Write the number of the correct definition and the synonym or meaning in the space provided. Remember that you may need to change the wording of the definition in order to have a grammatically correct sentence.

1 **remote** *adj* **1** : separated by an interval or space greater than usual **2** : far removed in space, time, or relation : divergent **3** : out-of-the-way, secluded **4** : acting, acted on, or controlled indirectly or from a distance; *also* : relating to the acquisition of information about a distant object (as by radar or photography) without coming into physical contact with it . . .

Think of a place as ( ) \_\_\_\_\_ as the far side of the moon.

By permission. From *Merriam-Webster's Collegiate® Dictionary*, 11th Edition © 2010 by Merriam-Webster, Incorporated (www.Merriam-Webster.com).

- 2 **contend** *v* **1** : to strive or vie in contest or rivalry or against difficulties : struggle **2** : to strive in debate : argue

Some people ( ) \_\_\_\_\_ that preserving Antarctica as a kind of world park will deprive the rest of the world of oil and mineral reserves.

- 3 **dismiss** *v* **1** : to permit or cause to leave **2** : to remove from position or service : discharge **3 a** : to reject serious consideration of **b** : to put out of judicial consideration

Until scientists began the first serious study of Antarctica in 1957, most people ( ) \_\_\_\_\_ the continent. They considered it a vast, useless place.

## F

# Word Forms

### PART 1

In English, many verbs become nouns by adding the suffix *-ion* or *-tion*, for example, *suggest* (*v.*), *suggestion* (*n.*).

Complete each sentence with the correct form of the words on the left.

**Use the correct tense of the verbs, in either the affirmative or the negative form. Use the singular or plural form of the nouns.**

**reflect** (*v.*)

**reflection** (*n.*)

- 1 The baby saw her \_\_\_\_\_ in the mirror and smiled. She didn't understand that the mirror actually \_\_\_\_\_ her own image, not another child's.

**reduce** (*v.*)

**reduction** (*n.*)

- 2 Neil \_\_\_\_\_ the amount of food he eats because he has gone on a diet. He is working on a weight \_\_\_\_\_ of ten to fifteen pounds in a month.

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**deplete** (v.)  
**depletion** (n.)

3 We \_\_\_\_\_ the world's supply of oil and natural gas at a steady rate. In order to reduce the rate of \_\_\_\_\_ of these natural resources, we need to resort to alternate sources of energy.

**exploit** (v.)  
**exploitation** (n.)

4 If we \_\_\_\_\_ our natural resources wisely, and take care to protect the environment, we will have a supply of oil and gas for a long time. However, it is very easy for unwise \_\_\_\_\_ to leave the Earth both polluted and without resources.

**negotiate** (v.)  
**negotiation** (n.)

5 The two computer firms entered into serious \_\_\_\_\_ in order to merge their companies into one. They not only \_\_\_\_\_ acceptable terms, but also decided where to relocate the newly formed company.

## PART 2

In English, many verbs become nouns by adding the suffix *-ment*, for example, *improve* (v.), *improvement* (n.).

Complete each sentence with the correct form of the words on the left.

**Use the correct tense of the verbs, in either the affirmative or the negative form. Use the singular or plural form of the nouns.**

**employ** (v.)  
**employment** (n.)

1 In the past, many companies had very unfair \_\_\_\_\_ practices. For example, they \_\_\_\_\_ anyone they were prejudiced against, and they often made people work six or even seven days a week.

**equip** (v.)  
**equipment** (n.)

2 The manager of Fielder's Choice always \_\_\_\_\_ the high school baseball team.

He provides the team with all the basic \_\_\_\_\_ it needs in return for having his shop's name on the team's uniforms.

**govern** (v.)

**government** (n.)

- 3 I'm going to vote for Joan Harrington for mayor because I think that our city \_\_\_\_\_ needs a change. I really believe that Joan \_\_\_\_\_ the city much better than the present mayor has been doing.

**manage** (v.)

**management** (n.)

- 4 Bill and Carla \_\_\_\_\_ the new company together beginning next year. The board of directors believes that the new \_\_\_\_\_ will help the company improve its productivity over the next five years.

**establish** (v.)

**establishment** (n.)

- 5 The government recently \_\_\_\_\_ an agency to investigate reports of environmental pollution. Many private environmental groups praised the government for its timely \_\_\_\_\_ of this agency.

### Word Partnership

Use **management** with:

- n.** business management, crisis management, management skills, management style  
waste management  
**adj.** management team, management training  
new management, senior management

### Word Partnership

Use **establish** with:

- n.** establish control, establish independence, establish rules  
establish contact, establish relations, establish someone's identity

# Critical Thinking Strategies

Read each question carefully, and write a response. Remember that there is no one correct answer. Your response depends on what **you** think.

- 1 Read lines 21–23. What do you think would happen if sea levels rose 200 feet?

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- 2 Read lines 38–41. What do you think are some other reasons that it may be important to study ancient climates?

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- 3 Read lines 59–63. When the Antarctic Treaty was signed in 1961, very little was known about the continent's natural resources. According to John Splettstoesser, what is the relationship between the quick signing of the treaty and the lack of information about the resources?

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## H

## Topics for Discussion and Writing

- 1 The authors ask who Antarctica belongs to. Whose continent *is* Antarctica? Do you think it should belong to one country, many countries, or to no one? Write a composition explaining your opinion.
- 2 **Write in your journal.** Reread the fifth paragraph (lines 18–25). In this paragraph, the authors describe Antarctica by comparing it with other places and by giving facts about it. The authors are trying to convey an image and a feeling about this unusual continent. Imagine that you are visiting Antarctica. Write a journal entry in which you describe what you see and how being in Antarctica makes you feel. Do you have feelings similar to those of the first explorers?

## I

## Follow-Up Activities

- 1 Scientists, tourists, environmentalists, and oil and mineral seekers all have different opinions about what to do with Antarctica. Choose one of these four groups, and imagine that you are a member. Working with a partner or in a small group, make a list of reasons why Antarctica is important to your particular group. Compare your list with your classmates' lists. Then as a class, decide which group has the strongest reasons to support its point of view.
- 2 Form a panel of experts. Write a set of guidelines for the protection and use of Antarctica by all the interested countries of the world. You want to be fair to all the interested countries. You also want to try to satisfy the four groups previously mentioned: scientists, environmentalists, tourists, and oil and mineral seekers.
- 3 In the third paragraph (lines 8–12), the authors say that tourists consider Antarctica to be Earth's last frontier. However, other people do not agree with this statement. They believe that there are other places on Earth that have not yet been fully explored and that are still exciting, challenging places to go to. Alone, or with a partner, decide what other such places exist on Earth and examine why people would be interested in going there.

# Cloze Quiz

Complete the passage with words from the list. Use each word only once.

<b>agreement</b>	<b>continent</b>	<b>however</b>	<b>research</b>
<b>all</b>	<b>countries</b>	<b>long</b>	<b>science</b>
<b>Antarctica</b>	<b>effect</b>	<b>number</b>	<b>scientists</b>
<b>Argentina</b>	<b>established</b>	<b>question</b>	<b>temporarily</b>
<b>claims</b>	<b>explorations</b>	<b>remains</b>	<b>useless</b>

Until \_\_\_\_\_<sup>(1)</sup> began the first serious study of the \_\_\_\_\_<sup>(2)</sup> during the 1957–58 International Geophysical Year (IGY), a multicountry cooperative \_\_\_\_\_<sup>(3)</sup> project, Antarctica was dismissed as a vast, \_\_\_\_\_<sup>(4)</sup> continent.

Based upon early \_\_\_\_\_<sup>(5)</sup> and questionable land grants, seven \_\_\_\_\_<sup>(6)</sup>, including Great Britain, Chile, and \_\_\_\_\_<sup>(7)</sup>, claim sovereignty over vast tracts of the continent. \_\_\_\_\_<sup>(8)</sup>, as IGY wound down, the \_\_\_\_\_<sup>(9)</sup> of who owns \_\_\_\_\_<sup>(10)</sup> came to a head. The 12 participating countries reached an international \_\_\_\_\_<sup>(11)</sup>, the Antarctic Treaty, which took \_\_\_\_\_<sup>(12)</sup> in June 1961. The \_\_\_\_\_<sup>(13)</sup> has since grown, making 39 in \_\_\_\_\_<sup>(14)</sup>. It \_\_\_\_\_<sup>(15)</sup> Antarctica as a “continent for \_\_\_\_\_<sup>(16)</sup> and peace,” and \_\_\_\_\_<sup>(17)</sup> set aside all \_\_\_\_\_<sup>(18)</sup> of sovereignty for as \_\_\_\_\_<sup>(19)</sup> as the treaty \_\_\_\_\_<sup>(20)</sup> in effect.





# 11

CHAPTER

## A Messenger from the Past

by James Shreeve  
*Discover*

### Prereading Preparation

- 1 Do you think it's important to learn about humans of the past? Why, or why not?
- 2 What are some ways we can learn about humans of the past?
- 3 Read the title of this article and look at the picture. Who is the messenger from the past? What message, or information, can he give us today?





# A Messenger from the Past

1 His people said good-bye and watched him walk off toward the mountains. They had little reason to fear for his safety: the man was well dressed in insulated clothing and equipped with tools needed to survive the Alpine climate. However, as weeks passed without his return, they must have grown  
5 worried, then anxious, and finally resigned. After many years everyone who knew him had died, and not even a memory of the man remained.

Then, on an improbably distant day, he came down from the mountain. Things had changed a bit: it wasn't the Bronze Age anymore, and he was a celebrity.

10 When a melting glacier released its hold on a 4,000-year-old corpse in September, it was quite rightly called one of the most important archeological finds of the century. Discovered by a German couple hiking at 10,500 feet in the Italian Tyrol near the Austrian border, the partially freeze-dried body still wore remnants of leather garments and boots that had been stuffed with straw for insulation. The hikers alerted scientists from the University of Innsbruck in  
15 Austria, whose more complete examination revealed that the man was tattooed on his back and behind his knee. At his side was a bronze ax of a type typical in southern central Europe around 2000 B.C. On his expedition—perhaps to hunt or to search for metal ore—he had also carried an all-purpose stone knife, a wooden backpack, a bow and a quiver, a small bag containing a flint lighter and  
20 kindling, and an arrow repair kit in a leather pouch.

Such everyday gear gives an unprecedented perspective on life in early Bronze Age Europe. "The most exciting thing is that we genuinely appear to be looking at a man who had some kind of accident in the course of a perfectly  
25 ordinary trip," says archeologist Ian Kinnes of the British Museum. "These are not artifacts placed in a grave, but the fellow's own possessions."

Unlike the Egyptians and Mesopotamians of the time, who had more advanced civilizations with cities and central authority, the Ice Man and his countrymen lived in a society built around small, stable villages. He probably spoke in a tongue ancestral to current European languages. Furthermore, though  
30 he was a member of a farming culture, he may well have been hunting when he died, to add meat to his family's diet. X-rays of the quiver showed that it contained 14 arrows. While his backpack was empty, careful exploration of the trench where he died revealed remnants of animal skin and bones at the same spot where the pack lay. There was also the remainder of a pile of berries.  
35 Clearly the man didn't starve to death.

So why did the Ice Man die? The trench provided him with shelter from the elements, and he also had a braided mat of grass to keep him warm. If injury or illness caused the Ice Man's death, an autopsy on the 4,000-year-old victim could turn

40 up some clues. The circumstances of his death may have preserved such evidence,  
as well as other details of his life. Freeze-dried by the frigid climate, his inner organs  
and other soft tissues are much better preserved than those of dried-up Egyptian  
mummies or the waterlogged Scandinavian “Bog Men” found in recent years.

One concern, voiced by archeologist Colin Renfrew of Cambridge University,  
45 is that the hot TV lights that greeted the hunter’s return to civilization may  
have damaged these fragile tissues, jeopardizing a chance to recover additional  
precious genetic information from his chromosomes. If not, Renfrew says, “it  
may be possible to get very long DNA sequences out of this material. This is far  
and away the most exciting aspect of the discovery.”

For the time being, all biological research has literally been put on ice at the  
50 University of Innsbruck while an international team of experts, led by researcher  
Konrad Spindler, puzzles out a way to thaw the body without destroying it.  
As sensational as it sounds, it remains to be seen how useful 4,000-year-old  
human DNA will really be. “The problem is that we are dealing with a single  
individual,” says evolutionary biologist Robert Sokal of the State University of  
55 New York at Stony Brook. “In order to make statements about the population  
that existed at the time, we need more specimens.”

The wish for more messengers from the past may yet come true. Five more  
bodies of mountain climbers, all of whom died within the past 50 years, have  
emerged from melting Austrian mountain ice this summer. The Ice Man’s return  
60 from the Tyrol has demonstrated that the local climate is warmer now than it has  
been for 4,000 years. People are beginning to wonder—and plan for—what the  
melting ice may reveal next.

“No one ever thought this could happen,” says Christopher Stringer, an  
anthropologist at the Natural History Museum in London. “The fact that it has  
65 occurred once means that people will now be looking for it again.”



# Fact-Finding Exercise

Read the passage once. Then read the following statements. Scan the article quickly to see if they are True (T) or False (F). If a statement is false, rewrite it so that it is true.

1 \_\_\_\_\_ T \_\_\_\_\_ F The Ice Man lived 4,000 years ago.

---

2 \_\_\_\_\_ T \_\_\_\_\_ F The Ice Man was discovered in Europe by scientists.

---

3 \_\_\_\_\_ T \_\_\_\_\_ F Scientists aren't sure how the Ice Man died.

---

4 \_\_\_\_\_ T \_\_\_\_\_ F The Ice Man's body had been frozen for 4,000 years.

---

5 \_\_\_\_\_ T \_\_\_\_\_ F Scientists have examined the Ice Man to get genetic information.

---

6 \_\_\_\_\_ T \_\_\_\_\_ F More bodies of mountain climbers who died 4,000 years ago were discovered.

---

# Reading Analysis

Read each question carefully. Circle the number or letter of the correct answer, or write your answer in the space provided.

- 1 Read line 7. This statement means
  - a. the Ice Man walked down from the mountain
  - b. the Ice Man woke up on the mountain
  - c. the Ice Man's body was brought down from the mountain
  
- 2 In line 9, what does the **4,000-year-old corpse** refer to?  

---
  
- 3 Read lines 14–16. **Whose** refers to
  - a. the Ice Man
  - b. the scientists
  - c. the hikers
  
- 4 Read lines 17–22.
  - a. What are some examples of the Ice Man's **everyday gear**?  

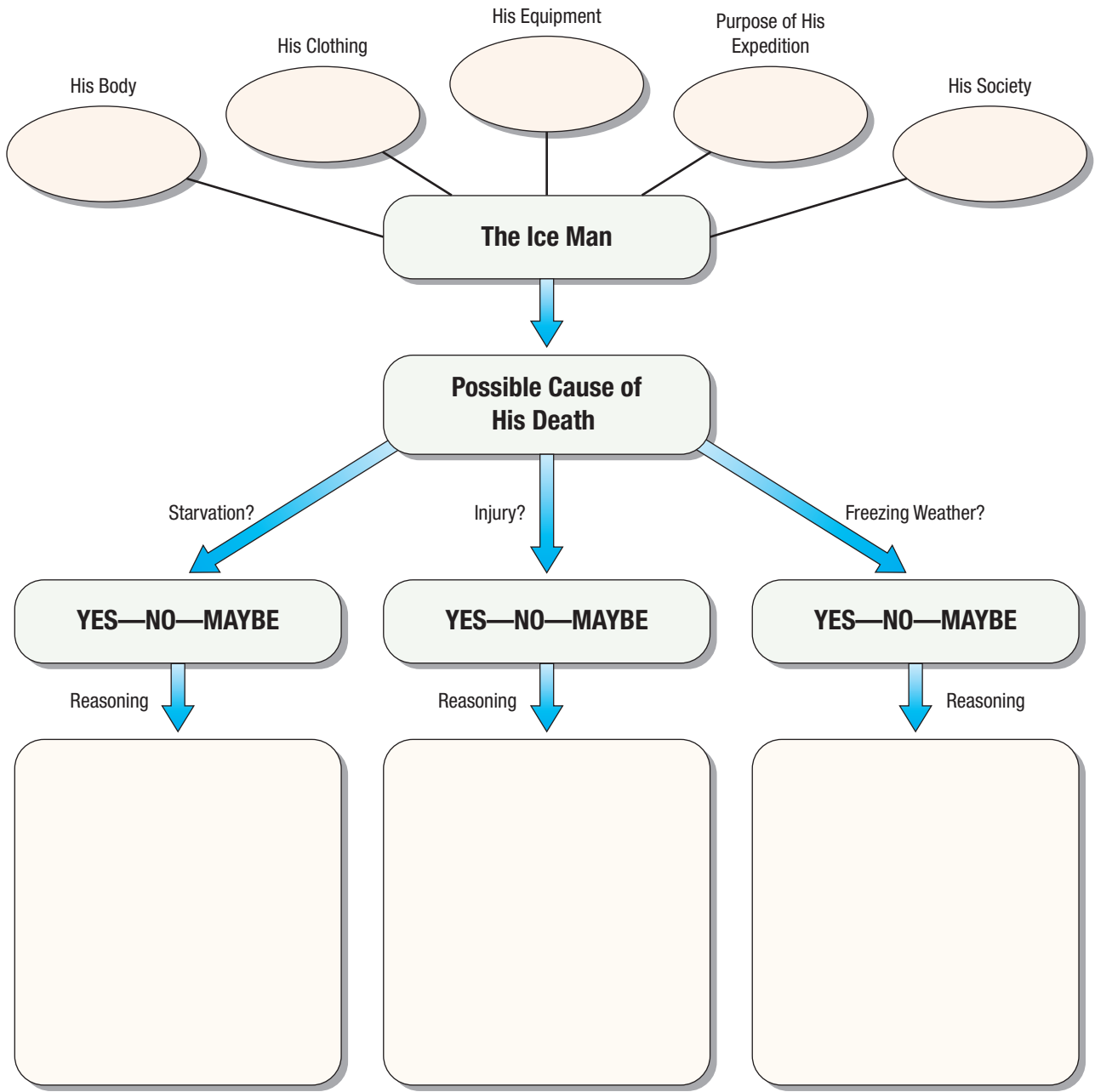
---
  - b. **Gear** means
    1. clothes
    2. equipment
    3. weapons
  
- 5 Read lines 28–29. In this sentence, what does **tongue** refer to?
  - a. The Ice Man's mouth
  - b. The Ice Man's accent
  - c. The Ice Man's language
  
- 6 In line 29, what follows **furthermore**?
  - a. An example
  - b. A theory
  - c. Additional information
  
- 7 Read line 35. What does **clearly** mean?
  - a. Unfortunately
  - b. Obviously
  - c. Possibly



- 8 Read lines 39–40.
- a. What does **evidence** mean?
    1. Proof of how the Ice Man died
    2. Clues to how the Ice Man died
    3. Theories describing how the Ice Man may have died
  - b. What does **as well as** mean?
    1. Better than
    2. As good as
    3. In addition to
- 9 Read lines 40–42. What are the Ice Man’s **inner organs and other soft tissues**?
- a. Parts of his body
  - b. Objects he had with him
  - c. The food remaining in his stomach
- 10 In lines 47–48, **far and away** indicates
- a. distance
  - b. importance
  - c. excitement
- 11 Read lines 49–51.
- a. **For the time being** means
    1. for a long time
    2. for now
    3. for a human being
  - b. **Thaw** means
    1. melt, as ice becomes water
    2. bring back to life
    3. bring back to normal temperature
- 12 In line 57, **yet** means
- a. still
  - b. but
  - c. not
- 13 Read lines 64–65. What does **it** refer to?
- 
-

# Information Organization

Read the article again. Underline what you think are the main ideas. Then scan the article and complete the flowchart, using the sentences that you have underlined to help you. For each possible cause of death, circle *yes*, *no*, or *maybe*, based on your reasoning from the information in the text.



# Information Organization Quiz and Summary

Read each question carefully. Use your notes to answer the questions. Do not refer back to the text. When you are finished, write a summary of the article.

- 1 a. What was the Ice Man wearing when he was found?

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- b. What marks did the Ice Man have on his body?

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- 2 a. What did the Ice Man have with him?

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- b. What might he have been doing before he died?

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- 3 Describe the society that the Ice Man lived in.

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- 4 What are some clues as to how the Ice Man died?

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## Summary

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# Dictionary Skills

Read the dictionary entry for each word. Then look at how the word is used in the sentence. Write the number of the correct definition and the synonym or meaning in the space provided. Remember that you may need to change the wording of the definition in order to have a grammatically correct sentence.

- 1 **remnant** *n* **1** **a** : a usually small part, member, or trace remaining **b** : a small surviving group—often used in *pl* **2** : an unsold or unused end of piece goods

The Ice Man's body still wore ( ) \_\_\_\_\_ of leather garments and boots that had been stuffed with straw for insulation.

- 2 **ordinary** *adj* **1** : of a kind to be expected in the normal order of events : routine, usual **2** : having or constituting immediate or original jurisdiction; *also* : belonging to such jurisdiction **3** **a** : of common quality, rank, or ability **b** : deficient in quality : poor, inferior

The Ice Man had some kind of accident in the course of a perfectly ( ) \_\_\_\_\_ trip.

- 3 **stable** *adj* **1** **a** : firmly established : fixed, steadfast **b** : not changing or fluctuating : unvarying **c** : permanent, enduring **2** **a** : steady in purpose : firm in resolution **b** : not subject to insecurity or emotional illness : sane, rational **3** **a** (1) : placed so as to resist forces tending to cause motion or change of motion (2) : designed so as to develop forces that restore the original condition when disturbed from a condition of equilibrium or steady motion **b** (1) : not readily altering in chemical makeup or physical state (2) : not spontaneously radioactive

The Ice Man and his countrymen lived in a society built around small, ( ) \_\_\_\_\_ villages.

4

**element** *n* **1** **a** : any of the four substances air, water, fire, and earth formerly believed to compose the physical universe **b** *pl* : weather conditions; *esp* : violent or severe weather **c** : the state or sphere natural or suited to a person or thing **2** : a constituent part: as **a** *pl* : the simplest principles of a subject of study : rudiments **b** (1) : a part of a geometric magnitude (2) : a generator of a geometric figure; *also* : a line or line segment contained in the surface of a cone or cylinder (3) : a basic member of a mathematical or logical class or set (4) : one of the individual entries in a mathematical matrix or determinant **c** : a distinct group within a larger group or community **d** (1) : one of the necessary data or values on which calculations or conclusions are based (2) : one of the factors determining the outcome of a process **e** : any of the fundamental substances that consist of atoms of only one kind and that singly or in combination constitute all matter **f** : a distinct part of a composite device **g** : a subdivision of a military unit

The trench provided the Ice Man with shelter from the

( ) \_\_\_\_\_, and he also had a braided mat of grass to keep him warm.

## F

# Word Forms

### PART 1

In English, many verbs become nouns by adding the suffix *-ion* or *-tion*, for example, *stimulate* (*v.*), *stimulation* (*n.*).

Complete each sentence with the correct form of the words on the left.

**Use the correct tense of the verbs, in either the affirmative or the negative form. Use the singular or plural form of the nouns.**

**insulate** (*v.*)

**1**

Nicholas put fiberglass between the outside and inside

**insulation** (*n.*)

walls of his house to provide good \_\_\_\_\_ . He

also \_\_\_\_\_ the roof; consequently, he saved

money on his heating bills last winter.

- demonstrate** (v.)      2 Many power companies provide clear and simple  
**demonstration** (n.) \_\_\_\_\_ to their customers on how to save  
on utility bills. The companies \_\_\_\_\_  
how to insulate a home and save electricity.
- explore** (v.)      3 On vacation, we \_\_\_\_\_ the Adirondack  
**exploration** (n.) \_\_\_\_\_ Mountains. Our \_\_\_\_\_ will also include  
underground caverns.
- preserve** (v.)      4 Many people are interested in the permanent  
**preservation** (n.) \_\_\_\_\_ of undeveloped land in Alaska.  
If we \_\_\_\_\_ this land now, it will be  
exploited by major oil companies.
- examine** (v.)      5 When Brian was ill, the doctor carefully  
**examination** (n.) \_\_\_\_\_ him. Although the  
\_\_\_\_\_ took a long time, Brian finally  
learned the cause of his illness.

## PART 2

In English, the noun and verb forms of some words are the same, for example, *promise* (v.), *promise* (n.).

Complete each sentence with the correct form of the words on the left.

**Use the correct tense of the verbs, in either the affirmative or the negative form. Use the singular or plural form of the nouns. In addition, indicate whether you are using the verb or the noun form by circling (v.) or (n.).**

- alert**      1 The police department put the town on  
\_\_\_\_\_ after a criminal escaped from  
(v., n.)  
the nearby prison. After they \_\_\_\_\_  
(v., n.)  
everyone, they began a systematic search of the area  
in order to find the escaped convict.

**release**

2 Film companies in the United States usually \_\_\_\_\_ about 20 major films a year. They \_\_\_\_\_ (v., n.) always advertise their new \_\_\_\_\_ (v., n.) on television and radio, and in magazines.

**damage**

3 The flood caused considerable property \_\_\_\_\_ (v., n.) to homes near the river. The muddy water ruined many people's homes, but, fortunately, it \_\_\_\_\_ (v., n.) any major buildings or contaminate the water supply.

**repair**

4 I called in a plumber to fix the leak under my kitchen sink. However, he \_\_\_\_\_ (v., n.) the leak properly, and water continued to drip. I decided to buy a book on plumbing and I made the \_\_\_\_\_ (v., n.) myself.

**return**

5 Perry is going to the store now, but he \_\_\_\_\_ (v., n.) by six o'clock. He is going to take back a shirt that doesn't fit. The store accepts both \_\_\_\_\_ (v., n.) and exchanges.



**Word Partnership** Use *repair* with:

- n. repair a **chimney**, repair **damage**,  
repair **equipment**, repair a **roof**  
**auto** repair, **car** repair, **home** repair,  
repair **parts**, **road** repair, repair **service**,  
repair **shop**

**Word Partnership** Use *return* with:

- v. **decide to** return, **plan to** return
- n. return **trip**  
return a **(phone) call**  
return **to work**

G

## Critical Thinking Strategies

Read each question carefully, and write a response. Remember that there is no one correct answer. Your response depends on what **you** think.

- 1 In the first paragraph of the article, the author gives a personalized description of what happened to the Ice Man 4,000 years ago and how his friends and family may have felt about his loss. What do you think the tone or feeling of this paragraph is? How is the tone and style different from the rest of the article? Why do you think the author started the article in this way?

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- 2 In the third paragraph, James Shreeve writes that the discovery of the Ice Man “was quite rightly called one of the most important archeological finds of the century.” What do you think Shreeve’s opinion of this discovery is? Why do you think so?

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- 3 In describing the equipment that the Ice Man had with him, Ian Kinnes points out that they “are not artifacts placed in a grave, but the fellow’s own possessions.” Why do you think this is so important? Why might objects in a grave be different from what a man normally carries with him for a day or a week?

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- 4 In lines 26–31, the author describes the society that the Ice Man lived in and compares it with the civilizations of the Egyptians and Mesopotamians of the same time period. How do you think James Shreeve knows what the Ice Man’s society was like? How does he know what Egyptian and Mesopotamian society was like at that time?

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- 5 The article informs us that “the Ice Man’s return from the Tyrol has demonstrated that the local climate is warmer now than it has been for 4,000 years.” What inferences can we make from this statement? What do you think may happen in the future as a result of a warmer climate?

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## H

### Topics for Discussion and Writing

- 1 According to Robert Sokal, an evolutionary biologist at the State University of New York at Stony Brook, we need to find many examples of preserved people from 4,000 years ago in order to “make statements about the population that existed at the time.” What information do you think we can learn from such discoveries? How might this information be useful to us in the twenty-first century?
- 2 If you could ask the Ice Man questions about himself and his time, what would you ask? Work with a partner and make a list of questions. Compare your list with your classmates’ lists.
- 3 **Write in your journal.** Imagine that you were the Ice Man 4,000 years ago. Describe your last week alive. Write about what you did, where you went, the people you met, and your last hours.

## I

### Follow-Up Activities

- 1 Work with a partner or in a small group. Read the passage that follows. This is up-to-date information about the Ice Man. Compare this new information with the original information from the article “Messenger from the Past.” If the original information is correct, leave it. If the information is now incorrect, change it. If there is additional information, add it to the chart.

# Otzi's Last Days: Glacier Man May Have Been Attacked Twice

ScienceDaily (Feb. 4, 2009)

1 Another chapter in a murder case over 5,000 years old. New investigations  
by an LMU (Ludwig-Maximilians-Universität München) research team working  
together with a Bolzano colleague reconstructed the chronology of the injuries  
that Ötzi, the glacier man preserved as a frozen mummy, received in his last  
5 days. It turns out, for example, that he did in fact only survive the arrow wound  
in his back for a very short time—a few minutes to a number of hours, but no  
more—and also definitely received a blow to the back with a blunt object only  
shortly before his death. In contrast, the cut wound on his hand is some days  
older. Reports Professor Andreas Nerlich, who led the study, “It is now clear that  
10 Ötzi endured at least two injuring events in his last days, which may imply two  
separate attacks. Although the ice mummy has already been studied at great  
length, there are still new results to be gleaned. The crime surrounding Ötzi is  
as thrilling as ever!” It is the oldest ice mummy ever found. Ötzi, the man from  
the Neolithic Age, is giving science critical information about life more than  
15 5000 years ago, not least from his equipment. His copper axe, for example,  
reveals that metalworking was already much more advanced in that era than  
was previously assumed. Yet Ötzi’s body, too, gives us many details as to his  
diet, state of health—and not least to his murder.

20 Some time ago, we detected a deep cut wound on Ötzi’s hand that he must  
have survived for at least a couple of days,” says Nerlich, head of the Institute  
of Pathology at Municipal Hospital Munich-Bogenhausen and member of the  
Medical Faculty of LMU, München. “Another team at about the same time found  
an arrow tip in Ötzi’s left armpit. The shaft of the arrow was missing, but there  
is an entry wound on the back.” It is probable, in that case, that the man died  
25 of internal bleeding because the arrow hit a main artery. What was unclear,  
however, was the age and exact chronology of the injuries.

Now, Nerlich has reconstructed the missing chronology while working  
together with LMU München forensic scientist Dr. Oliver Peschel and Dr. Eduard  
Egarter-Vigl, head of the Institute for Pathology in Bolzano. According to the  
30 new information, Ötzi did in fact only survive the arrow wound for a very short  
period of time, of no more than a few hours. “Ötzi had only shortly survived the  
arrow wound and the blow on the back,” Nerlich summarizes. “At least a couple  
of days before his death, however, he sustained a severe cut wound on his right  
hand. Over several days, then, Ötzi suffered at least two injuring events—which  
35 could point towards two separate attacks.”

	Original Information (Source): "Messenger from the Past" — Discover	Revised Information (Source): "Otzi's Last Days: Glacier Man May Have Been Attacked Twice"
When the Ice Man lived	4,000 years ago	
The Age the Ice Man lived in	the Bronze Age	
The Cause of the Ice Man's Death	(unknown)	
The Ice Man's physical condition	uninjured	
The marks on the Ice Man's body	tattoos on his back and behind his knee	
The Ice Man's equipment	clothes made of leather a bronze ax a bow, arrows, and a quiver	
Other Information		

- 2 According to this article, the Ice Man lived 4,000 years ago in the Bronze Age. His society was very different from the civilizations of Egypt and Mesopotamia of the same time period. Select an area of the world, perhaps your own. Refer to the chart below. In pairs or small groups, select one of the Ages and find out what characterizes each Age. Then refer to the Internet, a history book or an encyclopedia, or your own knowledge. What Age best describes the society you chose? Write a description of what life was like 5,000 years ago for the people in the society you have chosen. Discuss how their lives and the lives of Ice Man and his people were similar and how they were different.

Ages of Mankind	
B.C.	"Iron Age"
500	
1000	Chalcolithic "Bronze Age"
2000	
3000	Neolithic "New Stone Age"
4000	
5000	
6000	Mesolithic "Middle Stone Age"
7000	
8000	
9000	Paleolithic "Old Stone Age"
10,000	

# Cloze Quiz

Complete the passage with words from the list. Use each word only once.

<b>ancestral</b>	<b>contained</b>	<b>exploration</b>	<b>remainder</b>
<b>authority</b>	<b>culture</b>	<b>furthermore</b>	<b>revealed</b>
<b>circumstances</b>	<b>details</b>	<b>hunting</b>	<b>society</b>
<b>civilizations</b>	<b>die</b>	<b>illness</b>	<b>starve</b>
<b>clearly</b>	<b>evidence</b>	<b>probably</b>	<b>unlike</b>

\_\_\_\_\_ (1) the Egyptians and Mesopotamians of the time, who had more advanced \_\_\_\_\_ (2) with cities and central \_\_\_\_\_ (3), the Ice Man and his countrymen lived in a \_\_\_\_\_ (4) built around small, stable villages. He \_\_\_\_\_ (5) spoke in a tongue \_\_\_\_\_ (6) to current European languages. \_\_\_\_\_ (7), though he was a member of a farming \_\_\_\_\_ (8), he may well have been \_\_\_\_\_ (9) when he died, to add meat to his family's diet. X-rays of the quiver showed that it \_\_\_\_\_ (10) 14 arrows. While his backpack was empty, careful \_\_\_\_\_ (11) of the trench where he died \_\_\_\_\_ (12) remnants of animal skin and bones at the same spot where the pack lay. There was also the \_\_\_\_\_ (13) of a pile of berries. \_\_\_\_\_ (14) the man didn't \_\_\_\_\_ (15) to death. So why did the Ice Man \_\_\_\_\_ (16)? If injury or \_\_\_\_\_ (17) caused the Ice Man's death, an autopsy on the 4,000-year-old victim could turn up some clues. The \_\_\_\_\_ (18) of his death may have preserved such \_\_\_\_\_ (19), as well as other \_\_\_\_\_ (20) of his life.



# 12

CHAPTER

## Is Time Travel Possible?

by Mark Davidson  
*USA Today*

### Prereading Preparation

- 1 What is **time travel**? Do you think it is possible? Why or why not?
- 2 Do you think scientists should try to find a way to travel to the past? To the future? Why, or why not?
- 3 Would you like to travel to the past? If yes, what year would you like to visit?
- 4 Would you like to travel to the future? If yes, what year would you like to visit?
- 5 Using the chart on page 219 as a model, take a survey of your classmates. Compare your classmates' responses.



## TIME TRAVEL PREFERENCES

Student's Name	Would you like to travel to the past? Yes / No	Where would you like to go in the past?	Would you like to travel to the future? Yes / No	Where would you like to go in the future?

Track 12



# Is Time Travel Possible?

1        Contrary to the old warning that time waits for no one, time slows down when you are on the move. It also slows down more as you move faster, which means astronauts someday may survive so long in space that they would return to an Earth of the distant future. If you could move at the speed of light, 186,282  
5 miles a second, your time would stand still. If you could move faster than light, your time would move backward.

10       Although no form of matter yet discovered moves as fast or faster than light, scientific experiments have confirmed that accelerated motion causes a voyager's, or traveler's, time to be stretched. Albert Einstein predicted this in 1905, when he introduced the concept of relative time as part of his Special Theory of Relativity. A search is now under way to confirm the suspected existence of particles of matter that move faster than light and therefore possibly might serve as our passports to the past.

15       An obsession with time—saving, gaining, wasting, losing, and mastering it—seems to have been part of humanity for as long as humans have existed. Humanity also has been obsessed with trying to capture the *meaning* of time. Einstein used a definition of time, for experimental purposes, as that which is measured by a clock. Thus, time and time's relativity are measurable by any

20 sundial, hourglass, metronome, alarm clock, or an atomic clock that can measure a billionth of a second.

25 Scientists have demonstrated that an ordinary airplane flight is like a brief visit to the Fountain of Youth. In 1972, for example, scientists who took four atomic clocks on an airplane trip around the world discovered that the moving clocks moved slightly slower than atomic clocks which had remained on the ground. If you fly around the world, preferably going eastward to gain the advantage of the added motion of the Earth's rotation, the atomic clocks show that you'll return younger than you would have been if you had stayed home. Frankly, you'll be younger by only 40 billionths of a second. Even such an infinitesimal saving of time proves that time can be stretched. 30 Moreover, atomic clocks have demonstrated that the stretching of time increases with speed.

35 Here is an example of what you can expect if tomorrow's space-flight technology enables you to move at ultrahigh speeds. Imagine you're an astronaut with a twin who stays home.<sup>1</sup> If you travel back and forth to the nearest star at about half the speed of light, you'll be gone for 18 Earth years. When you return, your twin will be 18 years older, but you'll have aged only 16 years. Your body will be two years younger than your twin's because time aboard the flying spaceship will have moved more slowly than time on Earth. You will have aged normally, but you have been in a slower time zone. If your spaceship 40 moves at about 90% of lightspeed, you'll age only 50% as much as your twin. If you whiz along at 99.86% of lightspeed, you'll age only five percent as much. These examples of time-stretching, of course, cannot be tested with any existing spacecraft. They are based on mathematical projections of relativity science.

45 Speed is not the only factor that slows time; so does gravity. Einstein determined in his General Theory of Relativity that the force of an object's gravity "curves" the space in the object's gravitational field. When gravity curves space, Einstein reasoned, gravity also must curve time, because space and time are linked.

50 Numerous atomic clock experiments have confirmed Einstein's calculation that the closer you are to the Earth's center of gravity, which is the Earth's core, the slower you will age. In one of these experiments, an atomic clock was taken from the National Bureau of Standards in Washington, D.C., near sea level, and moved to mile-high Denver. The results demonstrated that people in Denver age more rapidly by a tiny amount than people in Washington.

<sup>1</sup>This hypothetical situation is known as the Twin Paradox.

55 If you would like gravity's space-time warp to extend your life, get a home at the beach and a job as a deep-sea diver. Avoid living in the mountains or working in a skyscraper. That advice, like the advice about flying around the world, will enable you to slow your aging by only a few billionths of a second. 60 Nevertheless, those tiny fractions of a second add up to more proof that time-stretching is a reality.

## Time Reversal

According to scientific skeptics, time reversal—travel to the past—for humans would mean an unthinkable reversal of cause and effect. This reversal would permit you to do something in the past that changes the present. The skeptics worry that you even might commit an act that prevents 65 your own birth.

Some scientists believe we should keep an open mind about time reversal. Open-minders speculate that time-travelers who change the past would be opening doors to alternative histories, rather than interfering with history as we know it. For example, if you prevented the assassination of Abraham Lincoln, 70 then a new line of historical development would be created. The alternative history—the one without Lincoln's assassination—would have a completely separate, ongoing existence. Thus, no change would be made in anybody's existing history. Another possibility is that nature might have an unbreakable law preventing time travelers from changing the past.

## Journey to the Future

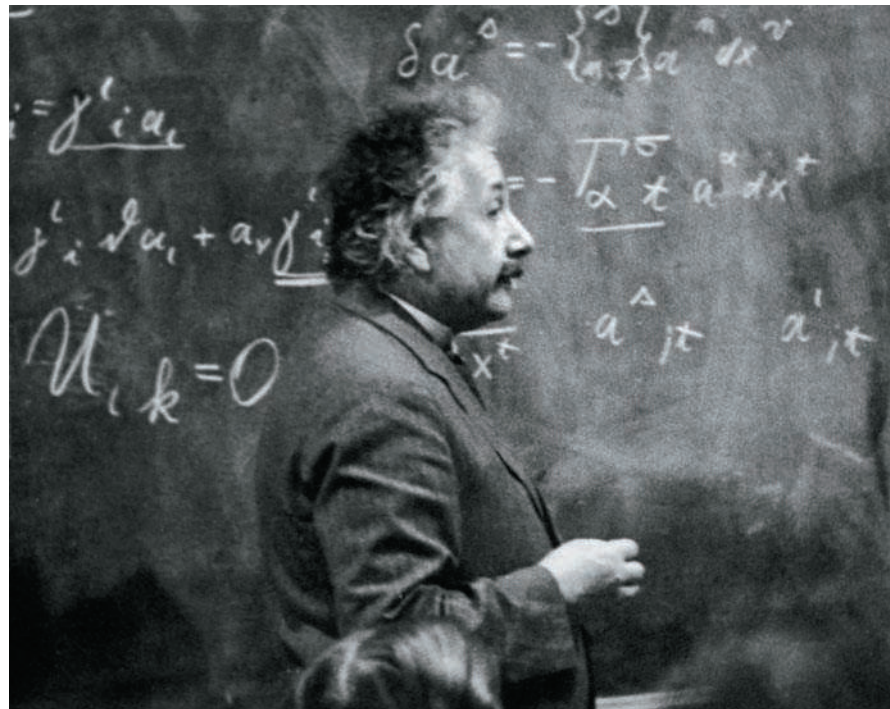
75 If we did discover a source of energy that would enable us to travel beyond lightspeed, we might have access not only to the past, but also to the future. Suppose you went on a super-lightspeed trek to the Spiral Nebula in the Andromeda Galaxy. That location is separated from Earth by 1,500,000 lightyears, the distance light travels in 1,500,000 years. Suppose you make the round trip in 80 just a few moments. If all goes well, you'll return to the Earth 3,000,000 years into its future, because that's how much Earth time will have elapsed.

Time is an abstraction. In other words, it cannot be seen, touched, smelled, or tasted. It seems to have no existence apart from the events it measures, but something tells us that time is out there, somewhere. "When we pursue the 85 meaning of time," according to the time-obsessed English novelist-playwright J. B. Priestly, "we are like a knight on a quest, condemned to wander through

innumerable forests, bewildered and baffled, because the magic beast he is looking for is the horse he is riding.”

90 What about our quest for particles that travel faster than light? If we find them, will we be able to control their energy to tour the past? If we return to our past, will we be forced to repeat our mistakes and suffer the same consequences? Or will we be able to use our experience to make everything turn out better the second time around?

95 Will we ever be able to take instant trips to the distant future, the way people do in the movies, with a twist of a dial and a “Zap!, Zap!” of sound effects? One cannot resist the temptation to respond that only time will tell.



## Fact-Finding Exercise

Read the passage again. Then read the following statements. Scan the article quickly to see if they are True (T) or False (F). If a statement is false, rewrite it so that it is true.

- 1 \_\_\_\_\_ T \_\_\_\_\_ F If you could move at the speed of light, your time would move backward.  
\_\_\_\_\_
- 2 \_\_\_\_\_ T \_\_\_\_\_ F Scientists have discovered a form of matter that moves as fast as light.  
\_\_\_\_\_
- 3 \_\_\_\_\_ T \_\_\_\_\_ F Scientists have done experiments which show that the stretching of time increases with speed.  
\_\_\_\_\_
- 4 \_\_\_\_\_ T \_\_\_\_\_ F Both speed and gravity slow time.  
\_\_\_\_\_
- 5 \_\_\_\_\_ T \_\_\_\_\_ F The closer you are to the Earth's core, the faster you will age.  
\_\_\_\_\_
- 6 \_\_\_\_\_ T \_\_\_\_\_ F Some people worry that if you could go back in time, you might change the present.  
\_\_\_\_\_



# Reading Analysis

Read each question carefully. Circle the number or letter of the correct answer, or write your answer in the space provided.

- 1 Read lines 4–5.
- a. What is the speed of light?
- 
- b. What does **your time would stand still** mean?
1. Your time would speed up.
  2. Your time would reverse.
  3. Your time would stop.
- 2 Read lines 9–11: “Einstein predicted **this** in 1905.” What does **this** refer to? In other words, what did Einstein predict?
- 
- 
- 3 Read lines 11–13.
- a. **Under way** means that the search is
1. being done now
  2. finished
  3. under a method
- b. **Suspected existence** means that
1. people have found these particles
  2. people believe these particles exist
  3. people do not believe these particles exist
- c. What are our **passports to the past**?
- 
-



4 Read lines 21–22. In this sentence, scientists mean that an airplane trip might

- a. make you younger
- b. speed up the aging process
- c. make you older

5 Read line 28. **Frankly** means

- a. actually
- b. on the contrary
- c. obviously

6 In lines 28–29, an **infinitesimal** saving of time is

- a. a large amount
- b. an average amount
- c. a very small amount

7 In lines 32–33, **tomorrow** refers to

- a. the day after today
- b. some time in the future
- c. some time next year

8 Read lines 33–38.

a. What is this imaginary situation commonly known as?

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---

b. How do you know?

---

c. **Back and forth** means

1. travel to the nearest star and then return to Earth
2. travel to the nearest star two times
3. travel back to the nearest star after you've been there

9 Read line 41. **Whiz** means

- a. age
- b. change
- c. move

10 Read lines 44–46. Why is “**curves**” in quotation marks?

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---

11 Read lines 70–74. What is this imaginary situation an example of?

---

---

12 Read lines 75–76. What is the purpose of **did**?

- a. To ask a question
- b. To show emphasis
- c. To express the past

13 In lines 79–80, what does **round trip** mean?

---

---

14 Read lines 84–88.

a. What does **quest** mean?

---

---

b. How do you know?

---

---

---



# Information Organization

Read the article again. Underline what you think are the main ideas. Then scan the article and complete the following table, using the sentences that you have underlined to help you. You will use this table later to answer specific questions about the article. Not all the boxes will be filled in.

	Speed	Gravity
Time speeds up		
Time slows down		
Time stops		
Experimental evidence		
Hypothetical example		

# Information Organization Quiz and Summary

Read each question carefully. Use your notes to answer the questions. Do not refer back to the text. When you are finished, write a brief summary of the article.

1 How does the speed of light affect time?

---

---

2 Describe the evidence which shows that time is affected by speed.

---

---

3 Describe the evidence which shows that time is affected by gravity.

---

---

4 How would time reversal change cause and effect?

---

---

## Summary

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# Dictionary Skills

Read the dictionary entry for each word. Then look at how the word is used in the sentence. Write the number of the correct definition and the synonym or meaning in the space provided. Remember that you may need to change the wording of the definition in order to have a grammatically correct sentence.

- 1 **matter** *n* **1** **a**: a subject under consideration **b**: a subject of disagreement or litigation **c** *pl*: the events or circumstances of a particular situation **d**: the subject or substance of a discourse or writing **e**: something of an indicated kind or having to do with an indicated field or situation **f**: something to be proved in law **g**: *obsolete*: sensible or serious material as distinguished from nonsense or drollery **h** (1) *obsolete*: reason, cause (2): a source *esp* of feeling or emotion **i**: problem, difficulty **2** **a**: the substance of which a physical object is composed **b**: material substance that occupies space, has mass, and is composed predominantly of atoms **3** **a**: the indeterminate subject of reality; *especially*: the element in the universe that undergoes formation and alteration **b**: the formless substratum of all things which exists only potentially and upon which form acts to produce realities . . .

No form of ( ) \_\_\_\_\_ has yet been discovered that moves as fast or faster than light.

- 2 **stretch** *v* **1**: to extend (as one's limbs or body) in a reclining position **2**: to reach out: extend **3**: to extend in length . . . **6**: to draw up (one's body) from a cramped, stooping, or relaxed position **7**: to pull taut **8** **a**: to enlarge or distend *esp* by force **b**: to extend or expand as if by physical force **c**: strain **9**: to cause to reach or continue (as from one point to another or across a space) **10** **a**: to amplify or enlarge beyond natural or proper limits **b**: to expand (as by improvisation) to fulfill a larger function . . .

Experiments with atomic clocks show that it is possible to ( ) \_\_\_\_\_ time.

**3** **determine** *v* **1** **a** : to fix conclusively or authoritatively **b** : to decide by judicial sentence **c** : to settle or decide by choice of alternatives or possibilities **d** : resolve **2** **a** : to fix the form, position, or character of beforehand : ordain **b** : to bring about as a result : regulate **3** **a** : to fix the boundaries of **b** : to limit in extent or scope **c** : to put or set an end to : terminate **4** : to find out or come to a decision about by investigation, reasoning, or calculation **5** : to bring about the determination of

Einstein ( ) \_\_\_\_\_ in his General Theory of Relativity that the force of an object's gravity "curves" the space in the object's gravitational field.

**4** **speculate** *vi* **1** **a** : to meditate on or ponder a subject : reflect **b** : to review something idly or casually and often inconclusively **2** : to assume a business risk in hope of gain; *especially* : to buy or sell in expectation of profiting from market fluctuations *vt* **1** : to take to be true on the basis of insufficient evidence: theorize **2** : to be curious or doubtful about: wonder <speculates whether it will rain all vacation>

Open-minders ( ) \_\_\_\_\_ that time-travelers who change the past would be opening doors to alternative histories, rather than interfering with known history.

# Word Forms

## PART 1

In English, some verbs become nouns by adding the suffix *-ance* or *-ence*, for example, *appear* (v.), *appearance* (n.).

Complete each sentence with the correct form of the words on the left. **Use the correct tense of the verbs, in either the affirmative or the negative form.**

**avoid** (v.)

**avoidance** (n.)

1 Monica regularly \_\_\_\_\_ exposure to the sun. Her careful \_\_\_\_\_ of the sun is due to persistent skin problems.

**resist** (v.)

**resistance** (n.)

2 It is a well-known fact that stress lowers the body's \_\_\_\_\_ to illness. It is logical, then, that we \_\_\_\_\_ disease better when we maintain good health and avoid stressful situations.

**accept** (v.)

**acceptance** (n.)

3 Gloria's English teacher \_\_\_\_\_ any papers that are more than two days late. This is her policy. Her professor's \_\_\_\_\_ of papers also depends on whether the students have followed her guidelines for the format of the paper, such as double spacing.

**insist** (v.)

**insistence** (n.)

4 Arthur invariably \_\_\_\_\_ on having dinner at the same time every day. His \_\_\_\_\_ on the same dinnertime isn't his only odd habit. He also insists on eating the same breakfast, and going to the same place for vacation every year.



**exist** (v)

**existence** (n.)

- 5 There is a myth about a creature called the Abominable Snowman, which some people believe \_\_\_\_\_ somewhere in the Himalaya Mountains. There is also a legend about the \_\_\_\_\_ of a giant creature called Sasquatch, or Bigfoot, which supposedly lives in the Pacific Northwest.

## PART 2

In English, some verbs become adjectives by adding the suffix *-al*, for example, *cause* (v.), *causal* (adj.).

Complete each sentence with the correct form of the words on the left. **Use the correct tense of the verbs, in either the affirmative or the negative form.**

**survive** (v.)

**survival** (adj.)

- 1 Mark and Laura were stranded in the mountains in the middle of a severe snowstorm. They needed basic \_\_\_\_\_ skills in order to stay alive. They \_\_\_\_\_ the bitter cold because they found a small cave, which protected them from the harsh weather until a rescue team found them two days later.

**arrive** (v.)

**arrival** (n.)

- 2 Ted's children eagerly awaited the \_\_\_\_\_ of their father at the airport. When Ted finally \_\_\_\_\_, the children greeted him very excitedly. He had been away for a long time!

**experiment** (v.)

**experimental** (adj.)

3 Scientists in the pharmaceutical laboratory are working on a new drug, but it is in the \_\_\_\_\_ stage. Doctors cannot prescribe it yet. The scientists \_\_\_\_\_ successfully with the drug in the laboratory; now they need to test it on human volunteers.

**cause** (v.)

**causal** (adj.)

4 When researchers try to establish what \_\_\_\_\_ a given disease, they look for relationships between certain factors and the onset of the disease. Sometimes it is difficult to establish a clear \_\_\_\_\_ relationship between the disease and a particular factor.

### Word Partnership

Use **experiment** with:

- v. **conduct an** experiment,  
**perform an** experiment, **try an** experiment
- adj. **scientific** experiment,  
**simple** experiment

### Word Partnership

Use **cause** with:

- v. **determine the** cause,  
**support a** cause
- n. cause **of death**, cause **an accident**,  
cause **cancer**, cause **problems**,  
cause **a reaction**, cause **for concern**

# Critical Thinking Strategies

Read each question carefully, and write a response. Remember that there is no one correct answer. Your response depends on what **you** think.

- 1 In line 1 of the article, the author refers to a proverb, "Time waits for no one." What do you think this proverb means? Why do you think the author mentioned this proverb with regard to the topic of the reading?

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- 2 Read lines 42–44. Why do you think time-stretching cannot be tested with any spacecraft we have today?

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- 3 Read lines 61–65. What do you think **reversal of cause and effect** means? What do you think about this argument against travel to the past?

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- 4 Read lines 82–88. What do you think is the purpose of this reference to a knight on a quest? In other words, what image do you think the author wants us to visualize? Why?

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## H

## Topics for Discussion and Writing

- 1 Imagine that you could travel to the past. What is the one historical event you would like to change? Why do you want to change it? How would you change it? What consequences might this change have for the present?
- 2 Would you like to see the future? Why? What year do you want to visit? Explain.
- 3 Imagine that time travel is possible. Do you think there should be restrictions on this type of travel? For example, many countries have visa and immigration restrictions. Should there also be restrictions on time travel? If so, what restrictions do you suggest? Who would be in charge of making these rules and enforcing them?
- 4 **Write in your journal.** Imagine that you could travel back in time. Choose a person from the past you would like to meet. Explain why you would like to meet this person.

## I

## Follow-Up Activities

- 1
  - a. Refer to the Time Preference Survey on page 236. Discuss it in class to make sure you understand the questions.
  - b. With a partner or alone, go outside your class and survey two or three people.
  - c. Bring back your data and combine it with the other students' information. Create a bar graph or other chart to compile your data. Divide your responses by past, present, and future. Then divide those responses by gender and/or by age. What do you observe about the responses? Are there any observable patterns by gender or by age? Speculate on the reasons why these groups prefer a particular time.

## TIME PREFERENCE SURVEY

	1	2	3
Informant's Gender (M / F)			
Informant's Age Group (under 20 / 20–25 / 26–30 / 31–35 / 36–40 / 41+)			
1. If you could travel through time, when would it be: the past / the present / the future?			
2. If you prefer the past, why would you go back?			
3. If you prefer the present, why would you stay here?			
4. If you prefer the future, why would you go there?			

# Cloze Quiz

Complete the passage with words from the list. Use each word only once.

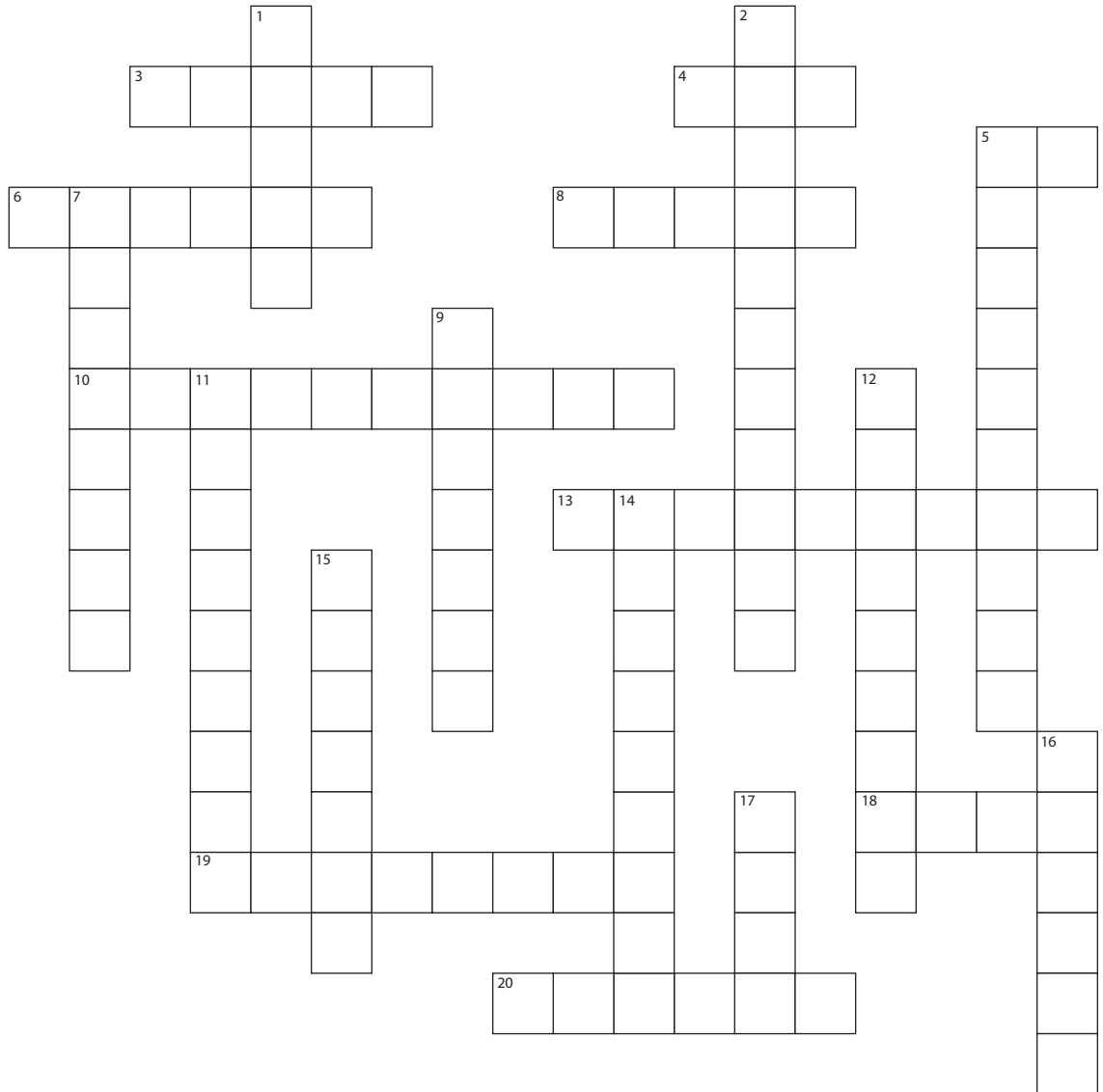
<b>concept</b>	<b>light</b>	<b>return</b>	<b>survive</b>
<b>contrary</b>	<b>motion</b>	<b>slows</b>	<b>than</b>
<b>experiments</b>	<b>move</b>	<b>space</b>	<b>time</b>
<b>faster</b>	<b>part</b>	<b>speed</b>	<b>waits</b>
<b>future</b>	<b>predicted</b>	<b>still</b>	<b>yet</b>

\_\_\_\_\_ (1) to the old warning that time \_\_\_\_\_ (2) for no one, \_\_\_\_\_ (3) slows down when you are on the move. It also \_\_\_\_\_ (4) down more as you move \_\_\_\_\_ (5), which means astronauts someday may \_\_\_\_\_ (6) so long in \_\_\_\_\_ (7) that they would \_\_\_\_\_ (8) to an Earth of the distant \_\_\_\_\_ (9). If you could move at the \_\_\_\_\_ (10) of light, 186,282 miles a second, your time would stand \_\_\_\_\_ (11). If you could move faster \_\_\_\_\_ (12) light, your time would \_\_\_\_\_ (13) backward.

Although no form of matter \_\_\_\_\_ (14) discovered moves as fast or faster than \_\_\_\_\_ (15), scientific \_\_\_\_\_ (16) have confirmed that accelerated \_\_\_\_\_ (17) causes a voyager's, or traveler's, time to be stretched. Albert Einstein \_\_\_\_\_ (18) this in 1905, when he introduced the \_\_\_\_\_ (19) of relative time as \_\_\_\_\_ (20) of his Special Theory of Relativity.

## Crossword Puzzle

Read the clues on the next page. Write the answers in the correct spaces in the puzzle.



## Crossword Puzzle Clues

### ACROSS CLUES

3. The same
4. The past tense of **put**
5. The Ice Man had an \_\_\_\_\_ made of copper.
6. A dead body
8. The past tense of **write**
10. Our house has \_\_\_\_\_ in the walls to help keep it warm in the winter.
13. The two countries want to \_\_\_\_\_ a peace treaty.
18. The past tense of **come**
19. The police look for clues, or \_\_\_\_\_, to help them solve crimes.
20. The universe is made up of \_\_\_\_\_

### DOWN CLUES

1. Harry is on a \_\_\_\_\_ to find the truth.
2. In addition
5. \_\_\_\_\_ is the coldest place on Earth.
7. Usual; routine
9. Is it possible to \_\_\_\_\_, or extend, time?
11. People often \_\_\_\_\_, or wonder, about the possibility of time travel.
12. Many scientists believe in the \_\_\_\_\_ of life on other planets.
14. We need a lot of gear, or \_\_\_\_\_, when we go camping in the woods.
15. Many businesses around the world would like to \_\_\_\_\_ Antarctica's natural resources.
16. The middle of the desert is a very \_\_\_\_\_ and lonely place.
17. Area; location



## Discussion

1. Modern technology has given us insights into the past, the present, and the future. What do you think is the greatest technological advance we have made so far? How will it help us better understand the past, the present, and the future?
2. If time travel to the past were possible today, it would be very easy for us to learn about ancient civilizations. Imagine that time travel to the future is also possible. What do you think would be the biggest advantage to knowing the future? What would be the biggest disadvantage? Explain your answer.
3. Imagine that you could travel 500 years into the future in Antarctica. What do you think you would see there? What country or countries would “own” Antarctica? Why? Explain your answer.
4. People sometimes want to save a “picture” of the time they live in for people in the future to see. They select objects to preserve so that people can look at them at a specific time in the future. A time capsule is a sealed container that people use in order to preserve these objects. You are a member of a committee whose job it is to prepare a time capsule for this year. The time capsule will not be opened until the year 3000. Discuss with the other members of your committee what you would like to put into the time capsule in order to show what this year was like.