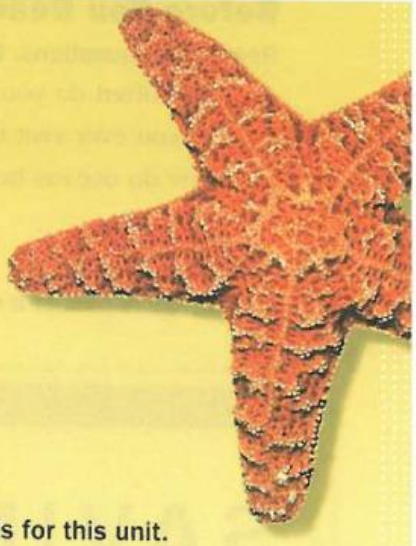
UNIT 9

Sea of Life



In this unit, you will

- learn about humans' impact on oceans and important deep-sea discoveries.
- review identifying definitions.
- increase your understanding of the target academic words for this unit.

READING SKILL Reading Statistical Tables

Self-Assessment

Think about how well you know each target word, and check (✓) the appropriate column. I have...

TARGET WORDS	never seen the word before	seen the word but am not sure what it means	seen the word and understand what it means	used the word, but am not sure if correctly	used the word confidently in *either* speaking *or* writing	used the word confidently in *both* speaking *and* writing
AWL						
aggregate						
annual						
compatible						
conduct						
contribute						
erode						
finite						
impact						
occupy						
process						
temporary						
terminate						
trace						
ultimate						

Outside the Reading What do you know about oceanography? Watch the video on the student website to find out more.

Oxford 3000™ keywords

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Before You Read

Read these questions. Discuss your answers in a small group.

1. How often do you eat fish?
2. Do you ever visit the ocean to go fishing or to relax on a beach?
3. How do oceans benefit people?

Read

This article is part of a series of articles about our changing oceans.

SAVING THE OCEANS

The oceans of the world **occupy** over 70% of the earth's surface. They provide food for billions of people, serve as places of recreation, and facilitate the transportation of passengers and cargo. For all of human history, people regarded the oceans as an indestructible and **infinite** resource. Until recently, humans had little **impact** on the oceans. However, as the earth's population increases, human activity will **ultimately** destroy the oceans unless immediate steps are taken.

OVERFISHING

Overfishing is one major threat. Fish are being taken out of the oceans faster than the remaining fish can reproduce. A big fish—tuna, cod, shark, or swordfish—yields many pounds of delicious seafood when it reaches maturity. However, to meet the increasing demand for these fish, commercial fishermen began catching small, immature fish. In the **process**, they almost destroyed the species. Ocean scientists estimate that 90% of these big fish are now gone from the oceans, and about 30% of all fished species have been destroyed.

A commercial fishing operation

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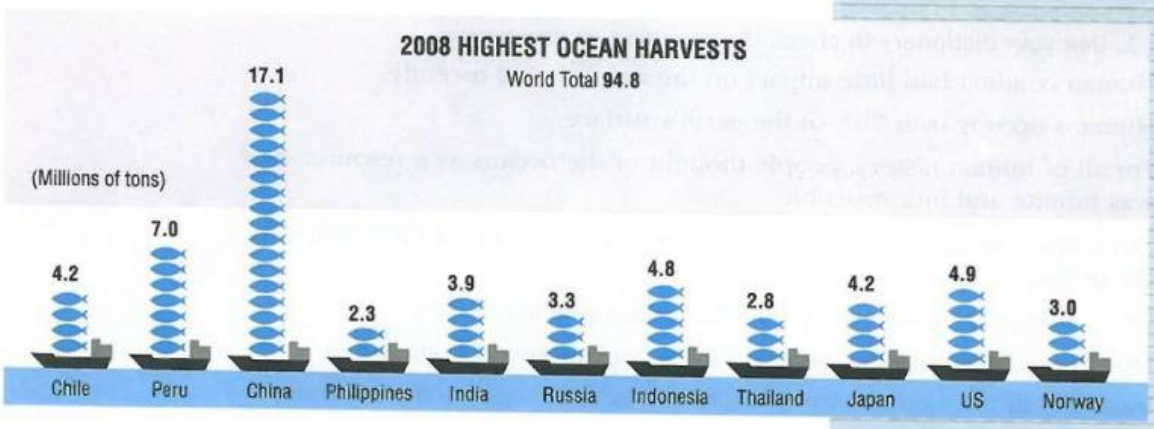
OCEANS AS A SOURCE OF FOOD

Of the earth's seven billion people, over one billion rely on fish as a source of protein. Billions more eat fish frequently because of its health benefits and its good taste. Throughout the world, food from the sea provides between 5% and 10% of the total food supply. But when fish disappear from the oceans, they will also disappear from our dinner plates. The **impact** on those who rely on fish could be malnutrition or even starvation.

HOW HUMANS IMPACT OCEANS

Humans are **impacting** ocean life not only by what they take out of the oceans, but also by what they put into the oceans. Carelessly discarded cans, bottles, plastic cups, and baby diapers find their way into the stomachs of fish, often killing them. Toxic chemicals and industrial trash are also discarded into the oceans, either accidentally or thoughtlessly. Such **conduct** pollutes the water and kills sea life. Spills from a single oil tanker can **contribute** 200,000 tons of oil to the already polluted oceans. In the United States, an estimated 15,000 tons of automobile oil **annually** washes off roads into rivers and streams and **ultimately** into the sea.

Trash that has ended up in the ocean



Along with the harmful oil, however, run-off also carries tons of nutrients in the form of plant matter, fertilizers, animal waste, and garbage that can be **traced** to cities, farms, factories, and forests. Poisonous algae and bacteria (microscopic plants and animals) in the ocean feed on the nutrients. As the run-off increases, the **aggregation** of algae and bacteria increases, further **eroding** the marine environment. Small fish that feed on the algae and bacteria are sickened or killed by the poisons they contain. When larger fish feed on the smaller ones, they too are

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sickened by the poisons. **Ultimately,** humans who eat the flesh of poisoned fish will be sickened, too.

STEPS THAT CAN SAVE THE OCEANS

Are healthy oceans **compatible** with an industrialized world? What can be done to **terminate** the steady destruction of the oceans? Among other steps, countries can set limits on the number of fish that fishermen can legally catch. Governments can also create sea reserves, areas where fishing is **temporarily** banned until the fish population increases. Commercial enterprises can develop open-ocean aquaculture to grow fish in underwater cages miles from land. And individuals can refuse to buy fish in restaurants and markets if the species is threatened.

Governments can also protect the sea by enacting strict controls on ocean dumping. They can demand that oil tankers have higher safety standards. They can **process** run-off water to remove toxic substances. Individuals can properly dispose of leftover household and garden chemicals so they do not add to the toxic run-off into the oceans.

Scientists agree that it's not too late to save the oceans, but we must begin at once to take the necessary steps.

Reading Comprehension

Mark each sentence as *T* (True) or *F* (False) according to the information in Reading 1. Use your dictionary to check the meaning of new words.

___ 1. Human conduct had little impact on the oceans until recently.

___ 2. Humans occupy over 70% of the earth's surface.

___ 3. For all of human history, people thought of the oceans as a resource that was infinite and indestructible.

___ 4. Steps must be taken to terminate human activity that may ultimately erode the quality of the oceans.

___ 5. Overfishing may temporarily benefit certain species of fish.

___ 6. Discarding trash into the oceans greatly contributes to pollution.

___ 7. Increases in the aggregation of algae and bacteria can be traced to the nutrients in run-off from cities, farms, factories, and forests.

___ 8. Oil tankers annually spill 200,000 tons of oil into the oceans.

___ 9. It isn't possible to process run-off water to remove toxic substances.

___ 10. Healthy oceans are compatible with an industrialized world if necessary steps are taken to protect the oceans.

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READING SKILL Reading Statistical Tables

LEARN

Articles about scientific topics frequently contain statistics that support the information in the text. The table in Reading 1, for example, compares the amount of fish collected, or harvested, by several nations of the world to support the information about overfishing.

Numerical information in tables is often reduced for clarity. The table in Reading 1 eliminates the many zeros in the numbers by telling the reader that amounts are in million tons. So, for Chile, the number 4.2 really means that Chile harvested 4,200,000 tons of fish. Shortened numbers are read differently from complete numbers. Chile's harvest is read "four point two million tons."

Numbers in tables are also often rounded up or down. The actual number of fish might be 4,198,314 tons, for example, but that number is rounded up to 4.2 million tons.

APPLY

A. Complete the tasks with a partner. Use the information in the table in Reading 1.

1. In the order of their fish harvests, read all of the country names and their fish harvests out loud. Use shortened numbers, such as "Chile—four point two million tons."
2. From biggest harvest to smallest, write all of the complete numbers, such as 4,200,000. Then, read them out loud.

B. What can you infer from the information in the table? Mark a statement *I* if you can infer that it is true. Mark a statement *N* if you cannot infer that it is true.

N a. The United States harvested more fish in 2008 than in 2007.
___ b. Fishing is an important industry in these countries.
___ c. About half of the top countries are in Asia.
___ d. Indonesia harvested more fish than Norway.
___ e. The numbers do not include fish caught in rivers and lakes.
___ f. All the fish is eaten by people within the country that harvests it.
___ g. China harvested about 18% of the world total in 2008.
___ h. Canada did not harvest fish in 2008.

REVIEW A SKILL **Identifying Definitions** (See p. 69)

Find definitions in Reading 1 for the words *nutrients* and *algae*.

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Vocabulary Activities STEP I: Word Level

A. Use the target vocabulary in this unit to complete these analogies. Then write the type of relationship each analogy has: example, synonym, antonym, action, or part. (See Unit 1, page 13, for more on analogies.)

	Relationship
1. start : end AS begin : _____	_____
2. house : permanent AS tent : _____	_____
3. grow : build AS destroy : _____	_____
4. player : team AS part : _____	_____
5. phase : development AS step : _____	_____

B. *Erosion* is the gradual process of something being destroyed or worn away. It can describe natural or biological processes or more abstract ideas. The verb form is *erode*. With a partner, decide what might cause the erosion of the following.

1. mountains
2. a person's health
3. the soil on a farm
4. a store's reputation
5. a person's plans to travel
6. a friendship

The verb *aggregate* (pronounced AG-gre-gate, with a slight stress on the last syllable) means to collect items into one body or mass.

*The company will **aggregate** its small stores into one superstore.*

The adjective form is spelled the same way but is pronounced slightly differently (AG-gre-git, no stress on the last syllable).

*The **aggregate** effect of pollution is depletion of sea life.*

The noun has two forms: *aggregate* (pronounced like the adjective) and *aggregation*.

CORPUS

C. With a partner, decide what to call an aggregation of these items. More than one answer is possible.

1. an aggregation of stores: *a shopping mall, a shopping center*
2. an aggregation of books: _____
3. an aggregation of plants: _____
4. an aggregation of people: _____
5. an aggregation of printed pages: _____

D. An annual event is one that occurs once a year or is repeated every year. With a partner, check (✓) the events that occur annually. When in the year do they take place?

___spring	___your birthday	___new classes
___New Year's Day	___a wedding	___animal migration
___a full moon	___October	___family gatherings

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When something is *finite* (pronounced FI-nite, rhyming with SKY-light), it is fixed in space or amount and can be measured.

*The amount of oil in the world is **finite**. When we use it up, there is no more.*

Something *infinite* (pronounced IN-fi-nit) is without limits. This word is often used for something that seems endless, very great, or not measurable.

*She is **infinitely** patient with the children in her class.*

CORPUS

E. **With a partner, match each sentence on the left with one on the right that has the same meaning.**

___ 1. The oceans seem infinite.	a. There sure are lots of them.
___ 2. Oil tankers hold a finite amount of oil.	b. They seem to go on and on.
___ 3. Whales have a finite number of teeth.	c. They're really interesting.
___ 4. There's an infinite number of fish species.	d. They don't grow new ones.
___ 5. I am infinitely fascinated by whales.	e. They can't hold any more.

F. **With a partner, use the target vocabulary to complete this article on the impact of global climate change.**

annual	contributed	impact	traced
compatible	erosion	process	ultimately

Today there are 20,000 to 25,000 polar bears worldwide. This represents a decline of 21% over the last 20 years that can be directly (1) _____ to global climate change. As the average (2) _____ ocean temperature in the Arctic rises, the bear population declines. The bears' way of life is not (3) _____ with a warm climate because they depend on sea ice for summer hunting. The (4) _____ of global climate change has caused an (5) _____ of the polar bear environment. It has (6) _____ to weight loss in the males, falling reproduction rates in the females, and lower survival rates among newborn cubs. If the overall warming (7) _____ of global climate change continues at its present rate, the polar bears will (8) _____ disappear.

Vocabulary Activities STEP II: Sentence Level

When people or things are *compatible*, they get along well or work together well. The negative form is *incompatible*. The noun forms are *compatibility* and *incompatibility*.

*Ahmed and Hakim were successful business partners because they were **compatible**.*

*Electrical appliances are often **incompatible** with foreign power systems.*

CORPUS

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G. Work with a partner. Imagine that one of you has an old computer. That person goes to a computer store to buy some new equipment and software for it. The other person is a clerk in a computer store. Create a short conversation that includes the words *compatible*, *incompatible*, *compatibility*, and *incompatibility* in at least two questions and two answers between the two people.

A: Is this printer ***compatible*** *with my computer?*

B: Actually, ***incompatibility*** *is often a problem with these older models.*

The word *impact* has two meanings. It can refer to a strong force hitting something, or more abstractly, to the strong effect something has or creates. Both meanings have a noun and verb form.

We felt the ***impact*** *of the explosion a mile away.*
The world economy ***impacts*** *all our lives.*

H. In your notebook, rewrite each sentence two ways, using *impact* once as a noun and once as a verb.

1. The shortage of fish has affected the fishing industry.

   The shortage of fish has had an ***impact*** *on the fishing industry.*
   The shortage of fish has ***impacted*** *the fishing industry.*

2. Her new job affected the whole family.
3. The collision had a different effect on each of us.
4. The new law will change the way people pay their taxes.

To *contribute to* something means to add or give something to a larger activity.

The adjective form is *a contributing + factor/cause/element/etc.*

High winds ***contributed*** *to the accident.*
High winds were a ***contributing*** *factor to the accident.*

To *contribute* means to give money or assistance, usually to a charity. The noun form is *contribution*.

I ***contribute*** *annually to Save Our Oceans.*
I send a ***contribution*** *to the Red Cross, too.*

Collocations (words that go together): *to make/send a contribution*

I. In your notebook, rewrite the following sentences to include a form of *contribute*.

In April 2010, an explosion of an oil rig caused a massive oil spill in the Gulf of Mexico. BP owned the rig.

1. BP admitted to mistakes that helped cause the oil spill.

   BP admitted to mistakes that ***contributed*** *to the oil spill.*

2. Oil rose to the surface of the ocean. Strong winds made the oil spread over 4,000 square miles.
3. BP gave $20 billion to build a fund to help pay for damages and clean-up.
4. Thousands of volunteers gave money and time to help rescue sea animals.

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Before You Read

Read these questions. Discuss your answers in a small group.

1. Some people claim that we know more about the moon than we know about our oceans. Do you agree?
2. What is the value of exploring the ocean floors?
3. Who should pay for exploring the oceans? Why?

Metric conversions for measurements used in Reading 2:

1 inch = 2.54 centimeters	1 pound = 0.45 kilogram
1 foot = 0.3 meter	1 knot = 1.85 km/hour
1 mile = 1.6 kilometers	

Read

This article about underwater exploration appeared in a science magazine.

Exploring the Deep Ocean

Alvin can dive to ocean depths of 20,000 feet—nearly four miles down. Alvin can rest on the ocean bottom or hover at middle depths for up to ten hours, taking photographs and performing underwater experiments. Alvin is amazing. Many of the 150 to 200 dives Alvin makes **annually** result in underwater discoveries of unusual sights never before seen.

The deep-sea submersible, Alvin

FACTS ABOUT ALVIN

Alvin is not a man. Alvin is a deep-sea submersible craft capable of carrying up to three **occupants**. It is owned and operated by the Woods Hole Oceanographic Institution on the east coast of the United States. Alvin was built in 1964, but it has been upgraded and reconstructed many times since then. Alvin's titanium hull, or outside shell, is built to withstand the **impact** of the immense pressure of the deep ocean. Alvin weighs 37,400 pounds and is 23 feet 4 inches long. It has a six-mile range and a top cruising speed of two knots. Five hydraulic thrusters propel the craft, and lead-acid batteries power the electrical system.

Inside is an **infinite** variety of the latest electronic equipment, including a gyrocompass, a magnometer, and a computer **terminal**.

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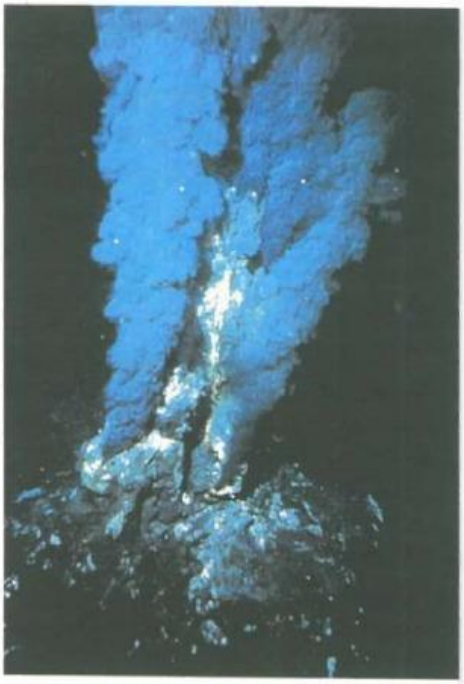
Alvin allows researchers to **conduct** underwater biological, chemical, and geological studies. Special lamps shine light into the black water so observers can see the wonders of the underwater environment. Cameras are mounted on the outside to take underwater photographs, and two external "arms" enable researchers to collect underwater samples.



A hydrothermal vent, or "chimney"

ALVIN'S AMAZING DISCOVERY

One day in 1977, Alvin **contributed** to an amazing discovery. On that day, Alvin was transporting scientists on a routine study. The craft was one and a half miles below the surface of the sea near the coast of the Galapagos Islands. As they looked through the three 12-inch portholes, the scientists were **temporarily** stunned to see a strange underwater landscape littered with what looked like chimneys. The chimneys were discharging clouds of black smoke into the surrounding water. Clustered around the chimneys was an **aggregation** of odd creatures that lived totally cut off from the world of sunlight. The scientists were looking at hydrothermal vents and the strange sea creatures that exist near them—an entire system of life based not on sunlight, but on energy from the earth itself.

STRANGE SEA CREATURES

An unusual kind of animal life exists around these vents. Among the chemicals pouring out of the vents is hydrogen sulfide, a gas that is poisonous to most land-based life. However, bacteria in the seawater near the vents feed on this gas and other dissolved chemicals and minerals pouring from the vents. Then tiny animals feed on the bacteria, and these tiny animals **ultimately** become food for still larger animals. Giant red and white tube worms eight feet tall cluster near the vents and dominate the scene. Tiny shrimps and white crabs feed on the worms while giant clams rest in the sand. In an environment that seems **incompatible** with life, these creatures are thriving.

Ocean life growing near the vents

WHAT IS IN THE FUTURE?

Since the first vent was discovered in 1977, hundreds of other vents have been located in oceans around the world. In 2008, a cluster of five vents was discovered in the Atlantic Ocean between Greenland and Norway. Some of the sites are inaccessible, so scientists have not been able to study them all. However, scientists are planning to **trace** the development of vents by revisiting some they studied earlier. They want to find out if the vents will **erode** or remain active over time and if the odd creatures will change. ■

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Reading Comprehension

Mark each statement as *T* (True) or *F* (False) according to the information in Reading 2. Use your dictionary to check the meaning of new words.

___ 1. Alvin makes between 150–200 dives annually.

___ 2. Alvin is a man who temporarily helped researchers conduct underwater studies aboard a submersible craft.

___ 3. Alvin's occupants have an infinite variety of electronic equipment available.

___ 4. Alvin contributed to the discovery of the Galapagos Islands in 1977.

___ 5. Near vents, aggregations of giant tube worms, shrimps, and crabs exist in an environment that seems incompatible with life.

___ 6. Scientists plan to revisit some of the vents in order to trace their development.

___ 7. Scientists will terminate their study of vents because some vents are inaccessible.

READING SKILL Reading Statistical Tables

LEARN

Facts about numbers are often difficult to read when they are included as part of the text of an article. For this reason, scientists and technicians usually create a specification sheet, or "spec sheet," to isolate these numbers.

APPLY

Using information from Reading 2, complete this spec sheet about Alvin. You may use the system of measurement in the article or convert those numbers to the metric system.

Alvin General Specifications	
Length	
Weight	
Maximum Depth	
Maximum Speed	
Range	
Occupants	
Propulsion	
Electrical System	
Equipment (Internal)	
Equipment (External)	

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Vocabulary Activities STEP I: Word Level

Something *temporary* exists or is used for only a short time. *Temporarily* is the adverb form.

*The **temporary** ban on tuna fishing ended last week.*

*Shipping was **temporarily** halted by a tsunami.*

CORPUS

A. With a partner, decide which of these are temporary.

___ a summer job	___ a mountain	___ a substitute teacher
___ a street name	___ a rainstorm	___ an oil spill
___ a cloud	___ a full moon	___ an emergency
___ a highway	___ a puddle of mud	___ an ocean

Literally, *ultimate* refers to the last or final thing. More commonly, it is used to indicate an extreme, such as the best or worst. *Ultimately* can mean "finally" or "basically."

*For me, the **ultimate** vacation is two weeks aboard a luxury cruise ship.*

*We tried to fix it several different ways but **ultimately** decided to buy a new one.*

CORPUS

B. With a partner, think of different ways to end these sentences.

1. I waited for a long time, hoping to catch a fish. Ultimately, . . .

   ***Ultimately,** I gave up and went home.*

   ***Ultimately,** I caught a big one.*

2. We couldn't decide where to eat dinner. My friend wanted Chinese food and I wanted seafood. Ultimately, . . .
3. The turtle struggled to get back into the water. Ultimately, . . .
4. My cell phone was making odd noises. I shook it and banged it on the table. Ultimately, . . .
5. The ultimate in awful food is . . .
6. We are almost finished painting the house. The ultimate step is . . .

Word Form Chart

Noun	Verb	Adjective	Adverb
terminal termination	terminate	terminal	terminally

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The word *terminate* and its forms have many uses, all related to "end" or "ending."

*I **terminated** the agreement with my cell phone company because their service was bad.*

*Failure to follow the rules will result in **termination** of the game.*

*Ed was **terminated** after working for the company ten years.*

*My grandfather has **terminal** cancer.*

*Her plane arrives at **Terminal** C, Gate 7, at 7:36 p.m.*

*Each office had forty or more computer **terminals**.*

Note: *terminate* cannot be used in place of *ultimate*.

CORPUS

C. **With a partner, match each sentence on the left with the one that explains it on the right.**

___ 1. Pedro terminated the lease on his apartment.	a. He was fired.
___ 2. Filipe's uncle has a terminal illness.	b. He hung up.
___ 3. Hiro was terminated from his job.	c. He wanted to take a bus.
___ 4. Hans waited at the downtown terminal.	d. He is very ill.
___ 5. Pham spent hours at his desk terminal.	e. He's moving soon.
___ 6. Suhart terminated the phone conversation.	f. He used his computer.

A *trace* is evidence that something happened or existed.

*I could see **traces** of mice in the garage.*

A *trace* is also a small bit of something.

*The river had **trace** amounts of toxic substances in it.*

To *trace* something is to follow its history or development. Not everything is *traceable*. Sometimes records are lost or unknown.

*The book **traced** the history of deep-sea exploration.*

*The oil spill was **traceable** to a small tanker in the North Sea.*

Another meaning for *trace* is to copy the outlines of a diagram or picture.

*He put a piece of paper over the picture and carefully **traced** its shape.*

CORPUS

D. **With a partner, match the person on the left with the kind of tracing he or she might do. Take turns making sentences.**

a 1. an artist	a. a picture

*An artist might **trace** a picture.*

___ 2. the post office	b. a family history
___ 3. a scientist	c. the life cycle of a whale
___ 4. a grandmother	d. a lost package
___ 5. the police	e. the letters of the alphabet
___ 6. a small child	f. the owner of an abandoned car

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Vocabulary Activities STEP II: Sentence Level

The word *conduct* has different meanings in its noun and verb forms.

As a verb, *conduct* (pronounced con-DUCT) refers to something that you organize and carry out. It can also mean to lead an activity or group. This meaning has no other word forms.

*Scientists **conducted** several underwater experiments.*

*She has **conducted** a number of choirs.*

Collocations (words that go together):

an experiment	an investigation	a test	a meeting
an orchestra	a class	a tour	a search
a survey	a demonstration	a project	a discussion

The noun (pronounced CON-duct) is a more formal word for *behavior.*

*This is clearly a case of improper professional **conduct**.*

CORPUS

E. **Match the people in the first column with an activity in the second column and the purpose or topic of their activity in the third column. Write complete sentences in your notebook using different forms of the verb *conduct*.**

*A visiting professor **conducted** a class on the future of sea exploration.*

1. ~~a visiting professor~~	a survey	playing his Symphony in F
2. detectives	~~a class~~	for the missing murder weapon
3. marketers	an experiment	to identify future customers
4. a famous composer	a search	~~the future of sea exploration~~
5. ocean scientists	a local orchestra	on poisonous algae

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Word Form Chart			
Noun	**Verb**	**Adjective**	**Adverb**
occupancy occupant	occupy	occupied occupying	_____
occupation	_____	occupational	occupationally

The word *occupy* has several meanings.

To have possession of a particular physical space:

*Do you know who **occupies** that apartment?*

*Hotel rates are based on double **occupancy**; there is an extra charge for a third person.*

To fill a space, a period of time, or one's thoughts:

*Studying **occupied** my weekends until I graduated.*

Politically, to take over a country or area by force and run it:

*A foreign army once **occupied** this country. The **occupation** began in 1850.*

The noun form *occupation* refers to the work that a person does.

*Everyone in my family has the same **occupation**—we're all farmers.*

*A police officer has to face many **occupational** hazards.*

If something is *occupied*, it is in use. If a person is *occupied*, then she is busy.

*The bathroom was **occupied**, so I waited my turn.*

*I am **occupied** all day with meetings.*

F. **In your notebook, rewrite the following sentences to include the given form of *occupy*.**

1. There is a computer inside Alvin. (*occupies*)

   *A computer **occupies** space inside Alvin.*

2. Dr. Lee works as an ocean scientist. (*occupation*)
3. Alvin has room for three people. (*occupants*)
4. Scientists spend most of their time looking out of the view ports. (*occupies*)
5. Giant tube worms live in an underwater environment without sunlight. (*occupy*)

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