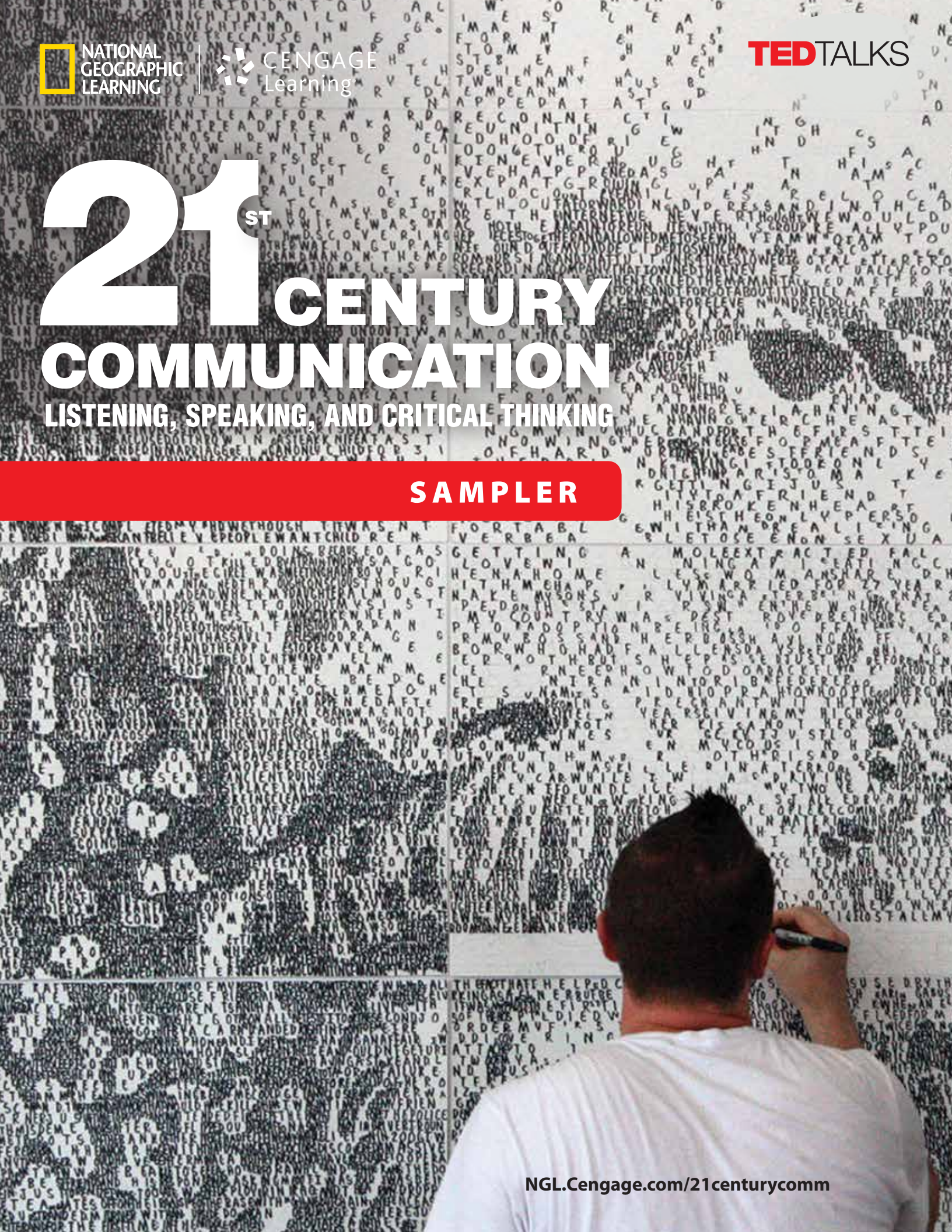
NATIONAL GEOGRAPHIC LEARNING | CENGAGE Learning

TEDTALKS

21ST CENTURY COMMUNICATION

LISTENING, SPEAKING, AND CRITICAL THINKING

SAMPLER



NGL.Cengage.com/21centurycomm

Inspiring Communication

TED Talks programs with National Geographic Learning take inspiring ideas and examples of effective communication from the TED stage to enable learners to express themselves thoughtfully and confidently in English.

Through use of the TED Talks and related, relevant content, National Geographic Learning and TED prompt learners to ask "Isn't this interesting?" We want to focus the learner's journey around questions like "What if?", "Have you ever wondered?", and "Could this be true?" To achieve this, our learning materials use 21st century themes and topics to help learners of English explore ideas and learn about creative solutions.

National Geographic Learning materials created with TED Talks introduce authentic and compelling content to the English language learning classroom. Alongside content from National Geographic and with one-of-a-kind instructional support, the inspiring ideas introduced on the TED stage provide a springboard for learners to express themselves thoughtfully and confidently in English.

Explore 21st century themes

The 21st century themes and topics featured in our learning materials bring real and relevant content to the classroom, encouraging learners to explore ideas that they will *want* to talk about!

Learn from inspiring speakers

Inspiring thinkers, doers, and innovators have shared their ideas on the TED stage and generated billions of views at TED.com. Each speaker is a respected leader in their field and has been selected because they have an idea worth spreading — and the skills to share it!

Develop essential skills

Programs created with TED Talks develop essential language and skills for learners to succeed in today's global society. Each program teaches important language and incorporates 21st century skills such as global awareness, information literacy, and critical thinking.


Alan Savory


Hetain Patel

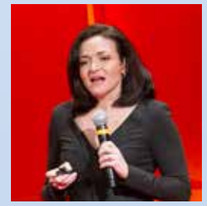

Marco Tempest


Iwaan Baan


Angela Lee Duckworth


Richard Turere


Charmian Gooch


Sheryl Sandberg

To learn more about all of our materials with TED Talks, please visit NGL.Cengage.com/TED

21st Century Communication: Listening, Speaking, and Critical Thinking is a four-level series that uses powerful ideas from **TED Talks** to teach learners to think critically and communicate effectively. Through authentic models of effective communication, students build fluency in the listening and speaking skills needed to achieve academic and personal success.

21st Century Skills


UNIT 6
Lending a Hand

An organization in Rajpal, India, teaches women the skills to build and repair solar-powered lanterns.

THINK AND **DISCUSS**

1 Look at the photo and read the caption. How do you think the lives of these women have changed?
2 Read the unit title. What do you think "lending a hand" means?

PART 1
Microloans: Breaking the Cycle of Poverty
Note Taking Use Symbols
Listening Recognize Facts and Opinions
Speaking Express an Opinion
Pronunciation Speak in Thought Groups

PART 2
TEDTALKS
Joy Sun
Should you donate differently?

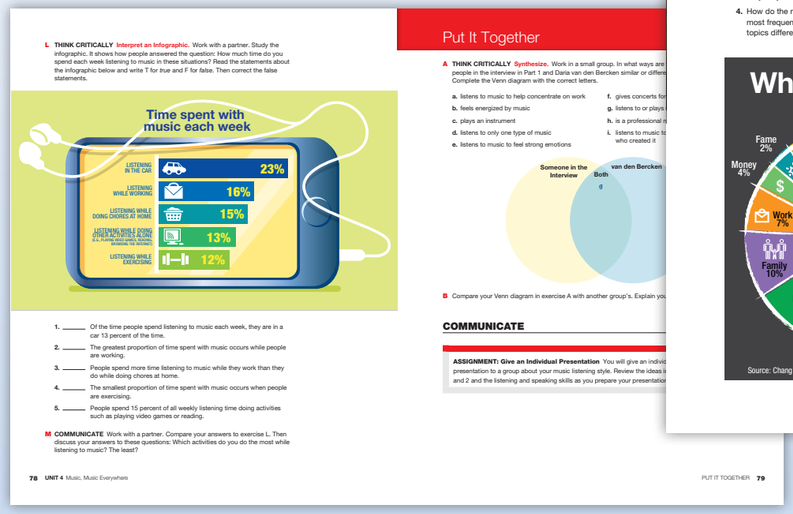
PUT IT TOGETHER
Communicate Participate in a Role Play
Presentation Skill Be Personable

103

Each unit focuses on a **21st century theme that affects everyone in a global society**, including:

- Innovation
- Conservation
- Business
- Visual Arts
- Education
- Design
- Technology
- And more!

TED Talks are used to develop **essential 21st century skills**, including critical thinking, collaboration, and visual literacy.


L THINK CRITICALLY **Interpret an Infographic.** Work with a partner. Study the infographic. It shows how people answered the question: How much time do you spend each week listening to music in these situations? Read the statements about the infographic below and write T for true and F for false. Then correct the false statements.

Time spent with music each week

LISTENING IN THE CAR 23%
LISTENING WHILE WORKING 16%
LISTENING WHILE DOING CHORES AT HOME 15%
LISTENING WHILE DOING OTHER ACTIVITIES ALONE (E.G. PLAYING VIDEO GAMES, READING, ETC.) 13%
LISTENING WHILE EXERCISING 12%

1. _____ Of the time people spend listening to music each week, they are in a car 13 percent of the time.
2. _____ The greatest proportion of time spent with music occurs while people are working.
3. _____ People spend more time listening to music while they work than they do while doing chores at home.
4. _____ The smallest proportion of time spent with music occurs when people are exercising.
5. _____ People spend 15 percent of all weekly listening time doing activities such as playing video games or reading.

M COMMUNICATE Work with a partner. Compare your answers to exercise L. Then discuss your answers to these questions: Which activities do you do the most while listening to music? The least?

78 **UNIT 4** Music, Music Everywhere

Put It Together

A THINK CRITICALLY **Synthesize.** Work in a small group. In what ways are people in the interview in Part 1 and Daria van den Bercken similar or differe... Complete the Venn diagram with the correct letters.

a. listens to music to help concentrate on work
b. feels energized by music
c. plays an instrument
d. listens to only one type of music
e. listens to music to feel strong emotions
f. gives concerts for...
g. listens to or plays ...
h. is a professional ...
i. listens to music t... who created it

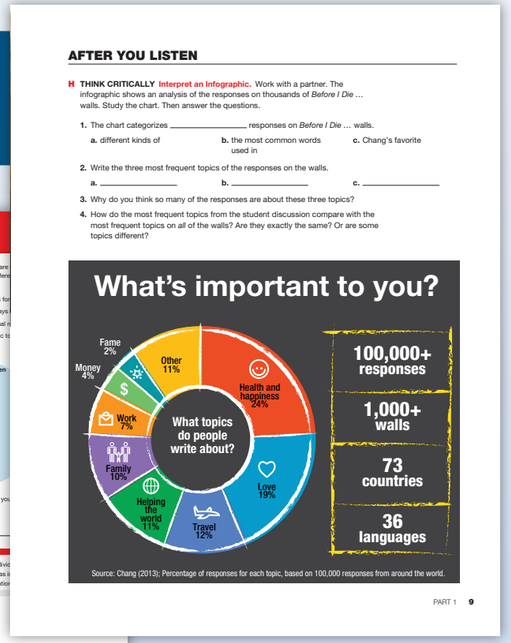
Someone in the Interview | Both | van den Bercken

B Compare your Venn diagram in exercise A with another group's. Explain you...

COMMUNICATE

ASSIGNMENT: Give an Individual Presentation You will give an individ... presentation to a group about your music listening style. Review the ideas i... and 2 and the listening and speaking skills as you prepare your presentatio...

PUT IT TOGETHER 79


AFTER YOU LISTEN

H THINK CRITICALLY **Interpret an Infographic.** Work with a partner. The infographic shows an analysis of the responses on thousands of *Before I Die ...* walls. Study the chart. Then answer the questions.

1. The chart categorizes _____ responses on *Before I Die ...* walls.
   a. different kinds of
   b. the most common words used in
   c. Chang's favorite
2. Write the three most frequent topics of the responses on the walls.
   a. _____ b. _____ c. _____
3. Why do you think so many of the responses are about these three topics?
4. How do the most frequent topics from the student discussion compare with the most frequent topics on *all* of the walls? Are they exactly the same? Or are some topics different?

What's important to you?

What topics do people write about?
Health and happiness 24%
Love 19%
Travel 12%
Helping the world 11%
Family 10%
Work 7%
Money 4%
Fame 2%
Other 11%

100,000+ responses
1,000+ walls
73 countries
36 languages

Source: Chang (2013); Percentage of responses for each topic, based on 100,000 responses from around the world.

PART 1 9

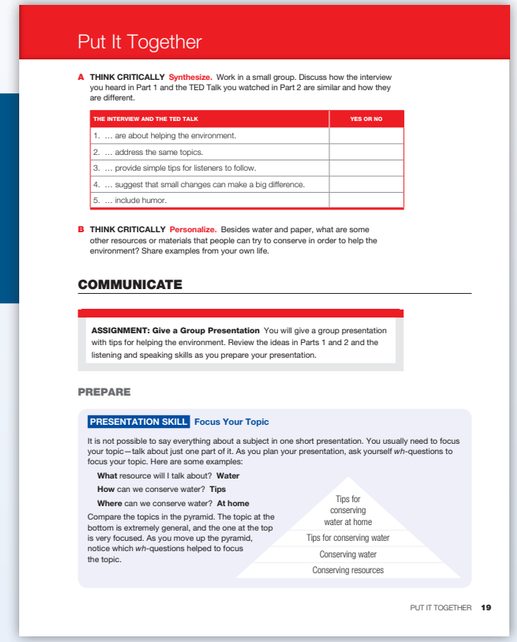
Presentation Skills

Presentation skills inspired by the TED speakers give students the strategies and language they need to **successfully deliver presentations on their own.**


PART 2 **TED**TALKS
A skateboard with a boost

"So next time you think about a vehicle, I hope, like us, you're thinking about something new."

52 **UNIT 3** Going Places


Put It Together

A THINK CRITICALLY **Synthesize.** Work in a small group. Discuss how the interview you heard in Part 1 and the TED Talk you watched in Part 2 are similar and how they are different.

THE INTERVIEW AND THE TED TALK	YES OR NO
1. … are about helping the environment.	
2. … address the same topics.	
3. … provide simple tips for listeners to follow.	
4. … suggest that small changes can make a big difference.	
5. … include humor.	

B THINK CRITICALLY **Personalize.** Besides water and paper, what are some other resources or materials that people can try to conserve in order to help the environment? Share examples from your own life.

COMMUNICATE

ASSIGNMENT: Give a Group Presentation You will give a group presentation with tips for helping the environment. Review the ideas in Parts 1 and 2 and the listening and speaking skills as you prepare your presentation.

PREPARE

PRESENTATION SKILL **Focus Your Topic**

It is not possible to say everything about a subject in one short presentation. You usually need to focus your topic—talk about just one part of it. As you plan your presentation, ask yourself *wh*-questions to focus your topic. Here are some examples:

What resource will I talk about? **Water**
How can we conserve water? **Tips**
Where can we conserve water? **At home**

Compare the topics in the pyramid. The topic at the bottom is extremely general, and the one at the top is very focused. As you move up the pyramid, notice which *wh*-questions helped to focus the topic.

Tips for conserving water at home
Tips for conserving water
Conserving water
Conserving resources

PUT IT TOGETHER 19

Presentation skills include:

- Rehearsing
- Creating effective hooks
- Using visual aids
- Making emotional connections
- And more!

For more information, visit NGL.Cengage.com/21centurycomm

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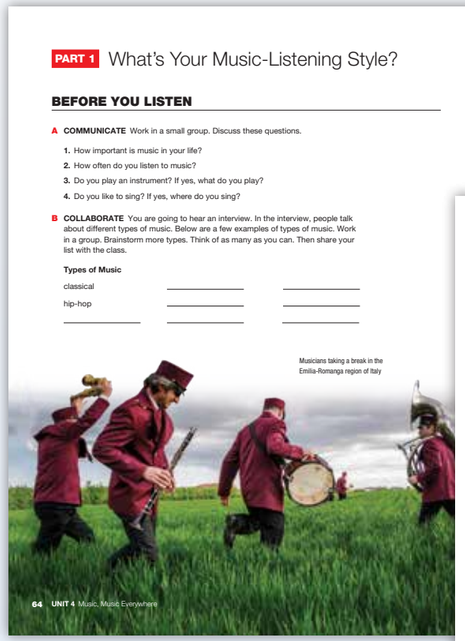
Listening and Note-taking



PART 1 What's Your Music-Listening Style?

BEFORE YOU LISTEN

A **COMMUNICATE** Work in a small group. Discuss these questions.

1. How important is music in your life?
2. How often do you listen to music?
3. Do you play an instrument? If yes, what do you play?
4. Do you like to sing? If yes, where do you sing?

B **COLLABORATE** You are going to hear an interview. In the interview, people talk about different types of music. Below are a few examples of types of music. Work in a group. Brainstorm more types. Think of as many as you can. Then share your list with the class.

Types of Music

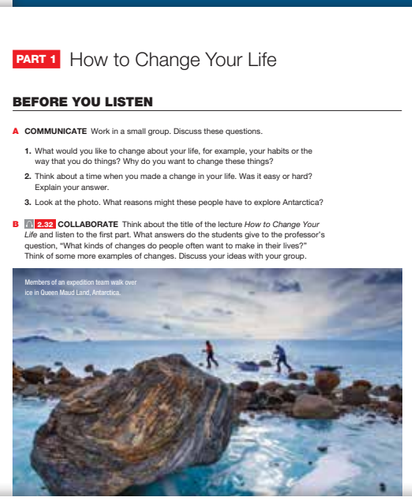
classical _____ _____

hip-hop _____ _____

_____ _____ _____

Musicians taking a break in the Emilia-Romanga region of Italy

64 **UNIT 4** Music, Music Everywhere



PART 1 How to Change Your Life

BEFORE YOU LISTEN

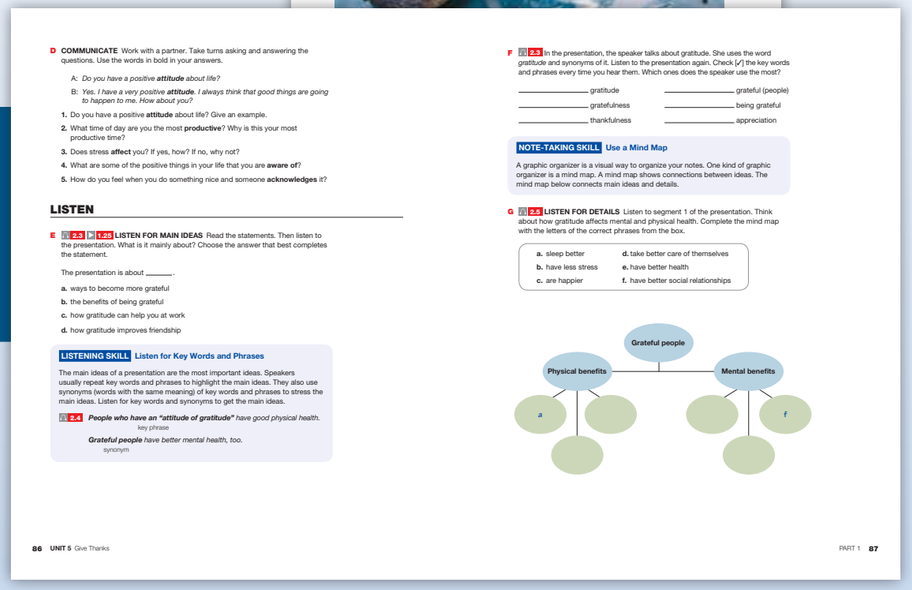
A **COMMUNICATE** Work in a small group. Discuss these questions.

1. What would you like to change about your life, for example, your habits or the way that you do things? Why do you want to change these things?
2. Think about a time when you made a change in your life. Was it easy or hard? Explain your answer.
3. Look at the photo. What reasons might these people have to explore Antarctica?

B 2.2 **COLLABORATE** Think about the title of the lecture *How to Change Your Life* and listen to the first part. What answers do the students give to the professor's question, "What kinds of changes do people often want to make in their lives?" Think of some more examples of changes. Discuss your ideas with your group.

Members of an expedition team walk over ice in Queen Maud Land, Antarctica.

A **variety of listening inputs**, including lectures, podcasts, and classroom discussions, provide a realistic context for developing key listening skills.



D **COMMUNICATE** Work with a partner. Take turns asking and answering the questions. Use the words in bold in your answers.

A: *Do you have a positive **attitude** about life?*

B: *Yes. I have a very positive **attitude**. I always think that good things are going to happen to me. How about you?*

1. Do you have a positive **attitude** about life? Give an example.
2. What time of day are you the most **productive**? Why is this your most productive time?
3. Does stress **affect** you? If yes, how? If no, why not?
4. What are some of the positive things in your life that you are **aware of**?
5. How do you feel when you do something nice and someone **acknowledges** it?

LISTEN

E 2.3 ▶ 2.4 **LISTEN FOR MAIN IDEAS** Read the statements. Then listen to the presentation. What is it mainly about? Choose the answer that best completes the statement.

The presentation is about _____.

a. ways to become more grateful
b. the benefits of being grateful
c. how gratitude can help you at work
d. how gratitude improves friendship

LISTENING SKILL Listen for Key Words and Phrases

The main ideas of a presentation are the most important ideas. Speakers usually repeat key words and phrases to highlight the main ideas. They also use synonyms (words with the same meaning) of key words and phrases to stress the main ideas. Listen for key words and synonyms to get the main ideas.

2.4 ***People who have an "attitude of gratitude"*** *have good physical health.*
key phrase

Grateful people *have better mental health, too.*
synonym

F 2.3 In the presentation, the speaker talks about gratitude. She uses the word gratitude and synonyms of it. Listen to the presentation again. Check (✓) the key words and phrases every time you hear them. Which ones does the speaker use the most?

_____ gratitude _____ grateful (people)
_____ gratefulness _____ being grateful
_____ thankfulness _____ appreciation

NOTE-TAKING SKILL Use a Mind Map

A graphic organizer is a visual way to organize your notes. One kind of graphic organizer is a mind map. A mind map shows connections between ideas. The mind map below connects main ideas and details.

G 2.3 **LISTEN FOR DETAILS** Listen to segment 1 of the presentation. Think about how gratitude affects mental and physical health. Complete the mind map with the letters of the correct phrases from the box.

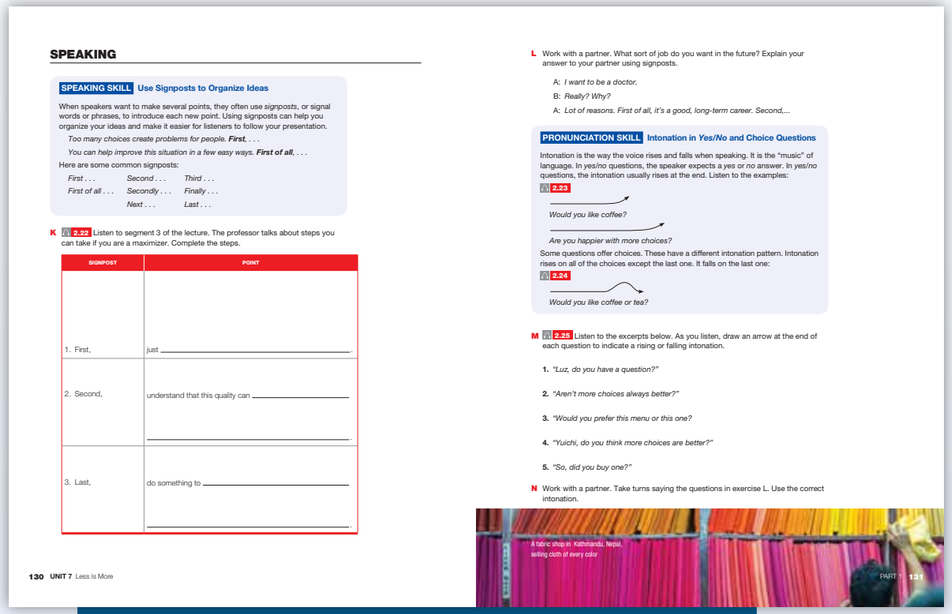
a. sleep better
b. have less stress
c. are happier
d. take better care of themselves
e. have better health
f. have better social relationships

86 **UNIT 5** Give Thanks

PART 1 **87**

Extended listening based on real-world situations and TED Talks provide **listening and note-taking practice.**

Speaking and Pronunciation



SPEAKING

SPEAKING SKILL Use Signposts to Organize Ideas

When speakers want to make several points, they often use *signposts*, or signal words or phrases, to introduce each new point. Using signposts can help you organize your ideas and make it easier for listeners to follow your presentation.

*Too many choices create problems for people. **First**, . . .*
*You can help improve this situation in a few easy ways. **First of all**, . . .*

Here are some common signposts:

First . . .	*Second . . .*	*Third . . .*
First of all . . .	*Secondly . . .*	*Finally . . .*
	Next . . .	*Last . . .*

K 2.22 Listen to segment 3 of the lecture. The professor talks about steps you can take if you are a maximizer. Complete the steps.

SIGNPOST	POINT
1. First,	just _____.
2. Second,	understand that this quality can _____.
3. Last,	do something to _____.

L Work with a partner. What sort of job do you want in the future? Explain your answer to your partner using signposts.

A: *I want to be a doctor.*
B: *Really? Why?*
A: *Lot of reasons. First of all, it's a good, long-term career. Second,...*

PRONUNCIATION SKILL Intonation in *Yes/No* and Choice Questions

Intonation is the way the voice rises and falls when speaking. It is the "music" of language. In *yes/no* questions, the speaker expects a *yes* or *no* answer. In *yes/no* questions, the intonation usually rises at the end. Listen to the examples:

2.23

Would you like coffee? ↗

Are you happier with more choices? ↗

Some questions offer choices. These have a different intonation pattern. Intonation rises on all of the choices except the last one. It falls on the last one:

2.24

Would you like coffee or tea? ↗↘

M 2.25 Listen to the excerpts below. As you listen, draw an arrow at the end of each question to indicate a rising or falling intonation.

1. *"Luz, do you have a question?"*
2. *"Aren't more choices always better?"*
3. *"Would you prefer this menu or this one?*
4. *"Yuichi, do you think more choices are better?"*
5. *"So, did you buy one?"*

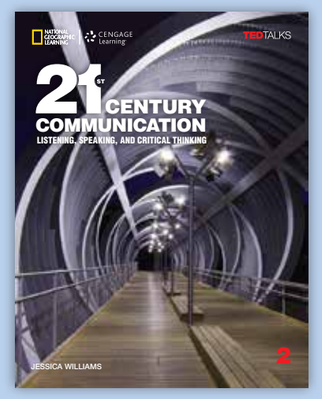
N Work with a partner. Take turns saying the questions in exercise L. Use the correct intonation.

A fabric shop in Kathmandu, Nepal, selling cloth of every color.

130 **UNIT 7** Less Is More

PART 1 **131**

Students learn and practice both academic and general speaking skills to help learners **express ideas confidently in any situation.**



21ST Century Communication 2: Listening, Speaking, and Critical Thinking
Unit 5

To access unit audio and video, visit NGL.Cengage.com/21centurycomm

UNIT 5

Engineered by Nature

An Olympic swimmer in a swimsuit made of fabric based on shark skin

THINK AND DISCUSS

1. Study the photo and read the caption. How might this swimsuit be better than other swimsuits?
2. Read the unit title. Why do you think engineers want to copy designs from nature?

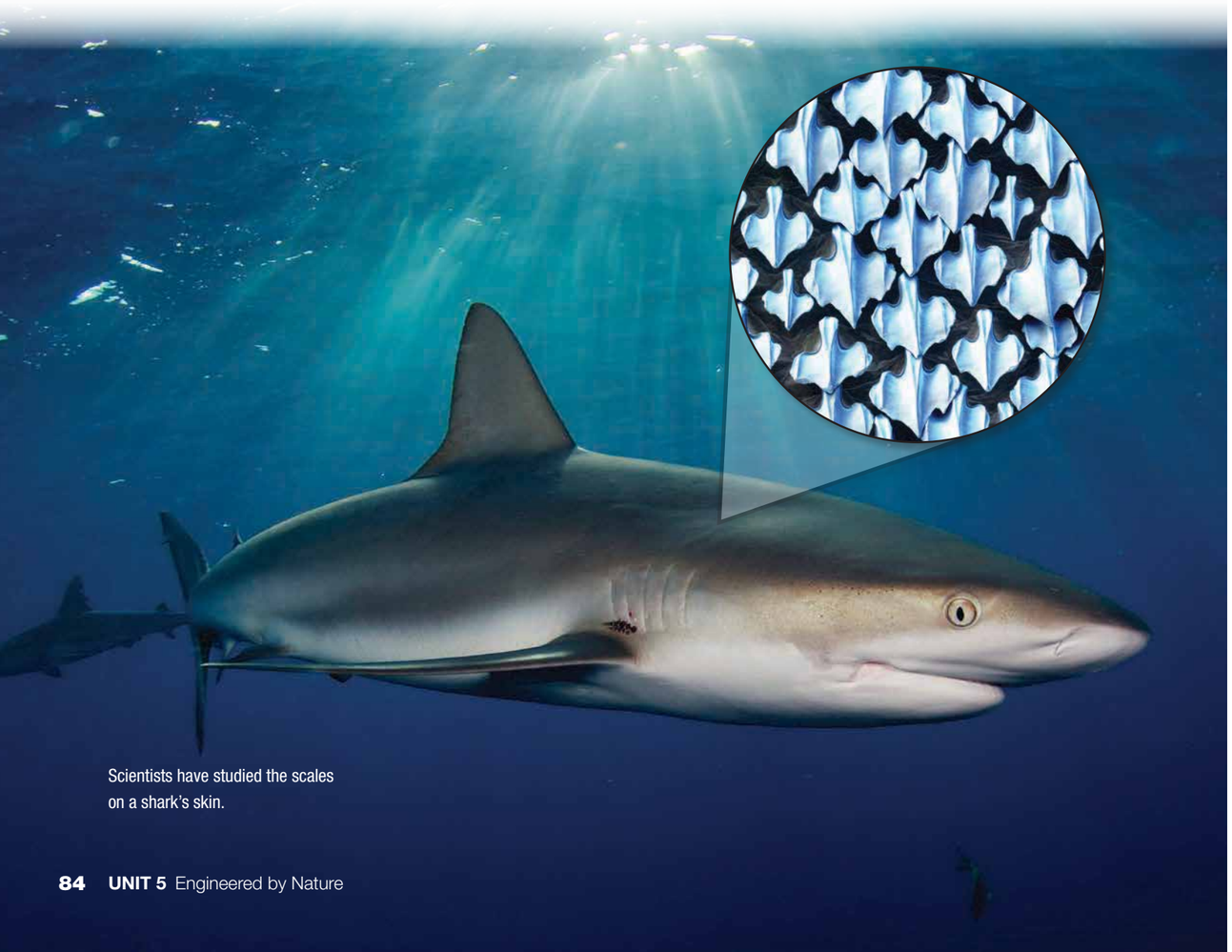
PART 1 The Science of Surfaces

BEFORE YOU LISTEN

A **COMMUNICATE** Work with a partner. Look at the photo. How would you describe shark skin?

B 2.2 **PREDICT** You are going to hear a documentary about how scientists copy nature to create new products. Listen to the beginning of the documentary. Then discuss these questions with a partner.

1. Why do you think scientists are interested in shark skin?
2. What do you think they can learn from it?



Scientists have studied the scales on a shark's skin.

VOCABULARY

C 2.3 Read and listen to the sentences with words from the documentary. Guess the meanings of the words in bold. Then choose the correct meanings.

1. There is a **layer** of thin ice on the top of the lake. It is dangerous to walk on it.
   A **layer** is a:
   a. sheet; covering **b.** piece **c.** type; kind
2. This animal catches its food in a **unique** way. I've never seen anything like it.
   Unique means:
   a. frightening **b.** strange; difficult to understand **c.** one of a kind; very unusual
3. A bird's feathers have several **functions.** They keep the bird warm and they help it to fly.
   Function means:
   a. origin **b.** purpose **c.** design
4. There are thousands of **organisms** in the world, from tiny bacteria to animals as large as whales.
   Organisms are:
   a. living things **b.** parts of the body **c.** diseases
5. Mathematics has many practical **applications** in everyday life, for example, in managing your money.
   An **application** is a/an:
   a. factor **b.** use **c.** explanation
6. There is ice on the ground so it is very **slippery**. Be careful and walk slowly.
   Slippery means:
   a. dangerous **b.** making things very cold **c.** causing things to slide or fall
7. The author **adapted** the story so that young children could understand it.
   Adapt means:
   a. to improve **b.** to change for different conditions **c.** to use again
8. The screen of the cell phone was protected by a clear plastic **film.**
   A **film** is a:
   a. thin covering **b.** hard case **c.** liquid
9. The scientists needed a powerful microscope to see the complex **structure** inside the tiny bacteria.
   Structure means:
   a. use; purpose **b.** behavior **c.** arrangement; design
10. When there is no wind, the **surface** of the water is smooth.
    The **surface** is the:
    a. top part **b.** color **c.** temperature

D **COMMUNICATE** Write an example of each of the following. Then compare your answers with a partner.

A: *I went on a cruise to the Antarctic.*
B: *Really! What a **unique** experience.*

1. A **unique** experience you had on vacation

2. A practical **application** of something you learned in high school

3. One **function** of the human tongue

4. A story or book that has been **adapted** for a movie

5. A **slippery surface**

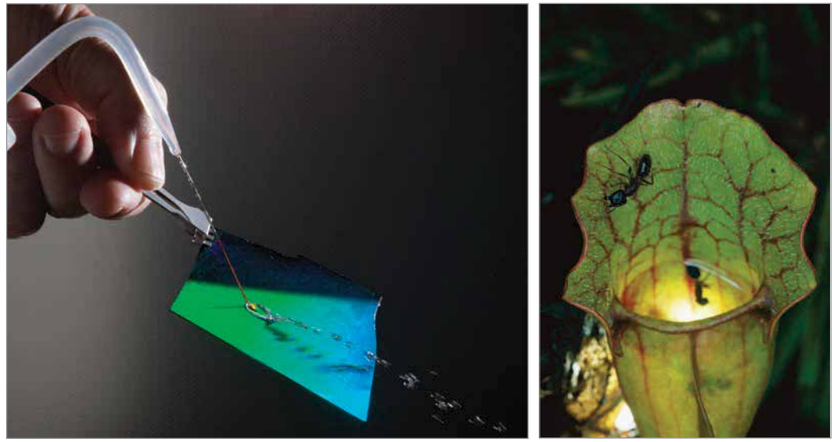
6. Something that has **layers**

LISTEN

E 1.20 2.4 **LISTEN FOR MAIN IDEAS** Read the statements below. Then listen to the documentary. Use three of the vocabulary items from exercise C to complete the statements about the main ideas of the documentary.

1. Many organisms have _____ surface structures.
2. Each surface has a special _____ that is important for the organism.
3. Scientists and engineers can _____ the structures found in nature for other applications.

F **CONFIRM PREDICTIONS** Work with a partner. Review your predictions from exercise B on page 84. Discuss whether your predictions were correct.



Scientists have developed a material based on the surface structure of the pitcher plant.

LISTENING SKILL Recognize References to Key Terms

Most speakers refer to key terms several times during a lecture or presentation. They may repeat words and phrases exactly, but sometimes they refer to the same term in different ways. For example, they use synonyms or phrases with similar meanings. Notice the reference to the key term "adapt" in the following example:

*Some lizards **can adapt to** their surroundings by changing their skin color. This **ability to change** helps them survive.*

Listening for these key terms can help you understand what the speaker thinks is most important.

G 2.5 Work with a partner. One of the key terms the presenter talks about is *surfaces*. Read the excerpts below. Then listen to segment 1. Complete each excerpt with words and phrases that repeat or refer to this key term.

1. *"Right, so what do I mean by* surfaces (1) *? Well, your skin is a natural surface—a* _____ (2) *that* _____ (3) *your whole body."*
2. *"The shark's* _____ (4) *has a unique structure. It is covered with a* _____ (5) *of tiny scales in the shape of a diamond."*
3. *"Engineers adapted the structure of shark skin and created a thin* _____ (6) *that can be used on walls, floors, and other* _____ (7) *."*

NOTE-TAKING SKILL **Take Notes Using Key Terms**

When you listen to a lecture or presentation, you can organize your notes around key terms. The first time you listen, notice the different words and phrases that refer to the key terms. Write the key terms down and leave space underneath them. When you listen a second time, listen for details about these key terms and take notes underneath them.

KEY TERM 1	KEY TERM 2	KEY TERM 3
details	details	details

H 2.6 **LISTEN FOR DETAILS** Listen to segments 1 and 2 of the documentary. Complete the notes with details based on the key terms.

Segment 1

SURFACE	FUNCTION	APPLICATION
shark has tiny _____ (1); _____ (2) shape	prevents growth of _____ (3)	film on _____ (4) walls

Segment 2

SURFACE	FUNCTION	APPLICATION
pitcher plant rough when _____ (5) slippery when _____ (6)	catches food; causes _____ (7) to fall into pitcher and die	slippery _____ (8) that prevents anything from _____ (9) to it

AFTER YOU LISTEN

I **THINK CRITICALLY** **Reflect.** Work with a partner. Each of the biomimicry projects in the documentary began with an observation by a scientist. What were the scientists' observations for the shark and the pitcher plant? Complete each statement.

1. For sharks, the scientists observed that _____
_____
2. For pitcher plants, the scientists observed that _____
_____.

J **THINK CRITICALLY** **Apply.** Work in a small group. Describe an observation that you can make about a different plant or an animal, such as how a cheetah runs or the way an octopus moves through the water. Think about an application this could have if scientists and engineers were able to adapt this for a new purpose.

A: *I've noticed that the plants in my apartment always turn toward the sun. So, is there a way scientists could adapt this function?*

B: *Well, there could be applications for solar energy. What if solar panels could automatically turn toward the sun?*

Photovoltaic solar panels rotating toward the sun

SPEAKING SKILL Use Signal Words to Mark Transitions

Speakers often use signal words such as *now, right, so,* and *well* to get their listeners' attention. Then speakers may transition (move on) to do one of the following:

1. Introduce a new topic

   Now/Right/So/Well, let's look at some of the research I am doing.

2. Expand or explain a topic they have introduced

   Now/Right/So/Well, what's the best way to solve this problem?

3. Sum up what they have said

   Well/So, that's how I see it.

Signal words also give listeners an extra moment to process what they have just heard. When you are speaking, you can help your listeners by pausing briefly after you use one of these signal words.

(See page 165 in the *Independent Student Handbook* for more information on signal words.)

K **COLLABORATE** Work with a partner. Read the excerpts below from the documentary. Underline the signal words in each. Then choose the reason why the speaker made each transition.

1. *"This week, we are going to look at how scientists and engineers are adapting the surfaces of plants and animals for new purposes. Right, so what do I mean by surfaces? Well, your skin is a natural surface—a layer that covers your whole body."*

a. introduce a new topic

b. expand or explain current topic

c. sum up

2. *"So, let's start with the shark. The shark's skin has a unique structure."*

a. introduce a new topic

b. expand or explain current topic

c. sum up

3. *"The film helps prevent the growth of bacteria. Now, let's move to the world of plants. Most plants use air, water, and sunlight to make their own food."*

a. introduce a new topic

b. explain or expand current topic

c. sum up

4. *"Just think of all the uses this could have! So, these are just two examples of biomimicry and how scientists and engineers can adapt designs from nature to improve our lives."*

a. introduce a new topic

b. explain or expand current topic

c. sum up

PRONUNCIATION SKILL Linking Sounds

Speakers often link the sound at the end of one word to the sound at the beginning of the next word. This makes their speech sound smooth and fluent.

If the end of one word is a consonant sound and the sound at the beginning of the next word is a vowel, or if the consonant sound at the end of one word is the same as the beginning of the next, hold the sound of the consonant into the next word. Listen to the examples below:

2.7

people are → peope *l*-are

scared of → scare *d*-of

because of → becau *z*-of

shark's skin → sharks-skin

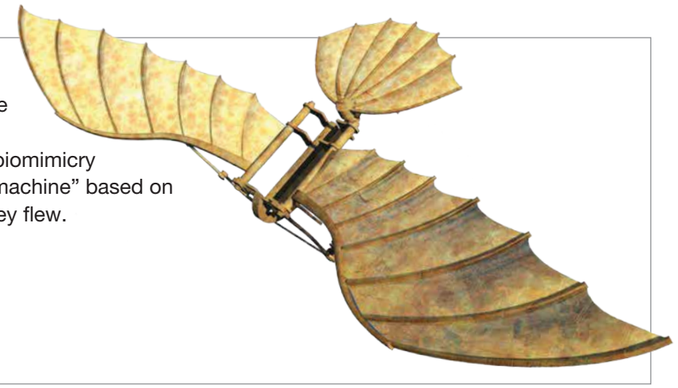
Most people are scared of sharks <u>because of</u> their large, sharp teeth.

L 2.8 Underline the sounds that you think should be linked in the excerpt below. Then listen and check your answers.

"The shark's skin has a unique structure. It is covered with a layer of tiny scales in the shape of a diamond."

M Work with a partner. Take turns saying the excerpt from exercise K. Link the sounds that you underlined. Listen to your partner and check that he or she links the sounds correctly.

learnmore People have been copying designs from nature for centuries. Leonardo da Vinci (1452–1519) was one of the first biomimicry inventors. He designed a "flying machine" based on observations of birds and how they flew.



N **THINK CRITICALLY** **Interpret an Infographic.** Work with a partner. Study the infographic below. Then answer the questions.

1. The biomimicry projects in the documentary are based on the surface structure of the organisms. What feature are the biomimicry projects below based on?
2. How do you think the Kingfisher's beak helps it survive?
3. What is another possible application for the mosquito's proboscis?

THE BULLET TRAIN

INSPIRATION: The Kingfisher

FUNCTIONS: Beak doesn't make a large splash when entering water

APPLICATION: A train with a long nose that makes the train less noisy

THE HYPODERMIC NEEDLE

INSPIRATION: The mosquito

FUNCTIONS: Mosquito's thin proboscis (nose) makes its "bite" almost painless

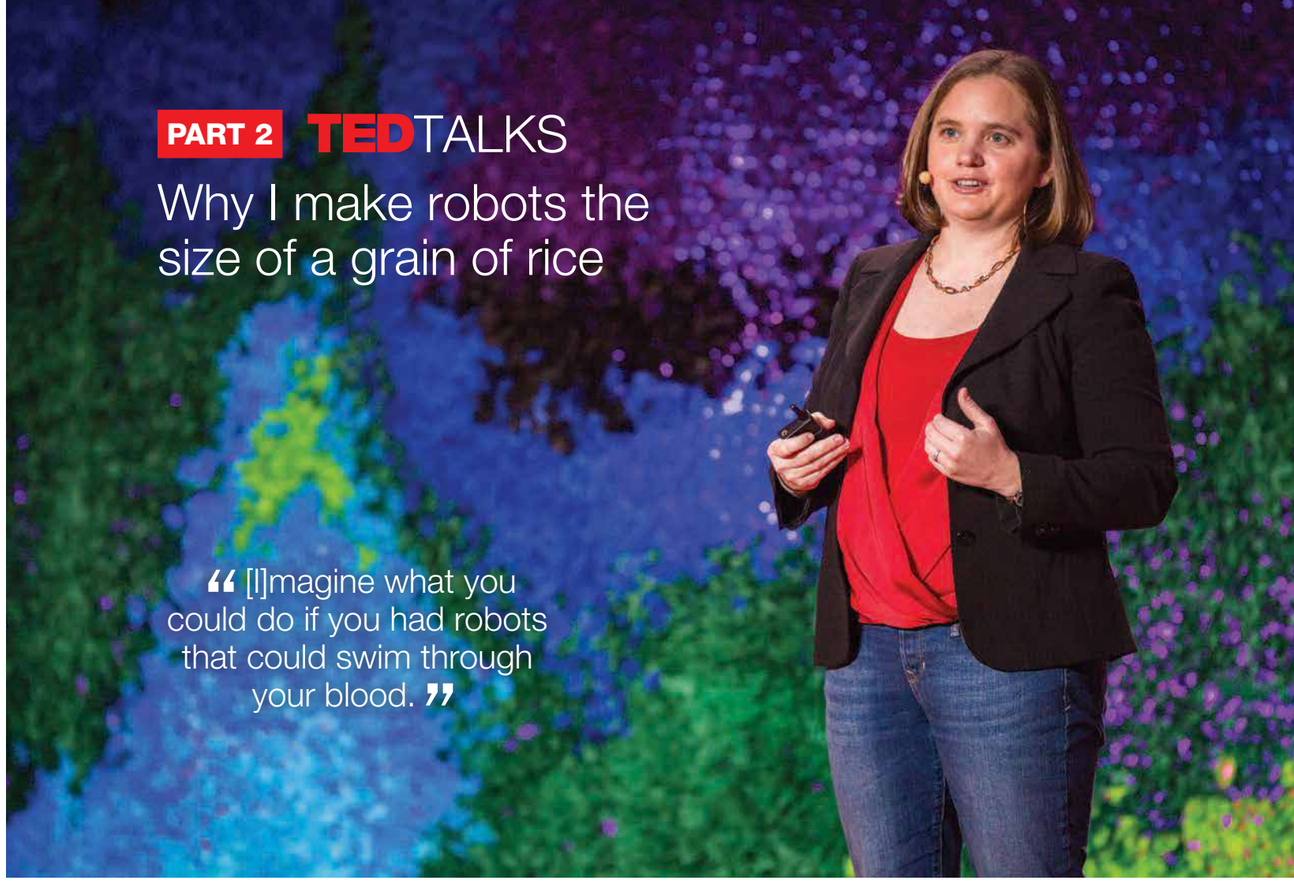
APPLICATION: A proposed design for a needle that you can't feel!

THE BIONIC CAR

INSPIRATION: The Boxfish

FUNCTIONS: Boxfish's body moves easily through water

APPLICATION: The car moves more easily through air



PART 2 **TED**TALKS

Why I make robots the size of a grain of rice

"[I]magine what you could do if you had robots that could swim through your blood."

BEFORE YOU WATCH

A **PREDICT** Work with a partner. Read the title of Sarah Bergbreiter's TED Talk and the information about her below. What possible applications might micro-robots have?

B Read the following statements. Choose the number that you think makes each statement true. After you watch the talk, check your answers.

1. Micro-robots can jump (10/100/1,000) times higher than their size.
2. Some micro-robots weigh only (3/30/300) milligrams.

SARAH BERGBREITER Micro-roboticist

Sarah Bergbreiter is an engineer who uses advanced technology to design tiny robots—micro-robots—that can run, roll, and jump high into the air. Many are only a few millimeters long.

Bergbreiter's idea worth spreading is that robots the size of insects may have widespread and very useful applications.

VOCABULARY

C 2.9 The sentences below will help you learn words in the TED Talk. Read and listen to the sentences. Guess the meanings of the words in bold. Then match each word to its definition.

a. The robots used electricity that is **stored** in small batteries.

b. You need to use **rigid** building material. If you use something soft, the structure cannot stand.

c. We need to **inspect** every part of the machine to make sure it is safe to operate.

d. Adding more legs improved the robot's **mobility.** It can now move faster and more easily.

e. We made a model of the robot on a small **scale** before we started building the full-size version.

f. The robot has a **mechanism** that makes it jump really high.

g. When the robot's main light switched on, it gave off a **flash** of light.

h. Ants have the **capability** of carrying something that weighs more than they do.

i. If you put too many heavy things on one side of the cart, it will **tip over.**

j. The machine is very **robust.** It works even in difficult conditions.

1. _____ (adj) strong; unlikely to break

2. _____ (n) part of a machine that performs a function

3. _____ (adj) stiff; difficult to bend

4. _____ (adj) kept for use in the future

5. _____ (n) the ability or power to do something

6. _____ (v) to look over very carefully

7. _____ (v) to fall to one side

8. _____ (n) size; level, especially compared to something else

9. _____ (n) the ability to move around

10. _____ (n) a sudden burst of light

WORDS IN THE TALK
locomotion (n): movement
rubble (n): broken bits of bricks from destroyed buildings

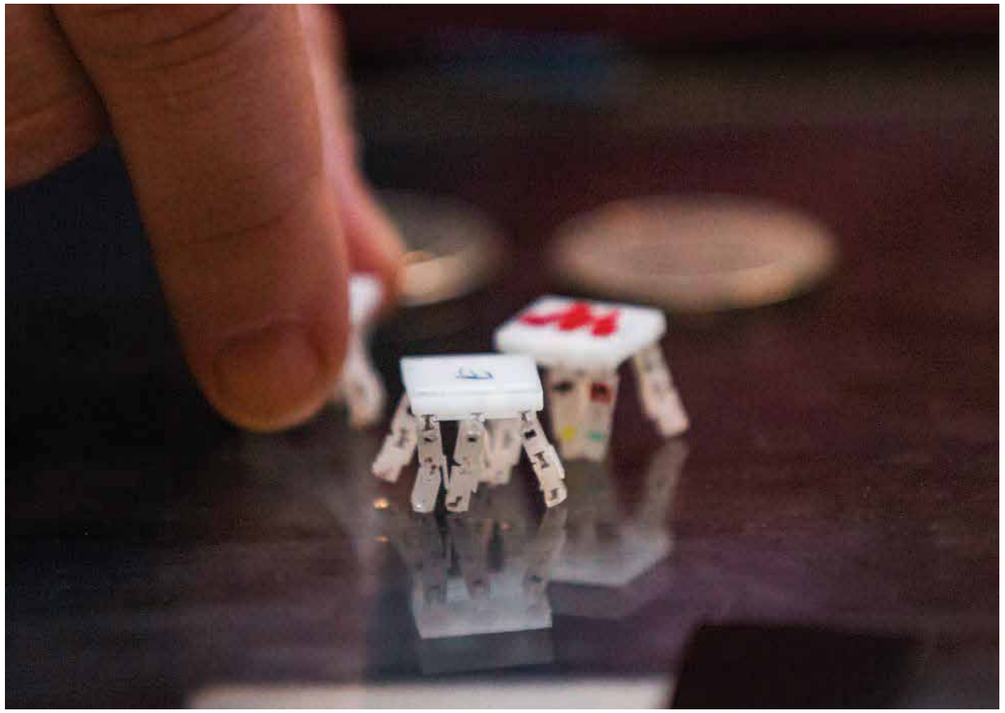
D COMMUNICATE Work with a partner. Take turns answering the questions.

1. Where is the safest place to **store** important personal information?
2. What steps has your school or college taken to help people with limited **mobility?**
3. What do you think is a computer's most important **capability?**
4. The **scale** of electronics such as cell phones has gotten smaller and smaller. Now some of them are going in the other direction. What size do you prefer for a cell phone, and why?

WATCH

E 1.21 **WATCH FOR MAIN IDEAS** Watch Bergbreiter's edited TED Talk. Check [✓] the two most important ideas that Bergbreiter wants her audience to understand.

1. ☐ The scale of robots is getting smaller every year.
2. ☐ Micro-robots have many possible applications.
3. ☐ Micro-robots of the future will be semi-intelligent.
4. ☐ Engineering mobility on a small scale is a big challenge.



F **1.22** **RECOGNIZE KEY TERMS** One of Bergbreiter's key terms is *mobility*. Watch and complete the excerpts below with different words and phrases that refer to this key term.

Segment 1

1. *"First of all, how do we get the capabilities of an ant in a robot at the same size scale? Well, first we need to figure out how to make them _____ when they're so small."*
2. *"I'll start with _____. Insects _____ around amazingly well. This video is from UC Berkeley. It shows a cockroach moving over incredibly rough terrain without tipping over."*
3. *"_____ is another really interesting way to _____ when you're very small."*

Segment 2

4. *"So, the next video is one of my favorites. So you have this 300-mg robot _____ about eight centimeters in the air."*
5. *"So, I think you can imagine all the cool things that we could do with robots that can _____ and _____ and _____ and _____ at this size scale."*

G **UNDERSTAND TRANSITIONS** Read the excerpts from Bergbreiter's talk. Underline each signal word. Choose the reason she made each transition.

1. *"To make these things really functional, we want a lot of them working together in order to do bigger things. So, I'll start with mobility. Insects move around amazingly well."*
   - **a.** to introduce a new topic
   - **b.** to explain or expand current topic
   - **c.** to sum up
2. *"And the basic idea is that we're going to compress this, store energy in the springs, and then release it to jump. So, there's no motors on board this right now, no power."*
   - **a.** to introduce a new topic
   - **b.** to explain or expand current topic
   - **c.** to sum up
3. *"So, I think I've given you some of the possibilities of what we can do with these small robots."*
   - **a.** introduce a new topic
   - **b.** explain or expand current topic
   - **c.** sum up

H **WATCH FOR DETAILS** Watch segments of the Talk again and complete the notes with details.

Segment 1

Intro:

- Bergbreiter and students work on _____ (1) robots
- Think of robotic versions of _____ (2)
- Challenge = get capabilities of ant in robot same _____ (3) scale

Segment 2

Contributions for B's lab:

- Combine _____ (4) and _____ (5) materials in small mechanism
  - _____ (6) material = silicon
  - _____ (7) material = silicon rubber
- No _____ (8) on board, no power

What we could do with micro-robots:

- After natural _____ (9), look for _____ (10)
- Inspect _____ (11) to make sure it's _____ (12)
- They could operate without having to _____ (13) you open

I ▶ 1.23 **EXPAND YOUR VOCABULARY** Watch the excerpts from the TED Talk. Guess the meanings of the phrases in the box.

figure out	semi-intelligent	rough terrain	set off	destination

J **WATCH MORE** Go to TED.com to watch the full TED Talk by Sarah Bergbreiter.

AFTER YOU WATCH

K **THINK CRITICALLY** **Infer.** Work with a partner. Read the excerpt from the TED Talk. Then discuss your answers to the questions.

> *"And we've made some advances so far, but there's still a long way to go, and hopefully some of you can contribute to that destination."*

1. What does Bergbreiter mean by "there's still a long way to go"?
2. What does she mean by "destination"?

L **COMMUNICATE** Work with a partner. Discuss the questions below.

1. Read the possible applications for micro-robots below. Check [✓] the ones you think are the most useful.
   - **a.** ☐ Tasks that are dangerous
   - **b.** ☐ Tasks that require absolutely perfect performance every time
   - **c.** ☐ Tasks that are too complex for humans
   - **d.** ☐ Tasks that are very repetitive
   - **e.** ☐ Tasks that are in spaces too small for humans
   - **f.** ☐ Other: _____
2. Which jobs do you think could be most affected by the use of micro-robots?

An artist's impression of micro-robots working in someone's blood stream

Put It Together

A **THINK CRITICALLY** **Synthesize.** Work in small groups. In what ways are the biomimicry projects in Parts 1 and 2 similar? Check [✓] the boxes in the chart. Then explain your answers to members of the group by giving examples from the two presentations.

A: *The projects in Parts 1 and 2 are both inspired by nature.*
B: *Right. They were inspired by plants or animals.*

	"SHARK SKIN" FILM	NON-STICK FILM	MICRO-ROBOTS
inspired by nature	✓	✓	✓
works on a very small scale			
focuses on mobility			
focuses on surface structure			
many possible applications			
applications already in use			

B **COMMUNICATE** Work with a partner. Which of the biomimicry projects from this unit do you think are the most useful? Explain your answer.

A: *I think the hypodermic needle is the most useful.*
B: *I agree. I hate getting shots!*

COMMUNICATE

ASSIGNMENT: Group Presentation Your group is going to give a presentation about another application for one of the projects you learned about in Parts 1 and 2. Review the ideas, vocabulary, and skills in the unit as you prepare for your presentation.

PREPARE

PRESENTATION SKILL **Have a Strong Ending**

It is important to have a strong ending to your presentation so that your audience will remember your ideas. You can summarize what you have said to make your point clear. You can also connect key ideas to your audience in a concrete way. It is not a good idea to introduce any new ideas in the conclusion. Notice how Bergbreiter ends by summarizing briefly and asking her audience to get involved.

▶ 1.24 *"So, I think I've given you some of the possibilities of what we can do with these small robots. And we've made some advances so far, but there's still a long way to go, and hopefully some of you can contribute to that destination."*

(See page 174 of the *Independent Student Handbook* for more information on having a strong ending.)

C Work with your group. Use the information and questions below to brainstorm other applications for the projects you have learned about. Do not worry about whether the idea is technically possible yet. Write short notes about your ideas.

- The "shark skin" film prevents bacteria from growing. How could this be used? Where would it be useful?

- The non-stick film is slippery; in other words, ice, oil, paint, etc. will not stick to it. How could this be used? Where would it be useful?

- Micro-robots may be better for some jobs than humans. What kinds of jobs might these be?

D **COLLABORATE** Choose one of the ideas you brainstormed in exercise C. In your group, discuss who will do the following parts of your presentation. Remember to repeat key words and use signals words and pauses to mark transitions.

- Explain how nature inspired this project:
  - Review your notes from Part 1 (page 88) or Part 2 (pages 96–97).
  - Be sure you can explain the key ideas.
  - Consider showing a photo or diagram of the plant or animal.
- Explain your application:
  - Explain the connection between the original research and your idea.
  - Describe how your idea will work.
- Give a short conclusion:
  - Explain why your application is useful and important.
  - Restate the importance of learning from nature.

E Read the rubric on page 182 before you present. Notice how your presentation will be evaluated. Keep these categories in mind as you present and watch your classmates' presentations.

PRESENT

F Give your presentation to a small group. Watch your classmates' presentations. After you watch each one, provide feedback using the rubric as a guide. Add notes or any other feedback you want to share.

G **THINK CRITICALLY** **Evaluate.** As a class, discuss what each presenter did well and what might make each presentation even stronger. Decide the two things you did well, and two areas for improvement.

REFLECT

Reflect on what you have learned. Check [✓] your progress.

I can

- ☐ recognize references to key terms.
- ☐ take notes using key terms.
- ☐ use signal words to mark transitions.
- ☐ link sounds.
- ☐ end strong.

I understand the meanings of these words and can use them.
Circle those you know. Underline those you need to work on.

adapt AWL	function AWL	organism	store
application	inspect AWL	rigid AWL	structure AWL
capability AWL	layer AWL	robust	surface
film	mechanism AWL	scale	tip over
flash	mobility	slippery	unique AWL

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