

Secrets of the Dark

“To me, science is fiction because sometimes it just seems unreal. Looking at bioluminescence, it’s just beautiful. It’s artwork.”

—David Gruber

Blue ghost fireflies

1. In the photo, fireflies create a beautiful light. What other things in nature produce light?
2. Bioluminescent animals use lights to communicate with one another. How do humans use lights to communicate?
3. Where do you feel comfortable in the dark? Why?

1 What would be difficult about living without sunlight for two months every year? Discuss. Then listen and read. **TR: 32**

For most of us, the days are divided into day and night. But for two months each winter in northern Norway, it's **dark** for 20 hours a day. There is no **sunrise** or **sunset** because the sun never gets above the **horizon**.

Would you like to live in **darkness** for this long? It may seem difficult, but many Norwegians love the beautiful colors of these

months. To the **south** are the red and gold colors of the horizon. To the **north**, the sky is a magnificent blue. Even the moon and stars look blue. In the towns, streetlights shine like little yellow diamonds.

People do need light to be healthy and happy. Since they don't have much daylight during this time of the year, Norwegians

exercise and eat foods with vitamins A and D, nutrients people normally get from being in the sun. And darkness doesn't stop Norwegians from having a good time. Each winter, people are skiing on hills and skating on ponds that are **lit up**. Some people are dogsledding (with **headlights**, of course!). Others are going to

film and music **festivals**. And other people are spending time with friends in cafés and restaurants. Of course, not everyone is so **active** in the dark months. Many people are just **going to sleep** a little earlier until the sun returns in the spring.

In the town of Longyearbyen, in northern Norway, there's no sunlight from November to January. However, the sun doesn't set from the end of April to the end of August.

2 Learn new words. Listen and repeat. **TR: 33**

3 Work in pairs. What would you like about living in the dark for two months? What wouldn't you like? Write three things for each. Compare your list with your partner's.

4 Read and write the words from the list. Make any necessary changes.

| | | | | |
|-----------|----------|----------|----------|-------------|
| active | dark | darkness | festival | go to sleep |
| headlight | light up | south | sunrise | sunset |

Light and _____ are two things we don't often think about. This is because we can have light any time at night. Thanks to electric lights, we're able to do what we need to at night. We _____ because we're tired, not just because it's _____. "Having all this energy to be able to have light at night is a really new thing for humans," says scientist David Gruber. Until the nineteenth century, people didn't have lights like we do today. The light of day came from the sun, as it does now. But at night, only the light of the moon and the stars _____ the sky. People got up at _____ and were _____ all day. Then after _____ they went to bed.

5 Learn new words. Listen for these words. Match each word to its definition. Then listen and repeat. TR: 34 and 35

| | | | |
|----------|---------|-------------|------------------------|
| daylight | healthy | streetlight | |
| _____ | _____ | _____ | 1. a light near a road |
| _____ | _____ | _____ | 2. not sick |
| _____ | _____ | _____ | 3. light from the sun |

6 Choose an activity.

- Work independently.** Observe an animal at night. What do you notice? What is surprising? Write your findings. Share them with the class.
- Work in pairs.** Imagine you lived hundreds of years ago. How was your life at night different from your life at night now? List at least five examples.
- Work in groups.** When you don't have electric light, what can you use to help you see in the dark? List three things. Choose one thing from your list and make an advertisement for it. Present your ad to the class.



A kinkajou

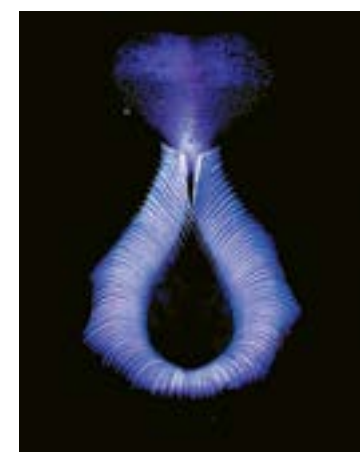
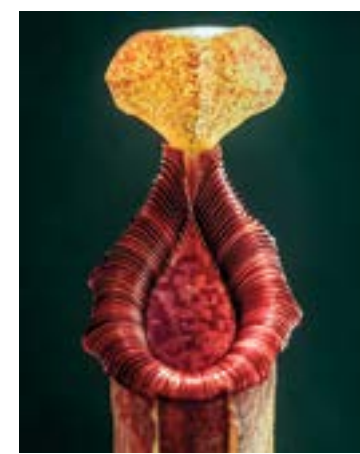
SPEAKING STRATEGY TR: 36

| Asking for help with schoolwork | Helping with schoolwork |
|----------------------------------|--|
| What does <i>nocturnal</i> mean? | It means <i>active at night</i> . |
| How do you pronounce it? | I'm not sure. I think you say <i>noct-tur-null</i> . |
| How do you spell it? | It's spelled <i>n-o-c-t-u-r-n-a-l</i> . |

7 Listen. How do the speakers ask for help and respond? Write the phrases you hear. TR: 37

8 Read and complete the dialogue.

Mae: This video about carnivorous plants is really cool.
 Hwan: _____
 Mae: _____ *things that eat meat*. This one is called a *Nepenthes*.
 Hwan: What? _____
 Mae: _____ Let's look it up. *N-e-p-e-n-t-h-e-s*. Another name is *pitcher plant*. It eats arthropods.
 Hwan: Anthro... what? _____
 Mae: _____ *an-throw-pod*. You know, insects, spiders, and things like that. Insects see the plant's light and go to it. Then they fall inside and die! That's how the plant eats them.
 Hwan: Amazing!



A glowing pitcher plant

9 Work in pairs. Talk about the animals on the cards. Help your partner to spell, pronounce, and learn more about each animal.

It's a Gila monster.
 A what? How do you pronounce that?



10 Work in groups. Think of a situation where you wanted to ask for help with schoolwork but didn't. Why didn't you ask? How can knowing these phrases help you in the future?

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GRAMMAR TR: 38

Present progressive: Saying what is happening now

Non-action verbs

I **like** stories about unusual animals.

Many animals **see** well enough to hunt in the dark.

It **is** 2:00 a.m. in the jungle, but that doesn't **mean** all the animals **are** asleep.

Action verbs

While I'm **reading** in bed at night in Mexico, my friend Akiko **is reading** at school in Japan!

While some animals **are hunting** in the dark, others **are hiding** or **sleeping**.

The monkeys **are sleeping** in trees, but the kinkajous **are looking** for food.

11 Listen. Circle the non-action verbs you hear. Underline the action verbs you hear. TR: 39

| | | | | | |
|------|------|-------|-------|--------|-------|
| bake | be | drive | enjoy | fly | help |
| know | like | need | open | search | sleep |

12 Read and complete the sentences. Use the *-ing* ending for action verbs.

1. People _____ (agree) that it's good to spend time with family.
2. This is difficult for family members who _____ (live) in different countries.
3. It's difficult because of different time zones. This _____ (mean) that it might be morning in one place and afternoon in another.
4. For example, Omar in Santiago _____ (eat) breakfast while his cousin Ali in Dubai _____ (come) home from school.
5. So when Ali _____ (think) about calling Omar, he _____ (have) to consider the time in Santiago first.

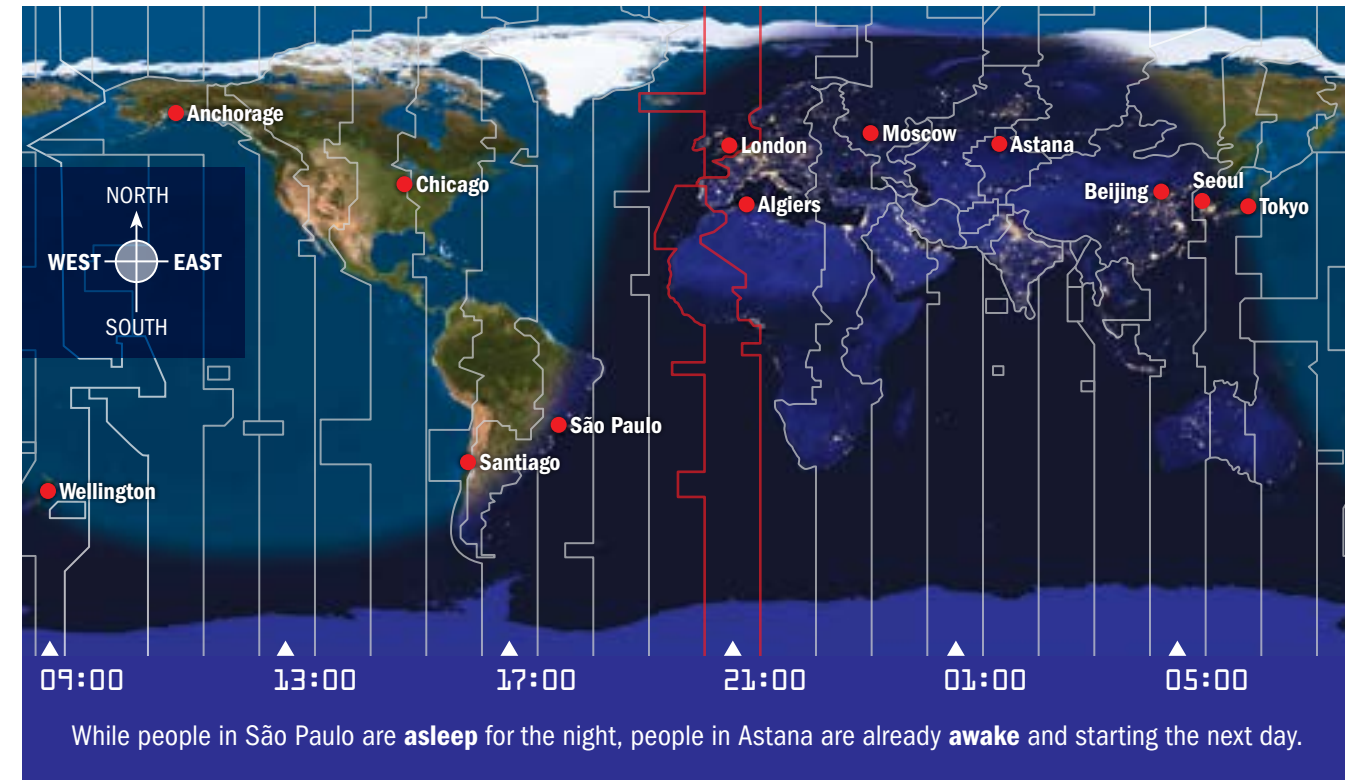
13 Work in pairs. Write what you do at these times. Compare your answers with a partner.

If it's Monday night, I'm studying, but Julia is making dinner.

| | | |
|-------------------------|-----------|-------|
| | Me | _____ |
| Monday night | | |
| Wednesday during school | | |
| Friday evening | | |
| Saturday afternoon | | |
| Sunday morning | | |

14 Learn new words. Listen to learn about time zones. Then listen and repeat. TR: 40 and 41

World Time Zones



15 Work in pairs. Find these cities and their time zones on the map. How many time zones separate them? Write a sentence about what people might be doing in each city.

1. Seoul / Santiago There are 12 time zones between Seoul and Santiago. While people in Santiago are coming home from school and work, people in Seoul are asleep.
2. Beijing / London _____
3. Astana / Algiers _____
4. Chicago / Moscow _____

16 Work in groups. Find the place where you live on the map. Note the time now. Choose three other cities. Say if they are to your east or west, and what time it is there. Take turns comparing what you're doing with what people in those cities are probably doing.

17 Before you read, discuss in pairs. What do you know about the ocean and life in the ocean? What do you want to learn?

18 Look at the text and photos quickly. Then answer the questions.

1. Who is this reading about?
2. What sea animal has really big eyes?

19 Learn new words. Find the words in the text. Guess their meaning. Then look at the first meaning given for each word in the dictionary. Compare those meanings with your guesses. Then listen and repeat. **TR: 42**

dawn to fascinate to glow to observe pattern

20 While you read, think about what makes animals in the deep ocean different. **TR: 43**

21 After you read, work in pairs. Check *T* for true or *F* for false.

1. David observes life in the ocean when it's dark. T F
2. We know a lot about everything that lives in the ocean. T F
3. We can see all the glowing colors in the ocean with our eyes. T F
4. Only one type of animal glows in the dark through the lens of David's camera. T F
5. A lot of animals at the bottom of the ocean make their own light. T F
6. The vampire squid has very large eyes to help it see in the dark. T F

22 Review. Look at your answers from Activity 18. Were they correct? What else did you learn about the person and the sea animal?

IN THE DARK OF THE OCEAN

A shark glows bright green through the filters of David's camera.

There are incredible creatures living in the darkness.

In the darkness before dawn, marine biologist David Gruber dives into the ocean to observe the amazing creatures that live there. "Seventy-one percent of Earth is ocean, and much of it is dark, with tons of life down there that we don't know about," he says.

David discovered that many sea animals can see colors in the water that we cannot. So he designed a camera that allows him to see the colors just as a fish does. His camera shows a secret world of neon green, red, and orange colors on ocean life that glows in the dark.

In this fascinating world, David discovered a special kind of shark that glows bright with green spots. "When you see all these little bright spots and patterns it's like flowers and butterflies. Why do they make patterns? It's to attract each other. It's to recognize each other," he says.

At the bottom of the ocean where there is no light at all, many animals produce their own light. The unusual vampire squid is an example. It can turn itself on or off, just like a lamp. It also has very big eyes to help it see in the dark. In fact, compared to its body size, the vampire squid has the largest eyes of any animal in the world. And this is just one

animal: ninety percent of the animals that live at the bottom of the ocean produce their own light.

It's easy to see why the darkness of the sea fascinates David. "Marine animals in the dark ocean produce lights to communicate with each other," says David. "It's an underwater disco party. We human beings are the last ones to join in!"

A vampire squid



23 Discuss in groups.

1. What things about the ocean fascinate you? Why do they fascinate you?
2. It's difficult to study the ocean at night because of the darkness. What are some other difficulties David might have when studying the ocean at night?
3. Do you think it's important to learn about what lives in the ocean? Why or why not?

24 Before you watch, discuss in pairs.

1. What did you love doing as a small child? Do you still love it? What else do you love doing now?
2. Are you interested in learning about what's in the ocean? Why or why not?

25 Work in pairs. The title of the video you're going to watch is *What Glows Beneath*. Think of what you learned about David Gruber and his work. Then make two lists: *What I learned about David* and *What I want to learn about David*.

26 Watch scene 3.1. While you watch, circle the correct answers.

1. David first became fascinated by the ocean by *surfing / scuba diving*.
2. David wondered *if it would be hard to study biology / what's beneath him in the water*.
3. David wanted to photograph the ocean so that he can *sell his photos to magazines / understand how fish see it*.
4. David says that *there's still a lot to learn about / scientists have discovered all of the species of the ocean*.
5. According to David, the future of exploration is finding out *why humans don't glow / how humans fit in among nature*.

27 After you watch, work in pairs to answer the questions.

1. What was David's hobby when he was a teenager?
2. How does this hobby connect to his job?
3. What is special about how David studies the ocean?
4. What do the filters in David's camera allow him to do?

28 Work in pairs. List three of the sea animals you saw in the video. Describe what they look like. Now think of three sea animals you know about or have seen photos of. How are they different from the animals in the video?

David uses a camera with special filters to explore the dark ocean.

29 Choose an activity.

1. **Work independently.** Imagine that you went scuba diving and saw some of the animals in the video. Write a postcard to a friend or family member, describing what you saw. In your postcard, explain how you were able to see the animals glow.
2. **Work in pairs.** Role-play a conversation between David and a reporter who's asking him about his work. Share your dialogue with the class.
3. **Work in groups.** Prepare a glow-in-the-dark presentation. Each person finds out about a different sea animal that glows in the dark. Draw it or find a photo of it. Write three pieces of information about it. Present your group of animals to the class.

GRAMMAR TR: 44

At, on, and in: Saying when things happen

at eight o'clock / **at** night / **at** dinner

on Monday(s) / **on** June 1 / **on** the weekend

in the winter / **in** the morning / **in** 2017 / **in** May

30 Read. Complete the paragraph with *at, on, or in*.

My family and I visited Marrakesh, Morocco, _____ 2015. We went _____ December. The weather is warm there _____ the winter. _____ Monday, our first day, we spent a lot of time in the Jemaa el Fna, the old city square. _____ lunchtime, we ate at a rooftop café, and _____ the afternoon, we watched some dancers. _____ five o'clock _____ the evening, we watched the day market stalls leave and the night market stalls arrive. _____ night we enjoyed the storytellers, magicians, musicians, and acrobats, as well as the food from the many food stalls. The Jemaa el Fna is incredible both day and night!



The Jemaa el Fna market

31 Work in pairs. Talk about places you go to regularly. Use *at, on, and in*.

1. Tuesdays _____ *On Tuesdays, I go to the park after school.*
2. night _____
3. afternoon _____
4. March _____
5. weekend _____
6. 8:00 a.m. _____

32 Work in pairs. Take turns tossing the cube. Talk about things that happen at different times.

In the summer, we go to the beach often.



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WRITING

In sensory writing, we choose a topic such as an event or a place. We use adjectives, or describing words, to explain what we see, hear, taste, smell, and feel. Describing something using senses helps our reader imagine that he or she is at that event or place.

33 Read the model. Work in pairs to identify and underline the words that describe what people see, hear, taste, smell, and feel.

When thousands of glowing lanterns light up the city at night on the fifteenth day of the Chinese New Year, I know the Chinese Lantern Festival has arrived. All kinds of lanterns shine brightly against the dark night sky. Some of the lanterns are small, and others are really big. Some look like beautiful flowers and dragons. The silk lanterns feel soft. The plastic lanterns feel smooth and warm. Families walk happily in the crowded streets, looking at the many kinds of amazing lanterns. While some people are enjoying the colorful lanterns, others are watching exciting parades and traditional Chinese lion dance performances. The loud, popping sounds of firecrackers fill the air. People prepare tasty rice dumplings in the morning for their families and friends to enjoy in the evening. The sweet smell makes me hungry for my favorite food. I love everything about this nighttime festival.



A Lantern Festival celebration in Shanghai, China

34 Work in pairs. Can you imagine how it feels to be at the Chinese Lantern Festival? Why or why not?

35 Write. Describe a fun nighttime event. Use sensory words to say what you see, hear, taste, smell, and feel at this event.



Understand and Protect

“People want to protect things they love and understand. The more I can share about the amazing animals I get to explore, the more people may want to help protect them.”

—David Gruber

National Geographic Explorer, Marine Biologist

1. **Watch scene 3.2.**
2. David cares deeply about the ocean and ocean life. Why is it important to protect animals in the ocean? How does David's work help protect them?
3. What do you want to protect? Why? How can you get others to care about this?

Make an Impact

A Design a poster.

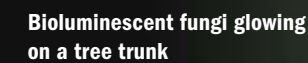
- Research animals or plants that glow in the dark. Find out how and why they glow.
- Make a poster to describe three of the glow-in-the-dark organisms you researched. Include photos.
- Present your poster to the class.

B Write a blog entry.

- Research a place that is light for more than two months a year.
- Pretend that you visit during the light season. Write a blog about your visit. Include photos.
- Publish your blog. Answer questions and respond to your classmates' comments.

C Make a “day-and-night” video.

- Choose an interesting place in your region.
- Make a video of that place during the day and during the night. Mention what is the same and what is different.
- Share your video with the class.



Bioluminescent fungi glowing on a tree trunk