

Reading

► Read the selection and answer each question.

How Whales Wing It

by Anna Ouchchy

¹ Whale watchers are amazed at how gracefully the humpback whale can move. From the deck of a boat, it's exciting to see a humpback emerge from the ocean. As long as a big school bus and as heavy as eight elephants, the whale turns in the air.

² Now scientists are studying the way humpback whales move, and they are using the results to do some surprising things—like creating better wind power.

A Whale of a Mistake?

³ The research started when Dr. Frank Fish was looking at a model of a humpback whale in a Boston shop. He noticed that the front, or leading edge, of the whale's flipper was covered with little bumps. Dr. Fish studies the science of animal movement, and bumpy flippers just didn't make sense to him.

⁴ Here's why Dr. Fish thought the artist had it wrong. As a whale moves through the water, three forces act on the animal's body and affect its movements. They are the same forces that act on an airplane wing and enable the plane to fly.

⁵ The first force is thrust, which moves the whale forward. The second force is drag, which slows the whale down. The third force is lift. As the whale angles a flipper upward, water pushing against the bottom side of the flipper creates lift, raising the flipper. A humpback uses lift under one flipper or the other to turn.

⁶ But the tilt of the flipper that creates lift also increases drag. In fact, if the whale keeps tilting the flipper, at some point the angle will create so much drag that the flipper will "stall," or stop producing lift. So the humpback is always changing the angles of its flippers to create the desired lift with the least drag.

⁷ Dr. Fish knew that the shape of a flipper or an airplane wing is important. Shapes that decrease drag will increase lift and delay stalling, and smooth, sleek surfaces seem to do this best.

⁸ In other words, bumpy flippers should slow a whale down. However, the artist was right: humpback flippers have bumps, or tubercles.

⁹ Dr. Fish was puzzled, but he knew that an animal's special characteristics are usually helpful to the animal. What if science had it wrong and the bumps were the secret to how the humpback whale is able to swim so gracefully?

From Whales to Wind

¹⁰ To test his theory, Dr. Fish teamed up with engineers from Duke University and the U.S. Naval Academy. The team made models of whale flippers and tested them in a wind tunnel. The result was a surprise: flippers with bumps created more lift and less drag than sleek flippers.

¹¹ The secret seems to lie in the way tubercles break up the flow of air and water, creating tiny vortices, or swirls. As the whale moves through the water, these vortices roll up and over the flipper, improving lift.

¹² The scientists wondered how they could apply their findings. "At first, we were thinking airplane wings," says Dr. Fish. "Then we started thinking about windmills."

¹³ Wind power is created by turbines, giant fan blades mounted on tall poles or towers. One problem for turbines is that wind is not constant. Even in gusty places like North Dakota and Kansas, strong winds do not blow all the time. When the wind blows slowly, the turbine blades can stall, much like a whale flipper or an airplane wing.

¹⁴ Dr. Fish and businessperson Stephen Dewar started a new company. They add features that are like whale tubercles onto the wind turbines. Because the attachments decrease drag and delay stall, these turbines keep turning even at low wind speeds. Dr. Fish hopes to apply the same technology to airplane wings and even ship and submarine rudders.

¹⁵ Dr. Fish loves the idea of using nature's designs to invent new technologies. But he points out that the idea has been around for more than 500 years, since the famous artist and scientist Leonardo da Vinci imagined new machines based on the shapes and movements of animals. Says Dr. Fish, "The possibilities are very exciting."

1 From whose point of view is the article written?

- (A) Dr. Fish
- (B) Stephen Dewar
- (C) a whale watcher
- (D) an outside observer

2 Read the sentence from paragraph 1.

From the deck of a boat, it's exciting to see a humpback emerge from the ocean.

Think about the prefix *e-*. What is the meaning of emerge above?

- (A) go across
- (B) come out of
- (C) act playfully
- (D) move very quickly

3 What is the author's main purpose?

- (A) to tell about the results of a discovery
- (B) to persuade people to use wind power
- (C) to tell an entertaining story about whales
- (D) to describe the life of an important scientist

4 Why does the author include the details in paragraph 3 about what happened in the Boston shop?

- (A) to help readers understand how scientists work
- (B) to show a difference between scientists and artists
- (C) to explain how the research into whale flippers began
- (D) to support the idea that humpback whales are amazing

5 How does this article support the idea that new discoveries can lead to surprises? Use details from the article to support your answer.

- 6 Which sentence from the article best represents the central idea?
- Ⓐ *To test his theory, Dr. Fish teamed up with engineers from Duke University and the U.S. Naval Academy.*
 - Ⓑ *The secret seems to lie in the way tubercles break up the flow of air and water, creating tiny vortices, or swirls.*
 - Ⓒ *Because the attachments decrease drag and delay stall, these turbines keep turning even at low wind speeds.*
 - Ⓓ *Dr. Fish loves the idea of using nature's designs to invent new technologies.*

- 7 Read the sentences from paragraph 13.

One problem for turbines is that wind is not constant. Even in gusty places like North Dakota and Kansas, strong winds do not blow all the time.

What is the meaning of constant as it is used above?

- Ⓐ steady
- Ⓑ visible
- Ⓒ common
- Ⓓ valuable

Writing

► Read the selection and choose the best answer to each question.

Laura wrote a story about a walk in the winter. Read the first part of Laura's story and look for any changes she should make. Then answer the questions that follow.

A Winter Walk

(1) After the snowstorm ended, I decided to go for a walk in the park. (2) Wondered all night how much snow had fallen. (3) I put on my heavy coat and my boots. (4) Then I walked down the snowy sidewalk to the gate of the park. (5) It was lucky that someone had shoveled the paths I could walk without having to wade through deep snow. (6) The trees looked magical with their branches covered with snow. (7) It was hushed and still throughout the park. (8) I could hear only the call of birds. (9) After passing the pond, I walked on to my favorite part of the park.

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- 1 What is the correct way to write sentence 2?
- (A) Wondered all night, how much snow had fallen.
 - (B) I wondered all night how much snow had fallen.
 - (C) I wondered all night. How much snow had fallen.
 - (D) Wondered all night and how much snow had fallen.
- 2 What is the correct way to write sentence 5?
- (A) It was lucky. That someone had shoveled the paths I could walk without having to wade through deep snow.
 - (B) It was lucky that someone had shoveled. The paths I could walk without having to wade through deep snow.
 - (C) It was lucky that someone had shoveled the paths. I could walk without having to wade through deep snow.
 - (D) It was lucky that someone had shoveled the paths I could walk. Without having to wade through deep snow.

- 3 What is the correct way to write sentence 6?
- Ⓐ The trees, looking magical, their branches covered with snow.
 - Ⓑ Their branches covered with snow, the trees looking magical.
 - Ⓒ The trees looked magical branches covered with snow.
 - Ⓓ No change is needed.

Answer Key: Module 1, Week 1 Assessment

Item Number	Correct Answer	Module, Week, Program Skill	Depth of Knowledge
READING			
1	D	M1W1: Comprehension: Point of View	1
2	B	M1W1: Generative Vocabulary: Prefixes <i>ex-</i> , <i>e-</i>	2
3	A	M1W1: Comprehension: Author's Purpose	2
4	C	M1W1: Comprehension: Author's Purpose	2
5	See rubric on p. R1.	M1W1: Comprehension: Theme	3
	Sample two-point response: Dr. Fish was surprised to find out that the bumps on whale flippers were so effective. Dr. Fish was "puzzled" when he discovered that whale flippers had bumps. He then learned from his team's surprising test results that the bumps improved the way that whales moved.		
6	D	M1W1: Comprehension: Theme	2
7	A	M1W1: Vocabulary Strategy: Context Clues	2
WRITING			
1	B	M1W1: Grammar: Complete Sentences	2
2	C	M1W1: Grammar: Complete Sentences	2
3	D	M1W1: Grammar: Complete Sentences	1

Constructed-Response Rubric

Points	Description
2	2 points <ul style="list-style-type: none">• Response provides a complete and correct explanation of, or answer to, the question.• Response includes clear and specific explanations, interpretations, and opinions of the text based on effective comprehension, inference, analysis, evaluation, and/or comparison.• Response is supported with details from the text.
1	1 point <ul style="list-style-type: none">• Response provides a partially complete and correct explanation of, or answer to, the question.• Response attempts to include explanations, interpretations, and opinions of the text, but they may be unclear or unsubstantiated, and they show limitation in comprehension, inference, analysis, evaluation, and/or comparison.• Response is supported with limited details (in quantity or quality) from the text.
0	0 points <ul style="list-style-type: none">• Response is incorrect, irrelevant, or not provided.