Directions

208026P

Read this article. Then answer questions 1 through 7.

What Do Flies Think About?

From *Ideas & Discoveries Magazine*

It seems unbelievable, but an insect's brain is more brilliant than any supercomputer. That's why researchers are studying flies and bees to understand their cognition. Food for thought . . .

Though it may seem like a mundane question, there is serious science behind it: Why is a common housefly able to land on a ceiling? After all, the insect flies with its feet down when it's below the ceiling, yet, in the blink of an eye, the fly is suddenly perched with feet upward. The explanation for the fly's aerial feat is important because it can reveal a lot about what the insect's brain is capable of: Regardless of how the fly manages the landing, its tiny brain (which consists of only 100,000 nerve cells) has to go into high gear to carry it out. For a long time, scientists believed the flies turn around in flight much like a fighter pilot performs loops. This would require them to first "visualize" a mental rotation—in other words, to plan the loop beforehand.

It was only recently that researchers discovered how a fly *actually* lands on a ceiling. Using a high-speed camera, they discovered that flies don't perform a loop after all. Instead, they stretch out their front legs over their head and toward the ceiling. As soon as the legs make contact with the ceiling, the fly swings its body around 180 degrees like a gymnast on a horizontal bar. Then it simply attaches itself to the ceiling with all its legs. This precision landing requires perfect coordination of all its muscles. The fly's swinging motion also needs to be calculated, which means information shoots through its body in the space of milliseconds. Not even an autopilot system controlled by a high-tech computer could carry out such a maneuver.

Bees are a favorite experimental creature for researchers because they are easy to breed and are considered the "Einsteins" of the insect world. These striped geniuses perform intellectual feats that cannot be taken for granted, even among mammals. Bees can count, distinguish between objects like humans and dogs, recognize complex shapes, learn things, navigate across great distances and remember their routes, and return to their hives and tell other bees exactly where the tastiest flowers are. Compare that with the difficulties humans can have when finding their way around an unfamiliar city without a map—not to mention having to describe to friends the route they took. "Brain size is not necessarily an indicator of intelligence," says bee researcher Lars Chittka at Queen Mary, University of London. "Larger brains usually utilize the same circuits over and over again. This might make for more detailed thinking or remembering, but it doesn't guarantee the thoughts or memories will be better."

Bees are also social insects that create complex colony systems and display a high degree of social behavior. The idea of life in a group is firmly rooted in their brains—which is what makes bees so interesting to brain researchers. We, too, are social creatures, after all, and scientists suspect that certain neuronal circuits have changed very little over the course of evolution. In other words, bee brains could provide us with information on nerve connections that will help us better understand our own human nature and how we think.

Researchers already know that insects living in groups need to have more computing power in their head. This is illustrated by the fact that all social insects have a larger brain than their loner counterparts. A key factor in this discovery was a study conducted by biologists at a Smithsonian lab in Panama. The country is home to a bee species that contains some members that live alone and others that form groups. The biologists discovered that the loner bees also had a smaller brain. So it appears that a larger brain is a consequence of group living. The same phenomenon is even more pronounced among several species of locusts that begin life alone and later join up to form giant swarms: As soon as they get together, their brains begin to grow by one-third. It's likely they need to possess greater thinking capacity in order to compete with rivals in the swarm. It's also likely that flying and communicating in a swarm is more difficult than doing those things alone. The biologists still don't know how locusts get their brains to grow. The explanation, should it be found, might be of interest to medical researchers looking into treatments for paralysis or strokes. In any case, the researchers have found substances in the locusts' brain that are extremely effective at killing bacteria. These substances are not related to any known antibiotics, so they could possibly pave the way for new medications in the future.

Such discoveries are definitely pointing scientists in a new direction. However, practically no insect brain researcher has gone as far as Atsushi Takashima at the Tokyo Institute of Technology in Japan. Takashima has inserted electrodes into the brains of male moths that he then uses as control units for a robot. Whenever the moth-machine hybrid catches the scent of a female moth, it begins to search for the source. "Chemical substances do not spread out uniformly in air," Takashima explains. "So even though their concentrations increase as you get closer to their source, the effects of wind and air currents make an analysis extremely difficult. But thanks to evolution, insect brains have developed techniques to get around this problem." Takashima's research has significant applications: His goal is to create robots that can sniff out explosives or dangerous chemicals in the air and locate their source. One day a processor will control such robots, but for now, a moth's brain is far superior to any supercomputer on the market.

What Do Flies Think About

1.The author compares flies to fighter pilots in lines 10 and 11 to show that flies are

A complicated
B forceful
C skillful
D mysterious

2. The sentences in lines 18 through 21 develop a key concept of the article by

A demonstrating how carefully a fly must target its landing place
B revealing the difficulty of conducting research on how a fly lands
C illustrating the complexity of the process a fly's brain must control
D explaining how rapidly the fly's landing occurs after it makes a loop

3. information **best** develops the view that bees are "the 'Einsteins' of the insect world" (line 23)?

A the discussion about the larger brain sizes of bees
B the list of intellectual feats that bees can accomplish
C the reasons that researchers are interested in studying bees
D the information about the complex colonies that bees live in

4.Which central idea of the article is **most** supported by lines 34 through 40?

A Social insects develop larger brains.
B Brain structures have changed little over time.
C Bee colonies can help us understand social systems.
D Insect brains can help us understand the human brain.

5.Which evidence from the article **best** supports the claim in lines 41 and 42?

A "Larger brains usually utilize the same circuits over and over again." (line 31)
B "The idea of life in a group is firmly rooted in their brains—which is what makes bees so interesting to brain researchers." (lines 35 and 36)
C "We, too, are social creatures, after all, and scientists suspect that certain neuronal circuits have changed very little over the course of evolution." (lines 36 through 38)
D "It's likely they need to possess greater thinking capacity in order to compete with rivals in the swarm." (lines 49 and 50)

6. What is the **most likely** reason for including information about the Smithsonian laboratory in Panama?

A to emphasize the results of a major study about bees
B to illustrate why biologists should conduct bee research
C to point out that biologists still know very little about locust brains
D to provide evidence that other countries are performing studies of locust brains

7. Lines 58 through 69 suggest that the author believes

A the study of moths will reveal changes in insect brains
B the study of moths can provide ways to enhance technology
C moth research will teach scientists more about the human brain
D scientists should develop more advanced methods of moth research

Directions

208055P

Read this article. Then answer questions 15 through 21.

The First Public Park

by Marcia Amidon Lusted

It was just an idea for more than a decade, but by 1857, New Yorkers were serious about building a grand public park. New York was the largest metropolis in the nation, and its citizens wanted to show the world that Americans were not just concerned about industry, wealth, and materialism but that they also appreciated natural landscapes.

Using eminent domain, the city took more than 840 acres of land in the center of Manhattan for the new park. The area was considered to lack any real estate value—it included swamps, bluffs, and rock outcroppings as well as two reservoirs that supplied city water. It was home to about 1,600 poor residents, however. This population of pig farmers, gardeners, and an African American settlement called Seneca Village was displaced by the park's construction.

The Central Park Commission held a competition to choose someone to design the park. Among the professional and amateur designers who entered the contest was a team consisting of an American agriculturalist and a British-born architect: Frederick Law Olmsted and Calvert Vaux.

It was Vaux's idea for the two men to join forces. A talented draftsman, Vaux used his detailed drawings to show how their idea for the park would look. An accomplished writer, Olmsted wrote the report that described their plan and included lists of proposed plants and an estimated budget. They submitted their plan, called "Greensward," a day after the commission's deadline.

Greensward included pastoral views and rolling meadows, just like those in traditional English parks. The plan offered beautiful vistas of green lawns and natural rocky ridges as well as more formal locations for public gatherings.

It also included four roads that cut through the park to carry carriage traffic from one side to the other. Olmsted and Vaux designed these major thoroughfares to run eight feet below the park's surface so they would not disrupt the park's views and rural feeling. Pedestrian paths, equestrian roads, and carriage drives were all kept separate from one another. Vaux designed more than 40 bridges so that these various paths would never have to cross on the same level.

Unlike some of the other submissions that included grand, elaborate buildings, Olmsted and Vaux kept structures to a minimum, with only four in the original plan. The design and materials for the buildings were also specifically selected to blend in with the natural environment.

Greensward was announced the winner in the spring of 1858. The selection committee debated over certain design points—some of the members wanted a wide grand avenue in the park, similar to those found in European parks. Olmsted argued against it by saying that stately roads would "destroy scenery at great cost" and that "straight lines of trees or stately architecture . . . belong not to parks for the people but to palatial gardens." Olmsted and Vaux had created their design for the recreation of all people, not just the wealthy. The park was to be a place where all New Yorkers could enjoy nature. Its ultimate design would retain this feeling.

The construction of Central Park was one of the most massive public works projects to take place in 19th-century New York. It required about 20,000 workers to reshape the natural features of the land according to Olmsted and Vaux's plan. Three hundred thousand cubic yards of rock were blasted into rubble, and the resulting stone was crushed to use as paving material. Nearly three million cubic yards of soil were moved, and more than 270,000 trees and shrubs were planted. Swamps were transformed into scenic lakes, and extensive drainage work was done to get rid of small streams and pools. By 1866, more than $5 million had been spent on construction. The park's final price tag was more than $10 million. In the end, this entirely planned park, stretching from 59th Street to 110th Street and from Fifth to Eighth avenues, had a completely natural, unplanned feeling to it.

The process of overseeing the park's construction and accounting for its expenditures exhausted Olmsted. He required a six-week rest cure in Europe in 1859 and suffered a severe broken leg in 1860 that laid him up, but he had the plans for the park spread out in his bedroom so he could continue to work. When he tried to resign from the project in 1861, however, the commission knew that it could not afford to lose him. Ultimately, Olmsted's duties and responsibilities were decreased, and when he departed the project to serve in the U.S. Sanitary Commission during the Civil War (1861–1865), the park's construction was completed under park commission president Andrew Green and Vaux.

Olmsted's involvement in Central Park spanned nearly 20 years. It was not the only site he worked or consulted on, and, for a couple of years, other projects demanded his full attention. But from the time their plan was selected until the mid-1870s, Olmsted and Vaux were associated with the park on and off. Sometimes, their titles as landscape architect advisors required little on-site work. At other times, such as when Olmsted filled in as acting president of the Department of Public Parks, he looked into establishing lights in the park at night and assessing the park's safety. By 1878, however, Olmsted's role with the park officially ended.

Today, Central Park stands as one of Olmsted's greatest legacies. It contains numerous playgrounds and athletic fields. Runners and bicyclists make use of the wide, rolling paths. There are places to skate in the winter and boat in the summer. Concerts, plays, and rallies take place there. Sculptures by famous artists can be found throughout the park. There are also quiet places to walk, sit and read a book, or watch birds. Central Park has become a

world-famous site that attracts more than 25 million visitors each year. It also is a shining example of Olmsted's desire to create and preserve public green spaces in urban places for generations of people to enjoy.

The First Public Park

8. Which evidence supports the claim that Americans "appreciated natural landscapes" (line 4)?

A "The area was considered to lack any real estate value—it included swamps, bluffs, and rock outcroppings as well as two reservoirs that supplied city water." (lines 6 through 8)
B "Vaux designed more than 40 bridges so that these various paths would never have to cross on the same level." (lines 27 and 28)
C"The construction of Central Park was one of the most massive public works projects to take place in 19th-century New York." (lines 41 and 42)
D"There are also quiet places to walk, sit and read a book, or watch birds." (lines 71 and 72)

9. How does the information regarding the competition contribute to the reader's understanding of Vaux and Olmsted?

A Vaux had different ideas from Olmsted regarding the appearance of the park.
B Vaux and Olmsted carefully considered suggestions made by the committee.
C Vaux and Olmsted's collaboration benefited from their distinct abilities
D Vaux was more concerned about details than Olmsted.

10. Which evidence supports the idea that Olmsted and Vaux wanted their park to appeal to all New Yorkers?

A They excluded some designs common to European parks
B They decided to put the park in the middle of Manhattan.
C They hired thousands of local residents to build the park
D They included lights so the park could be used at night

11. Read this sentence from line 68 of the article.

Today, Central Park stands as one of Olmsted's greatest legacies.

The author uses the word "legacies" in this sentence to mean
A accomplishments benefiting future users
B financial investments with the goal of benefiting everyone
C complicated models to copy and build
D old projects worthy of recognition

12. Read these sentences from lines 37 through 40 of the article.

Olmsted and Vaux had created their design for the recreation of all people, not just the wealthy. The park was to be a place where all New Yorkers could enjoy nature. Its ultimate design would retain this feeling.

Lines 37 through 40 relate to lines 68 through 72 by showing that the

A role of the park has changed over time
B park is now used throughout the year
C park designers achieved their goal
D size of the park is increasing

13. Which phrase from the article helps readers understand the meaning of "pastoral" (line 20)?

A "grand public park" (line 2)
B "formal locations" (line 22)
C "rural feeling" (line 25)
D "world-famous site" (line 73).

14. Based on evidence from the article, which claim is **most** accurate?

A Olmsted and Vaux were hired based on their reputations.
B The scale and design of the project made Central Park remarkable for its time.
C Americans had a greater appreciation of nature than did Europeans.
D Central Park today hosts a greater array of activities than it did in the past.

Directions

308035P

Read this story. Then answer questions 52 and 53.

The Pod

by Maureen Crane Wartski

Couldn't Pete talk about anything but *fish*?

Jesse Waring tried to block his cousin's voice, but there was no escape.

"Dolphins aren't fish, they're mammals," Pete was lecturing. "They look big and tough, but they can get stressed or scared, like the stranded dolphin we rescued . . ."

"Jesse?" His mother was standing beside him, her eyes full of concern. His parents were always worrying about him these days, Jesse thought, irritably, and the other relatives were just as bad. *Poor Jesse, it's a shame about the accident. He used to be a great athlete . . .* Even when they didn't talk to him, he could feel their pitying thoughts.

"Can you go to the store for me?" his mother was saying. "We've run out of milk. That is," she added quickly, "if you're not too tired . . ."

". . . And I want to make sure to visit the Cape Cod Stranding Network," Pete was droning on. "They have a hotline, and they do great work. . . ."

Yada, yada, yada. "Sure, Mom," Jesse said. *Anything to get away from Pete's lectures and all these pitying eyes.*

He snatched up car keys from the table in the entryway, grabbing his windbreaker as he limped out the door. Once outside, he wished he'd brought his parka—the wind had an icy sting—but he wasn't going back into the house.

He'd always enjoyed the annual Waring family reunion, when cousins, uncles and aunts from all over the country got together and rented a house on New England's Cape Cod, but this March was different. It was the first time the clan had gathered since the accident.

Jesse didn't want to think about how a man driving a pickup had jumped a red light, slamming into his car and fracturing his legs. Until then Jesse had been the star of the school soccer team, certain of an athletic scholarship.

"Not anymore," he muttered, then frowned as he realized he'd passed the store. Well, OK, there was a convenience store about 30 miles away, and the drive would give him some needed alone time.

At first, the silence was great.

But as Jesse drove on the road that wound beside the ocean, he kept thinking how his future had been smashed along with his legs. Pep talks that people gave him made it worse. He was a cripple, and he knew it. These days Jesse always felt as if there was a tight, hard knot in his chest.

On impulse, he turned the wheel, pulling into an empty parking lot that faced the water. He got out and limped down some stairs. Except for screeching seagulls and a few scattered rocks, the beach was deserted.

Suddenly, Jesse tensed. *That rock . . . did it move?* He took a step closer and saw that it was no rock.

The dolphin wasn't very big, not even four feet long. When Jesse hobbled over, the big fish . . . *mammal*, according to Pete . . . rolled an eye at him. How long had it been there? It was breathing, but its sides were heaving painfully.

Fragments of Pete's endless monologue came back to him. His cousin had said that a dolphin's rib structure wasn't built to protect it on land. The body weight of this creature was slowly compressing its vital organs, and if it didn't get back into the water soon, it could die.

It was going to low tide, and the waves seemed far away. The best thing to do was to call Pete, who would know what to do. Jesse reached for his cell phone.

It wasn't there. He'd left it in the pocket of his parka! He could drive home and get Pete, but that would mean leaving the dolphin. Would it be alive when he got back? He knew nothing about this creature except that it was helpless.

The dolphin's eye rolled again, and Jesse felt a sudden jolt of empathy.

It looked as scared as he had felt when they'd wheeled him into the emergency room that afternoon.

"Hey, Bud . . ." Jesse knelt down beside the dolphin. "OK, I can't just leave you to die. But how do I get you back into the water?"

Even if he managed to drag this creature that weighed—what? maybe 75 pounds? back to the water, the coarse sand might damage its skin. Jesse looked helplessly toward the gray ocean and was surprised to see dark shapes arcing out of the waves. A *pod*—Pete's word—of dolphins was out there.

"I think your family's waiting for you, Bud." Carefully, Jesse reached out and patted the dolphin. Was it his imagination that his touch made the dolphin calmer?

Jesse didn't waste time thinking about that. He was trying to remember what Pete had said about how, when he'd helped rescue a stranded dolphin, they had put the creature on a sort of blanket sling and carried that contraption down to the water. Well, he didn't have a blanket handy, so his windbreaker would have to do.

Carefully, Jesse scooped a hollow in the soft sand under the dolphin's head, then eased part of the windbreaker under it. He was streaming with sweat by the time he'd managed to maneuver as much of the dolphin as possible onto its makeshift "blanket," then began to drag the dolphin toward the water.

Twice, his legs buckled under him tumbling him backward onto the sand, but he kept going until water was lapping around his ankles.

"Almost there, Bud," Jesse gritted.

As Jesse waded knee-deep into the water, the dolphin made some kind of noise and then began to swim.

"Woo hoo!" Jesse yelled, then yelped in dismay. The dolphin was swimming back toward the shore.

What was wrong with the crazy creature? Pete's voice began to drone in Jesse's mind again, recounting his own dolphin rescue: *"The dolphin was disoriented. It kept heading for the shore. We had to guide it back into the deep water . . ."*

Jesse waded deeper, past the breakers. Icy waves broke against him as he tried to head off the young dolphin. When he'd finally managed that, it wouldn't turn. He wished he had paid more attention to Pete's lecture, but wishing never helped.

Waves sent freezing spumes into his face. "Bud, you've got to save yourself," Jesse gritted through chattering teeth. "Nobody's going to do it for you. If you give up, you're finished . . ."

Suddenly, as if it had at last understood, the young dolphin turned toward deeper water and began to swim toward the pod. Waiting dolphins arced nearer as if in welcome, and watching them, Jesse thought of his own family. They'd be worried because he'd been gone so long.

My pod, he thought.

He was freezing as he limped back to his car, but he was grinning, and he was happier than he'd been in a long while. He was going to drive to the nearest store and call Pete, who would probably contact that Cape Cod Stranding Network hotline that he'd been talking about. The CCSN would make sure Bud didn't strand again.

"But that's not going to happen anyway," Jesse said aloud.

He had a feeling that the young dolphin was finally on the right track.

The Pod

15. How does Jesse feel about his family in lines 1 through 21? Use **two** details from the story to support your response.