

外 国 語

次の英文は *Discover*, vol. 23, no.6 (June 2002) に掲載された“Sight Unseen”という
題の記事です。この文章をよく読んで、問題 1 から 5 に答えなさい。

解答は解答用紙の指定された欄に記入すること。

*のついている語句の注は問題のあとに示されています。

Mike May lost his vision at the age of 3, when a container of fuel exploded in his face. It destroyed his left eye and scarred the cornea* of his right, but over the next 43 years he never let those disabilities slow him down. He played football in elementary school, soccer in college, and nearly any activity that didn't involve flying objects as an adult. He earned a master's degree in international affairs from Johns Hopkins University, took a job with the CIA, and became the president of a company that makes talking Global Positioning Systems for the blind. He also found time to help develop the first laser turntable, marry, have two children, and buy a house in California. “Someone once asked me if I could have vision or fly to the moon, what would I choose,” he once wrote. “No question — I would fly to the moon. Lots of people have sight, few have gone to the moon.”

Then one day in 1999, at a hospital in San Francisco, surgeon Daniel Goodman dropped a circle of corneal stem cells* onto May's right eye (his left was too severely damaged to be repaired). The cells replaced scar tissue and rebuilt the surface of the eye, preparing the eye for a corneal transplant. On March 7, 2000, when the bandages were removed, May got his first look at his wife, his children, and for the first time since he was a small child, himself.

The stem-cell surgery performed on May was developed in Japan and introduced to the United States in 1999. Since then hundreds of people have benefitted from it. But of all those who have had their sight restored throughout history, only about 20 recorded cases were blind since childhood, and of those, most

had less-than-perfect corneas after surgery. When Dr. Goodman peered into May's eye after the surgery, he saw a lens that ought to provide crystal-clear vision.

It doesn't — far from it. Flawless as his optical hardware is, May's brain has never been programmed to process the visual information it receives. May still travels with his seeing-eye-dog, or taps the sidewalk with a cane, and refers to himself as “a blind man with vision.” And that paradox fascinates Don MacLeod and Ione Fine, psychologists at the University of California at San Diego. The speed with which babies learn to understand the world suggests that they're born with the ability to process some aspects of vision. But which aspects? What is learned and what is hardwired? During the past year and a half, Fine and MacLeod have put May through a lot of physical and psychological tests, including functional magnetic resonance imaging (fMRI*) which tracks blood flow in the brain. The results are opening the first clear view into how we learn to see.

⁽¹⁾ MacLeod's laboratory at the university is a labyrinth of filing cabinets, optical equipment, and oddly placed desks. “It's well booby-trapped,” he says, guiding May toward the first of many tests. “But May has an uncanny ability to navigate complicated arrangements.” Sitting in front of an ancient computer monitor, May watches as thick black-and-orange bars appear on the screen. MacLeod and Fine are testing his ability to see detail. His job is to adjust the contrast until he can just see the bars. A click on a mouse brings up another set of bars, thinner than the last, and he plays around with those until he can see them too. Although his right eye ought to provide 20/20 vision, in reality it's closer to 20/500. Instead of seeing the letter E on an eye chart from 25 feet, May can see it only from two. In the past the blurred vision of people with restored sight was blamed on scar tissue ⁽²⁾ from surgery. But stem-cell surgery leaves no scars. The signals are reaching May's brain, but they are not being interpreted very well.

More than 300 years ago, in a famous letter to the philosopher John Locke*, the Irish thinker William Molyneux* anticipated what May sees. A blind man who

is suddenly given vision, Molyneux suggested, wouldn't be able to tell the difference between a cube and a sphere. Sight is one kind of perception and touch another; they can be linked only through experience. Objects, faces, depth — just about everything that helps us function in the world — are meaningless when a person who has never seen before gets sight. “Babies are born into a bright, buzzing confusion, but we can't ask them what it's like,” Fine says. “In some ways talking to Mike May is like getting to talk to a 7-month-old.”

In the first months after his surgery, May fulfilled Molyneux's prediction: He couldn't distinguish a sphere from a cube. Since then his sight has improved, but only slightly. He has a better grasp of spheres and squares (“We've shown him an awful lot of them,” Fine says), and with practice he can understand things he's seen again and again. But this is only a work-around: He's past the critical period for learning to recognize objects instantly.

“Two of the major clues I have are color and context,” May says. “When I see an orange thing on a basketball court, I assume it's round. But I may not be really seeing the roundness of it.” Faces give him even more trouble. Although he has seen faces everywhere since the first day his vision was restored, he still can not recognize people. Their expressions — their moods and personalities — are also a mystery. Even his wife is familiar to him only by her way of walking, the length of her hair, and the clothes she wears. “If a face has no hair and a fake moustache, we can still tell the gender,” Fine says. “But he can't deal with it. The bit of the brain that does that isn't working.”

The fMRI scans, which track May's brain activity as it's occurring, show that when May sees faces and objects, the part of his brain that should be used to recognize them is inactive. However, when he sees an object in motion, the motion-detection part of his brain lights up like a disco ball. He can interpret movement on a computer screen as well as any normal-sighted adult and seems to have the same skill in real life. “We were driving along, and a minivan came up to us pretty fast on his side,” Fine remembers. “It whizzed by him, and he mentioned that it

was going fast. That's a complicated calculation. The motion on the retina* depends on how big the car is, how close, and how fast it's going."

It's hard to escape the conclusion that motion detection, unlike every other visual experience except color, is largely hardwired. The best illustration of this may be offered by cats. "If you roll a ball along a floor, the cat will chase it as long as it's moving," Fine says. "As soon as it's stationary, the cat will have a hard time seeing it and will ignore it." That's why mice freeze when they're afraid. It may also explain why May, who can barely recognize a stationary ball, is pretty good at catching a moving one. It's his favorite use of his new sense. "I don't know who has more fun," he says, "my 8-year-old or me."

Only a few adults have seen the world through the eyes of a baby, and many who did came away wishing they were still blind. Their family and friends had convinced them that vision would offer a miraculous new appreciation and understanding of the world. Instead, even the simplest actions — walking down stairs, crossing the street — became extremely difficult. Discouraged and depressed, about a third of them returned to the world of the blind, preferring dark rooms and walking with their eyes closed.

If May feels differently, it may be because his expectations were so low. For a man who used to enjoy windsurfing blind and alone, usually able to return to the place from which he'd started, sight is just another adventure in a life of exciting obstacles. "People have this idea that it's so overwhelmingly practical to have sight," May says. "I say it's great from an entertainment point of view. I'm constantly looking for things that are unique to vision. Running and catching a ball is one of them — I've been chasing balls my whole life. Seeing the difference between the blue of my two sons' eyes is another. Or if you drop something, you can find it."

The gift of sight may seem most miraculous to those who have never been blind. But May still finds things in the world to fascinate him. Sitting in the passenger seat of Fine's car one day, with his dog at his feet, he ignores the blue

Pacific ocean and the tall, top-heavy trees lining the road. Instead, he looks at the sunlight coming through the window onto his lap. “I can’t believe the dust is just floating in the air like this,” he says. Oceans and trees he has known all his life through touch. But seeing this sparkle of dust, suspended in the bright sun, is an entirely new experience. He waves his hand through the sparkling light. “It’s like having little stars all around you.”

問 題

1 *What do the following words, which are underlined in the text, refer to? Answer in English.*

- (1) it
- (2) it
- (3) they
- (4) that
- (5) one

2 *Decide whether the following statements are true or false and circle the correct answer.*

- (1) May has avoided sports since becoming an adult.
- (2) The stem-cell surgery restored sight in both of May's eyes.
- (3) May had seen himself before he lost his vision at the age of 3 .
- (4) May's cornea was perfect after the stem-cell surgery.
- (5) Molyneux's experiments proved, more than 300 years ago, that a blind man who is given sight will be unable to tell the difference between cubes and spheres.
- (6) MacLeod's experiments threw doubt upon Molyneux's prediction.
- (7) May has trouble distinguishing objects based on their shape.
- (8) The only face that May can recognize is his wife's.
- (9) Although many people with restored sight are disappointed with the results, May finds the difficulties to be exciting.
- (10) May can not see the difference between the colors of his two sons' eyes.

3 *Answer the following questions in English.*

- (1) Based on the article, list two inborn aspects of vision for human beings, that is, two built-in visual abilities.
- (2) What do fMRI scans tell us regarding May's perception of faces?
- (3) Many people who have had their sight restored became depressed and discouraged. Why did this occur?

4 下線部 (ア)～(ウ) を日本語に訳しなさい。

5 この文章から人間の視覚についてどのようなことがわかりますか。「脳」, 「認識」という言葉を必ず用い, マイク・メイの実例にそって 400 字以内で説明しなさい。

注

corneal (*adj.*) < cornea : 角膜

stem cell : 幹細胞

fMRI : 核磁気共鳴機能画像法。磁気を用いた画像診断法(MRI)の一種。生体の機能を詳しく知ることができる。

John Locke : ジョン・ロック (1632-1704) イギリス経験論を代表する哲学者, 政治思想家。

William Molyneux : ウィリアム・モリノー (1656-1698) ダブリン生まれの思想家で, ロックの友人。

retina : 網膜