Rise Up
by Stephen Fraser

A treatment enabled a paralyzed man to stand and take steps again.

It was an evening in July 2006. The Beavers, Oregon State University's baseball team, had recently won the College World Series. One of the team's pitchers, Rob Summers, 20, was retrieving his gym bag from his parked car when another car hit him. "The car then drove off, leaving me there with no help," says Summers.

The impact rendered Summers paraplegic-unable to move his lower body. His doctors told him he'd never walk again-hard news for an active young man to hear.

"They told me that I had no hope," says Summers. "My comment was, 'You don't know me very well. I'm going to fight until I get well again.'"

Five years later, Summers regained the ability to stand and could take steps on a treadmill. His recovery "remains unprecedented," European researchers commented in the British medical journal *The Lancet*. "We are entering a new era."

Information Highway

The car that hit Summers seriously injured the lower part of his *spinal cord*-the column of nervous tissue that runs through the backbone. It carries messages to and from the brain, the...
body’s central organ. Radiating outward from the spinal cord is a web of *motor neurons*, which govern movement. The damage done to Summers’s spinal cord stopped the brain's messages from reaching many of the motor neurons in his lower body, preventing him from standing or walking.

![Rob Summers after the accident that rendered him a paraplegic.](image)

After the accident, Summers underwent two years of standard therapy—muscle massages, lessons in how to use a wheelchair, and the like. Before then, little more could be done for paraplegic patients. Summers had the good fortune, though, to be chosen for an experimental research project. "Rob was an ideal candidate," says one of the project's researchers, Susan Harkema, a professor of neurosurgery at the University of Louisville in Kentucky. "He was young and in otherwise good health. He's also a very determined, disciplined person -an extraordinary young man."

![Summers stood with his father, Mike Summers.](image)

In a four-and-a-half-hour operation, the research team implanted electrodes in Summers’s spinal cord. The electrodes were then wired to a pulse generator that was implanted in his back. The pulse generator is remotely controlled by a device outside the body.
Body's Wiring

After the surgery, Harkema and her team began the treatment. They switched on the pulse generator for two hours a day, electrically stimulating the nerves in his spinal cord. Nerves can respond to electrical stimulation because the messages they carry take the form of electric signals. Nerves are the body’s "wiring."

On the third day of electrical stimulation, Summers was able to stand with assistance. "It was unbelievable," he says. "There was so much going through my head at that point. I was amazed; I was in shock."

By 2012, Summers could not only stand but also could walk slowly on a treadmill with the aid of an assistant and a supporting harness. He was able move his hips, knees, ankles, and toes voluntarily. The exercise had enabled his leg muscles to regain some of their former mass.

Sensory Signals

The brain does more than just control movement. It receives messages from all parts of the body. Many of the messages come from the eyes, ears, nose, skin, and muscles. Those messages travel by way of the sensory neurons. Summers's spinal cord wasn't totally damaged. It could still receive limited sensory signals from the muscles in his lower body.

That residual feeling in his lower body might be what enabled the experimental treatment to succeed, says Harkema. Sensory messages from the legs might have been traveling to Summers's electrically stimulated spinal cord, prompting it to send signals along the motor neurons and make the legs move.

"Our big finding is that the spinal cord is as sophisticated as the brain," says Harkema. "It has a memory. When you walk, it remembers that you are on two legs or one. The spinal cord basically takes information from the brain and then handles all the details. We didn't know that before."

Patients who don't have some physical sensation, as Summers does, may not be helped by the treatment, says Harkema.

Body Control
Spinal cord damage can do more than impair limb function. Victims can lose bladder and bowel control. Those functions are regulated by another part of the nervous system—the autonomic nervous system—that radiates from the spinal column. It controls automatic processes in the body, such as heart rate, blood pressure, sweating, and salivation. Summers has regained function in his bladder and bowels. He also has been able to discontinue a variety of expensive medications prescribed to alleviate pain and prevent heart disease.

"Now I can stand," says Summers. "I've gotten my confidence back to just go out in public." His goal is to stand and walk completely normally. "I'm working toward that every day."

Broken Cord

The spinal cord carries nervous signals back and forth between the brain and the rest of the body. An injury to it can cause a complete or partial loss of function depending on the severity of the damage.
1. What was done beyond the standard therapy for paraplegic patients that allowed Rob Summers to walk?
   A. replacement with an electrically stimulated spinal cord
   B. inclusion in an experimental research project
   C. two years of muscle massages and lessons in how to use a wheelchair
   D. inclusion in a drug trial for quadriplegics

2. Which sections describe the effects of the experimental research project treatment?
   A. "Information Highway and Body's Wiring"
   B. "Body's Wiring and Sensory Signals"
   C. "Broken Cord and Information Highway"
   D. "Body's Wiring and Body Control"

3. Read the sentences:

   "The car that hit Summers seriously injured the lower part of his spinal cord—the column of nervous tissue that runs through the backbone. It carries messages to and from the brain, the body's central organ. Radiating outward from the spinal cord is a web of motor neurons, which govern movement."

Which sentence best summarizes the functions of the brain and motor neurons?
   A. The brain is the body's central organ, the motor neurons radiate outward.
   B. The brain carries messages, the motor neurons direct movement.
   C. The brain sends and receives messages, the motor neurons direct movement.
   D. The brain connect the spinal cord, the motor neurons protect the spinal cord.

4. Read the sentences:

   "His recovery 'remains unprecedented,' European researchers commented in the British medical journal The Lancet. 'We are entering a new era.'"

Which phrase below is closest to the meaning of unprecedented?
   A. not having an example beforehand
5. What is this passage mostly about?
   A. the importance of the spinal cord and brain in playing sports
   B. the perseverance of one inspiring neurosurgeon, Susan Harkema
   C. the effects of and treatments for spine injuries
   D. the different treatments for hit and run victims

6. What advances or improvements has Rob Summers made since the experimental treatment?

7. What can the reader infer about Rob Summers's character based on the passage? Use evidence from the text to support your answer.

8. The question below is an incomplete sentence. Choose the answer that best completes the sentence.
   Rob Summers received therapy and treatment; __________, he is now able to stand, walk slowly with some assistance, and control some bodily functions.
   A. consequently
   B. in the end
C. for example
D. previously

9. **Vocabulary Word**: residual (adj.): remaining, left over.

Use the vocabulary word in a sentence: