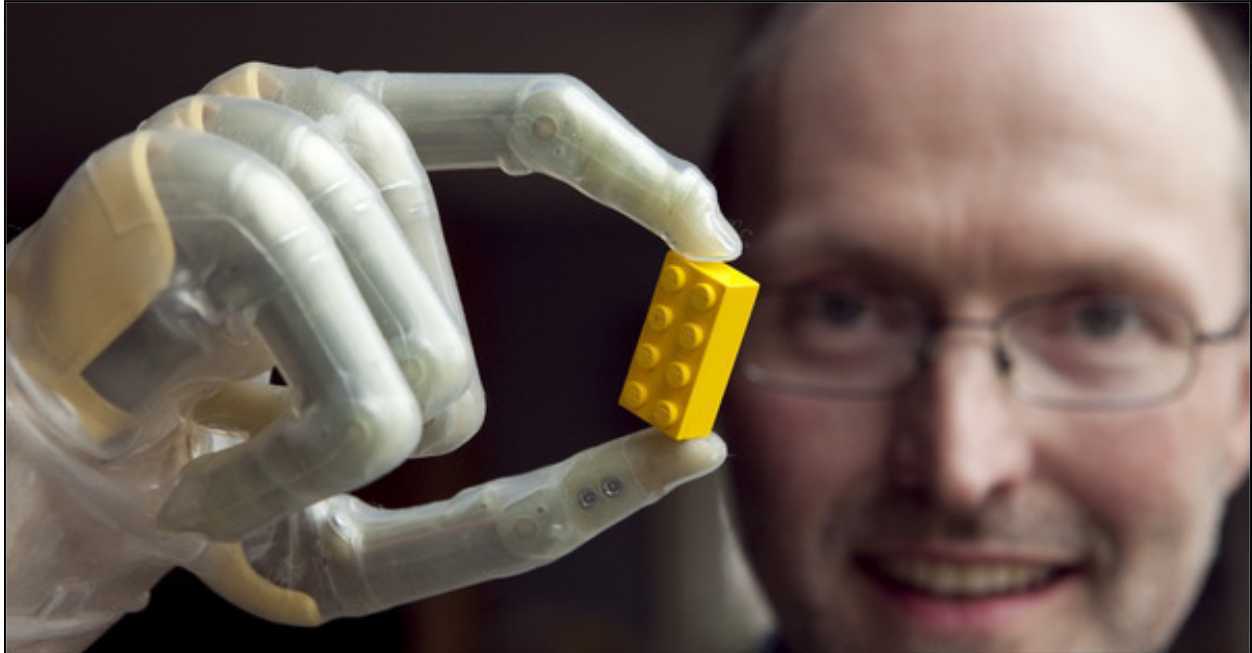


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## Grabbing Gracefully, With Replacement Fingers



Eric P. Jones demonstrating his new prosthetic fingers. They have helped him master movements other people take for granted, like pouring soda into a cup.

By ANNE EISENBERG

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ERIC JONES sat in a middle seat on a recent flight from the New York area to Florida, but he wasn't complaining. Instead, he was quietly enjoying actions that many other people might take for granted, like taking a cup of coffee from the flight attendant or changing the channel on his video monitor.

These simple movements were lost to Mr. Jones when the fingers and thumb on his right hand were amputated three years ago. But now he has a prosthetic replacement: a set of motorized digits that can clasp cans, flimsy plastic water bottles or even thin slips of paper.

"Pouring a can of soda into a cup — that is a mundane daily action for most people, but to me it is a very big deal," said Mr. Jones, who lives with his family in Mamaroneck, N.Y. "I slip my bionic fingers on like a glove, and then I have five moveable fingers to grasp things. It's wonderful to have regained these functions."

Mr. Jones's prosthesis, called ProDigits, is made by Touch Bionics in Livingston, Scotland. The device can replace any or all fingers on a hand; each replacement digit has a tiny motor and gear box mounted at the base. Movement is controlled by a computer chip in the prosthesis.

ProDigits was released commercially last December, said Stuart Mead, the chief executive of Touch Bionics. About 60 patients have been fitted worldwide, he said, and some have been wearing it for three or four years. The cost is \$60,000 to \$75,000, including fitting and occupational therapy.

The technology used by Touch Bionics is based on prostheses that the National Health Service in Scotland developed for children there who suffered effects of the drug thalidomide, he said. The company, founded in 2003 as a spin-off from the health service, adapted the technology from custom prostheses into ones that could be produced commercially. It had funding from investors including Archangel Informal Investment and the Scottish Co-investment Fund.

The company's first product, released two and a half years ago, was the i-Limb Hand, an entire hand that opens and closes and can grasp objects. It has been a success, Mr. Mead said, with more than 1,200 patients fitted with it in 40 countries.

The company then turned to creating ProDigits. "We decided to develop the technology to mechanize not just a hand, but individual fingers," he said. "We always knew that it would be the bigger market — more people lose individual digits than lose entire hands — but also the most challenging technically."

The individual, motorized fingers are a new and promising development in the field, made possible in part by miniaturization of components, said John Miguelez, founder and president of Advanced Arm Dynamics of Redondo Beach, Calif. The company specializes in prosthetics for hands and arms for, among others, soldiers returning from Afghanistan and Iraq at Walter Reed Hospital in Washington. "More voltage and current can be applied to the motors," he said, "creating increased speed and force."

Dr. Douglas G. Smith, a professor of orthopedic surgery at the University of Washington and Harborview Medical Center in Seattle, agreed. "Motors are getting stronger and smaller, and the batteries are thinner and smaller, too," he said, making it possible to fit mechanical components into the space formerly occupied by a finger.

Eric Jones has been wearing a ProDigits prosthetic for 18 months. The artificial fingers are slightly larger than the originals, but that is not a problem, he said. "The fingers look cool," he said. A switch on the side turns the power on and off, and he charges the digits overnight, as he would a cellphone

Mr. Jones starts the action by flexing or relaxing a muscle in the palm of his hand. Sensors built into the prosthesis pick up the signals sent by the muscles and send the message to the computer chip that controls the motor. The artificial fingers stop closing when they detect resistance, said Karl Lindborg, professional services director for Touch Bionics.

A single, outstretched prosthetic finger can operate a microwave oven or a cellphone; a finger and a thumb can hold a chess piece; three or more fingers can grasp a sphere. Mr. Jones said the fingers also provided a touch of class. "I can grasp a wine glass with my bionic fingers," he said. "My pinkie and ring finger curve under the bowl very elegantly."

PRODIGITS may be opened and closed not only by sensors that pick up muscle contractions, but also by dime-size pads put at the base of the fingers to detect pressure exerted by remnant bone. "If you can wiggle the bones in your palm, Mr. Miguelez explained, "that wiggle can be translated into controls to open and close the fingers."

Robert J. Green of Bel Air, Md., who lost the fingers and thumb on his dominant left hand last year, operates his ProDigits in just that way. He uses his prosthetic fingers, for example, to write with a pen or a pencil. The artificial digits have actually improved his handwriting, he said, and he likes their appearance, too. "I look something like Arnold Schwarzenegger in 'The Terminator,'" he said.

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