

RISER
A FULLY
IMMERSIVE
REHAB ROBOT

BIRTHPLACE: University of British Columbia
OCCUPATION: Rehabilitator
WHY WE NEED IT: Today's physical-therapy equipment for balance requires stroke victims to have enough strength to stand on their own, but that puts them at risk of more falls and injuries.
HOW IT WORKS: The RISER (Robot for Interactive Sensory Engagement and Rehabilitation) is the only rehab system that can simulate a wide range of unstable situations while fully supporting a patient's body weight to help him regain his sense of balance after a stroke. Supported by a back brace, a patient stands on a Wii-board-like platform that can move in six directions. Virtual-reality goggles work in sync with the platform to guide users through different simulated activities, such as riding up an escalator or windsurfing. Patients can gradually attempt more-challenging balancing acts to speed up their recovery.
 The platform is also a powerful research tool in the quest to better understand the neurobiology of balance. When a patient stands on the platform and experiences a recording of his previous ride, electrodes attached to his scalp give scientists insight into how different brain regions are responding to the experience.
ON THE JOB BY: 2015



The RISER

RAVEN 2

A ROBO-SURGEON THAT DOES THE WORK OF TWO DOCTORS

BIRTHPLACE: University of Washington and University of California at Santa Cruz
OCCUPATION: Remotely operated surgeon
WHY WE NEED IT: Wounded soldiers, disaster victims and people who live in rural areas are rarely within reach of top-notch surgeons and medical centers. As inventor Jacob Rosen puts it, "There's a doctor who's done the surgery once in his lifetime standing next to you, or an expert halfway around the world. Who do you choose?"
HOW IT WORKS: The Raven surgical system is the first to allow two surgeons to remotely operate together on a patient. One surgeon could sit at a console in, say, Los Angeles, watching on a computer screen as the robotic arm she's manipulating with a joystick deftly slices into a patient lying on an operating table in North Dakota. Meanwhile, another surgeon at a console in New York wields the second set of robot arms. Rosen, a computer engineer at the University of California at Santa Cruz, designed software that allows surgeons to seamlessly operate the four arms without colliding them.
ON THE JOB BY: 2013



DR. ROBOTO This remotely operated surgeon at the University of California at Santa Cruz features four arms.

CARDIOARM
THE SLINKIEST SURGICAL TOOL

BIRTHPLACE: Cardiorobotics and Carnegie Mellon University
OCCUPATION: Surgical assistant: conducts minimally invasive heart surgery
WHY WE NEED IT: Heart surgery means slicing the chest, breaking the sternum, and splaying the ribs; recovery can take months.
HOW IT WORKS: Carnegie Mellon University engineer Howie Choset's snake-shaped surgeon is only a centimeter long and weighs less than three ounces, yet it's packed with motors and joints that give it 102 degrees of freedom, letting it deftly wrap itself around organs and worm through intestines, bronchial tubes and

other pathways used during endoscopic surgery. Its unprecedented flexibility, along with a tiny camera head, makes it easy to steer remotely using a joystick. "Make a quarter-inch turn one way, move an inch, and boom!—you're behind the heart," says Choset, the co-founder of Cardiorobotics, Inc. In February the robot performed a diagnostic procedure on a patient who otherwise would have required a surgeon to split her breastbone, which would have tacked months onto recovery.
ON THE JOB BY: 2012



TAIZO
THE RICHARD SIMMONS OF ROBOTS

BIRTHPLACE: National Institute of Advanced Industrial Science and Technology, Japan
OCCUPATION: Workout instructor
WHY WE NEED IT: Exercise can help senior citizens live longer, healthier lives, but their growing ranks will soon outnumber qualified fitness instructors.
HOW IT WORKS: This two-foot-tall robot looks more like a miniature snowman than a personal trainer, but its 26 joints make it almost as flexible as a yogi. Taizo helps lead simple movement classes in Japan, mostly from a chair for the convenience of

its seated students. Among its repertoire of 30 exercises, Taizo can stretch its arms wide and bend down to touch its toes. And although the robot is in great shape, it's not tireless—after two straight hours of exercise, its batteries need recharging. Special motors allow the little guy to perform slow, methodical motions that are easy to imitate and help followers avoid muscle strain. Next month, developer General Robotix begins selling the robot's \$10,000 frame to scientists for research.
ON THE JOB BY: Next year

