

The robot revolution is just beginning

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Rodney Brooks

When industrial robots were first introduced in the early 1960s — initially on automobile assembly lines — computers were still in their infancy, so the robots were designed to perform only the most rigidly predetermined set of repetitive movements. Despite a half-century of exponential growth in computational power, that’s pretty much still the state of industrial robotics. But according to Rodney Brooks, who last year left a tenured position as MIT’s Panasonic Professor of Robotics to focus on his latest company, that may not be true for much longer.

Brooks’s “lips are sealed,” as *The Economist* put it last week, about what exactly he and [Heartland Robotics](#) are up to in a converted warehouse in

South Boston's Innovation District. But venture capitalists have already gambled \$32 million on the premise that whatever it is they produce, it's going to set a whole new direction in the field.

Brooks, now the chairman and chief technology officer of Heartland Robotics, spoke at MIT on April 20, addressing a recently formed student entrepreneurship group called do.it@MIT.

In robotics, "today's technology is going to look so incredibly primitive in a couple of decades," Brooks told a crowd of about 400, mostly students, gathered at MIT's Kresge Auditorium. And, he added, "you're the ones who are going to invent" the new robotic technologies that will transform the field.

Robots down under

The former director of MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL) described growing up in Adelaide, Australia. While he had never heard of MIT, he was an inveterate tinkerer who became intrigued early on by robotics.

In the early 1960s, Brooks recalled, he built a very primitive computer, using vacuum tubes, that had a total random access memory capacity of 64 bits (or 8 bytes) and took a year and a half to build. He then went on to build a very simple [robot](#) that remained in his mother's garden shed for the next 30 years, he said.

After seeing the 1968 movie "2001: A Space Odyssey," he became intrigued by HAL, the movie's intelligent, responsive computer. "He was a murdering psychopath," Brooks quipped — but nonetheless an impressive portrayal of machine intelligence.

Brooks' first exposure to the Institute came when he read that an MIT

professor named Marvin Minsky had been a consultant to filmmaker Stanley Kubrick; he immediately decided he wanted to attend MIT.

That dream took a while to realize: Brooks was turned down for graduate school at MIT, and turned down again — twice — for faculty positions after earning his doctorate at Stanford University. “Rejection is not the end,” he advised the students, saying that it’s important to persevere in pursuit of one’s dreams: “Persistence pays off.”

In 1994, on his third try, Brooks finally did get an MIT faculty appointment, and quickly set about upending the world of robotics research.

Out of control

Brooks’ first major contribution to the field came from an insight based on nature: the idea of building swarms of tiny, inexpensive robots with autonomous control systems. Initially intended as an alternative to NASA proposals for huge planetary rovers, the concept was described in a research paper called “Fast, Cheap and Out of Control.” Soon thereafter, Brooks became a central character in a documentary film of the same name by Oscar-winning filmmaker Errol Morris.

The concept of smaller, simpler robots did ultimately have an impact on NASA, and led to Brooks’ work on the first mobile robotic device ever to land on another planet: a Mars rover called Sojourner.

Working with MIT students and postdocs, Brooks developed a variety of robots that could watch people’s facial expressions and gestures and make inferences about their meaning and emotional state — for example, sensing when people were frustrated or bored. The goal, then as now, was to create robots that could more easily interact with human beings.

Over the years, Brooks set up several companies; his first big success was one that became known as iRobot, which introduced the vacuum-cleaning robot called Roomba. The company also produces military robots that are widely used by U.S. forces to disarm explosives and explore dangerous areas.

Brooks' latest concept for next-generation robots could, he thinks, revolutionize manufacturing. Instead of huge machines that need to be kept inside protective cages so they won't injure nearby workers, he envisions smaller, nimbler, more responsive robots that could work alongside people, helping them with tasks. The new robots, he says, will compare to today's lumbering [industrial robots](#) in much the way that an iPhone compares to an earlier, room-sized mainframe computer.

Brooks isn't revealing anything yet about what his new robots will look like, or what they'll be capable of doing. But based on his comments at MIT, don't expect them to look much like people. "If you make them too humanlike, people's expectations go up, and they're easily disappointed," he said. "You don't want to make it look like Einstein!"

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