Radhika Nagpal, Microsoft Research New Faculty Fellow
Assistant professor of computer science, School of Engineering and Applied Sciences, Harvard University

Research Focus: Bio-inspired computing, robotics

Education: B.S., M.S. and Ph.D. in computer science, Massachusetts Institute of Technology
One of the greatest challenges for early-career university faculty is attracting the recognition and financial support needed to pursue their research interests. But all of that fell into place early on for Radhika Nagpal, an assistant professor of computer science at Harvard University.

In 2005, just a year after joining the faculty at Harvard’s School of Engineering and Applied Sciences, Nagpal was selected to receive a Microsoft Research New Faculty Fellowship. It was the first year of the fellowship program, which selects five recipients annually from a pool of nominees representing more than 100 leading research universities throughout the United States and Canada. The program recognizes uniquely talented individuals who are advancing computing research in novel directions and who demonstrate great potential for becoming thought leaders in their field.

Nagpal says the award gave her instant recognition among her peers. “All of a sudden, people know who you are and what you do,” she says. “When you walk into a room and you want to discuss science and research, a little bit of the groundwork has already been laid.”

More importantly, the fellowship enabled Nagpal to pursue research in an area outside the mainstream of computer science—looking to biology for ideas about how to make computing systems more robust and developing “bio-inspired” self-adapting robots.

“The Microsoft Research fellowship gave me the time and courage to take a risk and try new things...”

Nagpal used the Microsoft fellowship to fund a Ph.D. student who helped in her study of how biological systems—such as cells in an organism or ants in a colony—work collaboratively to perform complex functions, make repairs and adapt to environmental conditions.

Based on that research, Nagpal is developing algorithms that enable her to replicate these biological processes to create self-organizing, self-adapting distributed computing systems. As a demonstration, a student in her lab developed a self-adapting table. Four multi-jointed robotic legs work in unison to keep the tabletop level when the table is placed on varying surfaces.

Nagpal sees many potential uses for self-adapting artificial systems, such as helping to stabilize building structures and bridges. She also envisions possible uses in medicine, such as a programmable stent that can intelligently adjust its pressure against an artery wall.

“One of the things that has always excited me about computer science is the creativity—it’s all about thinking and inventing, and once you do that, the ideas can almost instantly come to life and be used by others,” Nagpal says. “I also love the mix of science and engineering—it’s both about what we can learn about the world and how we can change it.”

Her passion for research really took root when, as a student, she worked alongside prominent computer scientists at AT&T (now Alcatel-Lucent) Bell Labs in New Jersey. “It was incredibly innovative,” she says. “They were constantly pursuing ideas that seemed crazy at the time but today would be considered mainstream.”

Before joining the computer science faculty at Harvard, Nagpal spent a year as a research fellow in Harvard Medical School’s newly created Department of Systems Biology. That work helped lay the foundation for Nagpal’s research into bio-inspired computing.

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Fellowship Enables Early-Career Professor to Pursue Research Passions