As fast as their tiny 'bot' legs will carry them (w/ video)

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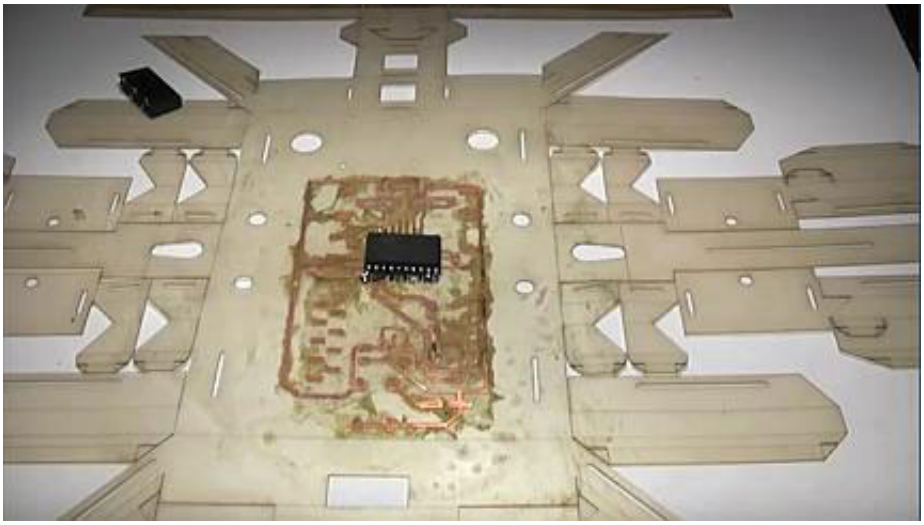

The National Science Foundation's Expeditions in Computing Program is funding a project that envisions a future in which 3-D robotic systems can be produced and designed using 2-D desktop technology fabrication methods. If this feat is achieved, it would be possible for the average person to design, customize and print a specialized robot in a matter of hours. "This research envisions a whole new way of thinking about the design and manufacturing of robots, and could have a profound impact on society," says MIT Professor Daniela Rus, project leader and director of the Computer Science and Artificial Intelligence Lab (CSAIL). "We believe that it has the potential to transform manufacturing and to democratize access to robots." Credit: Science Nation, National Science Foundation

Imagine robots no bigger than your finger tip scrambling through the

rubble of a disaster site to search for victims or to assess damage. That's the vision of engineer Sarah Bergbreiter and her research team at the University of Maryland.

With support from the National Science Foundation (NSF), the team is building micro-robots, using insects as inspiration—starting with the legs. The objective of this project is to create legs that will ultimately allow a millimeter-scale robot to traverse rough terrain at high speeds. Many insects jump to clear obstacles, so the research team is working to build that capability into some of the micro-robots as well.

The researchers have to test out different materials and designs on bigger robots before scaling them down to size. In fact, these robots are so small that the research team uses microscopes to build them. To address the challenge of determining how these tiny 'bots' are going to move around, the researchers' preliminary are testing process uses magnets instead of motors.

Bergbreiter envisions the micro-robots as mobile sensor platforms that can move through real-world environments at insect-like speeds for a variety of purposes, such as searching through small cracks in rubble after natural disasters, providing low-cost sensor deployment and engaging in stealthy surveillance.

"This is a very worthwhile effort and is just the beginning of what we hope will be achieved in the future when these micro-robots are equipped with video sensors and wireless communications," says George Haddad, a program director in the Division of Electrical, Communications and Cyber Systems within NSF's Directorate for Engineering.

At Harvard University, electrical engineers Rob Wood and Gu-Yeon Wei, and computer scientist Radhika Nagpal saw a challenge, after seeing a television program about honeybee populations in steep decline. And, so began the creation of the "RoboBee," a miniature flying robot, inspired by the biology of a bee and the insect's hive behavior. With NSF support, Wood put together a diverse team of collaborators to get the RoboBee project off the ground. One challenge: to design a small exoskeleton to house the bee's wings, motors, brain and electronics. Wood's team developed a folding assembly. Wei heads up a team developing the RoboBee's intricate, multitasking, computer chip brain. Honeybees live in colonies of thousands, and, through amazing cooperation, achieve efficiency far beyond the sum of individuals. Bees do a number of things to increase efficiency, from sharing information within the hive to continually adapting their division of labor. Ultimately, Wood, Wei and Nagpal hope to build a colony in which the RoboBees interact, using their hive as a refueling station. The researchers say RoboBees have the potential to be useful in a number of ways, including search and rescue missions, traffic monitoring and weather mapping. Credit: Science Nation, National Science Foundation

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