



Robin Murphy with her “marsupial robot,” a large robot that carries smaller ones to a disaster site.

Robots to the

by Susan Barnes and Steven R. Wills

On August 6, 2006, 16 coal miners working 1,500 feet underground in the Crandall Canyon mine in Emery County, Utah, felt the earth shift and buckle beneath them. Coal shafts below and around them heaved and walls bulged. A low rumble quickly exploded into a roar that seemed to surround them, signaling a cave-in so powerful it registered 3.9 on the Richter Scale — a measurement typically reserved for earthquakes.

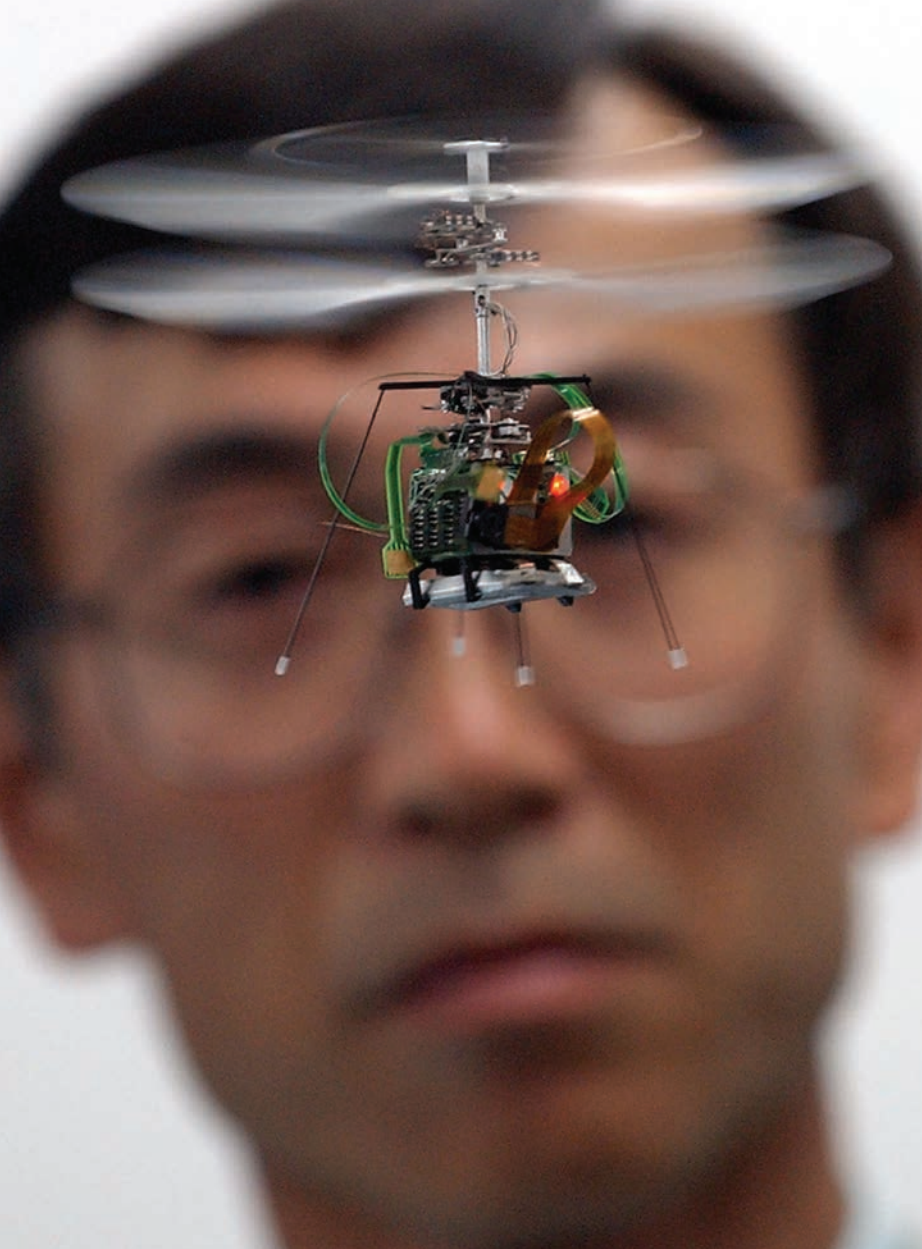
There was no time for the men to even begin the quarter-mile journey to the surface. They were trapped. For the next 10 days the nation waited, watched, and hoped for some word of a miraculous rescue. That word never

came. The 16 miners, along with three rescue workers who died in the effort to save them, were among 47 coal mining fatalities in 2006.

It was a heartbreaking tragedy, not only for the families and friends of the 19 men, but for the scores of others who worked tirelessly to try and save them. Among those working was Dr. Robin Murphy, a University of South Florida engineering professor who offers help in such disasters in the form of rescue robots.

Since Murphy’s robots are designed for specific types of catastrophes, they don’t all look the same. Some are small and move on treads; others have cameras that look like eyes. But they all do serve one general purpose: to extend the senses of human rescue teams. To do this,

of
rescue



some rescue robots use cameras (to extend sight), microphones and speakers (to extend listening and speaking), chemical sensors (to “smell” the air for toxins), and maneuverable wheels, treads, and arms (to extend reach).

Here They Come

Although scientists have talked about using robots in rescue situations for many years, rescue robots’ history is actually short. After the Oklahoma City bombing in 1995, which claimed 168 lives and injured 800, researchers began to see how robots could have been used to search the collapsed Federal Building. That same year, robot prototypes were used to search for victims in the Conchita, California, mudslides.

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Seiko Epson Corporation’s Micro Flying Robot looks like a miniature helicopter about the size of a giant bug. The company hopes it will be used for disaster rescue, security, and space exploration in the future. It flies autonomously according to a flight-route program sent by Bluetooth wireless from a computer.

It’s OK. Here Comes Survivor Buddy.

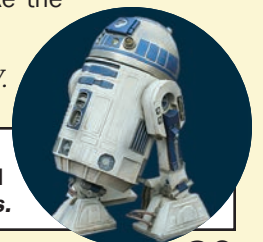
You wake up in the midst of a nightmare. The last thing you remember before losing consciousness is someone yelling, “tornado!” You’re pretty banged up, but the worst part is you can’t move — trapped beneath collapsed ceiling plaster, steel beams, and who knows what else? How long have you been here? Where is everyone? You yell for help — but in the chaos outside, can anyone hear you?

What’s that soft whirring sound? It’s behind you, but you can’t turn around. Then you hear a strange voice saying, “We know you’re there. We can see you on our camera. Tell us if you’re hurt.”

It’s Survivor Buddy. You’ve been found!

Survivor Buddy (currently under development) is a type of rescue robot designed to keep victims company and provide emotional support until human help arrives. It can be hours or even days before a trapped victim is rescued, and that wait can be terrifying, even if a victim knows help is on the way. Dr. Robin Murphy is designing Survivor Buddy to communicate with the victim, offer a drink of water, and during delayed rescues even provide pictures or video of family members. The robot’s purpose is simply to calm victims by keeping them company. And Survivor Buddy has help — it can play soft, soothing music. (Sorry, though — no heavy metal. The vibrations might shake the rubble.)

S.B. and S.R.W.



1977 • Science fiction robots R2-D2 and C-3PO thrill movie audiences in *Star Wars*.

Each new challenge has for rescue robots brought improvement as well as failure.

A staff member of the International Rescue System Institute demonstrates a snakelike robot called “Souryu” that can search for people buried in debris at disaster sites.



In order to boost interest in this technology, the American Association for Artificial Intelligence held the first Rescue Robot Competition in 2000. These competitions have increased in frequency and in difficulty over the last eight years, providing a showcase for better designs and new ideas (see “Smoke Detectors,” p. 38).

By 2001, after the destruction of the World Trade Center, some rescue robots were ready for action. They were flown to Manhattan to help in four ways: to search for victims; to find pathways through the rubble; to check for structural weaknesses; and to detect hazardous materials. Although their use was limited, the robots were able to explore spaces too small and too dangerous for people, and were able to find remains within the wreckage. By 2005, in the wake of Hurricane Katrina, it was no longer a surprise to human rescue teams to see robots on the job. Robots also assisted rescue forces at the collapse of a parking garage in Florida in 2007, as well as at the Crandall Canyon mine disaster described earlier.

Success Within Reach

Each new challenge for rescue robots has brought improvement as well as failure — and each failure has led to ideas for further improvement. For example, since many robots at disaster sites must be very small (to get into tight places), they have a limited battery size. This triggered Murphy’s development of the “marsupial robot.” The ’bot is large (and so has a large battery) but its purpose is to carry several smaller robots (with smaller batteries) close to a disaster area, where they can then be deployed.

Murphy understands not only the potential of rescue robots, but also the need for them. She is confident that “one day you’ll see rescuers and dogs at a disaster site, but if you don’t see a robot you’ll say, ‘Where are they?’ because they’ll have become so commonplace. They’ll do things dogs and people can’t.” 🐶

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