Aaron Edsinger, SM '01, PhD '07, works with Domo, a prototype household robot.

DONNA COVENEY/MIT

# Meet Domo

## It just wants to help

When Aaron Edsinger was 12, he grew impatient with the family TV, which had a clunky dial and no remote control. So he built a mechanical hand that let him change channels from the couch.

Now Edsinger, SM '01, PhD '07, is the lead researcher behind Domo, a robot designed to assist elderly and disabled people with tasks like shelving groceries. "The future for robots involves adapting to changes in surroundings," says the 34-year-old postdoctoral associate at MIT's Computer Science and Artificial Intelligence Lab.

Robots' core elements include sensors that transmit signals to register stimuli, actuators that convert energy into motion, and software that controls actions. For factory-floor robots, those actions are repetitive, but Domo is no one-trick pony. "I can work with Domo for a half-hour and never do the exact same thing twice," Edsinger says. He and his collaborators developed algorithms that let Domo place unfamiliar objects on a shelf or in a cup. "It's not that robots have never adapted in real time before," he says. What's new is how broadly Domo adapts on the fly.

Domo inherited much from two MIT-designed forebears: Kismet, which was created to interact with humans, and Cog, which was designed to learn about objects by poking them with its hand. (Edsinger worked on both; Cog was at the heart of his master's thesis.) Domo has Kismet's face-tracking capabilities, so its enormous blue eyes can follow humans and encourage interaction. From Cog, Domo gained the framework for its arms, as well as the shock-absorbing actuators, called series elastic actuators, used in 22 of its 29 joints.

Domo responds primarily to verbal commands but registers physical cues as well. Say "Domo, here," and the robot fixes its gaze on the speaker, extending a hand to receive objects. Grab Domo's arm while it reaches for a shelf, and it stops. A dozen computers help the robot interpret its surroundings. The data flow through an Ethernet connection to a main computer, which controls Domo's body.

Human-robot collaboration can be of great value, Edsinger says: "A person may have great planning and perception skills, but maybe they don't have great physical ability. The robot and person can work together as a team."

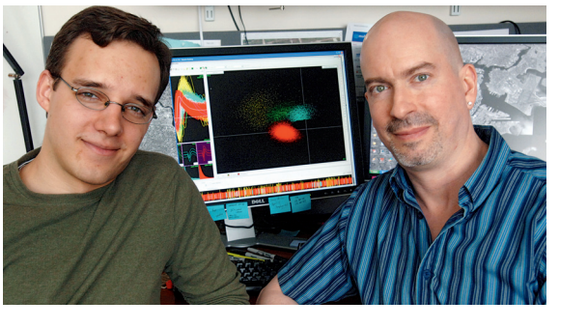
**SANDRA A. SWANSON**

# Help for ADHD

**RITALIN HELPS PEOPLE** with attention-deficit hyperactivity disorder concentrate. But it stimulates the entire brain, causing side effects such as insomnia.

Earl K. Miller, associate director of the Picower Institute for Learning and Memory, and Timothy Buschman, a grad student in brain and cognitive sciences, hope that a better understanding of how attention works could lead to drugs targeting the brain regions where ADHD symptoms arise. They recently described their work, which suggests that two different brain regions control two different kinds of attention, in *Science*.

Miller and Buschman monitored electrical activity in the parietal and frontal cortices of monkeys performing visual tasks designed to elicit the two kinds of attention: automatic and willful. Monkeys watching a screen searched for a green rectangle. To test for automatic attention, the researchers put the green rectangle in a field of red rectangles, to make it pop out at the monkeys quickly. In images testing for willful attention, the green rectangle had to be distinguished more carefully from an array of multicolored rectangles.



Graduate student Timothy Buschman (left) and Professor Earl Miller study attention.

Their results suggest that the frontal cortex is responsible for willful attention and the parietal cortex for automatic. Other researchers had looked at the cortices separately and found that both seemed to be involved with attention. The Picower researchers were the first to monitor both concurrently and to distinguish their roles in the two kinds of attention. They plan to test their findings in healthy people and those with ADHD. **KATHERINE BOURZAC, SM '04**