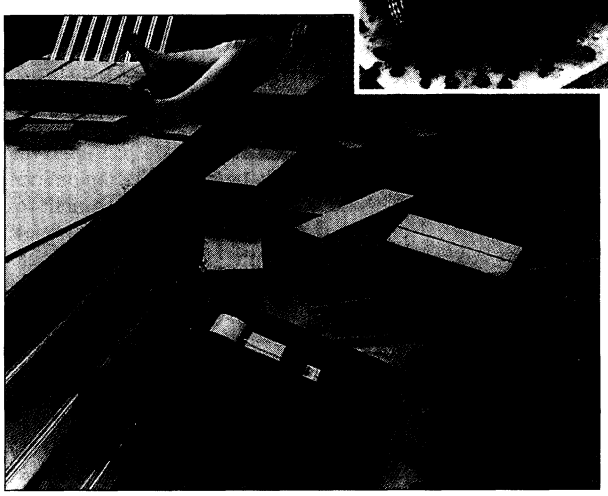
ROBOTICS

Rescue Droids Stumble In an Urban Jungle

AUSTIN, TEXAS—Broken bodies were strewn on the floor like discarded rag dolls. Severed legs protruded from under shattered furniture. Twitching fingers pushed hopelessly at a pile of bricks. Somewhere, a baby cried. Agonized moans drifted up from the basement, while unseen fingers tapped feebly on metal pipes. Then, clambering through the wreckage, came the robots.

It wasn't the set of *Terminator 3*, but the floor of the Austin Convention Center. There, in the midst of the 17th Annual National Conference on Artificial Intelligence,* four teams of engineers fielded mechanical contestants in the first annual urban ruin search-and-rescue competition—a simulated catastrophe created to test intelligent lifesaving robots that may one day lead rescuers to people trapped in the precarious rubble of collapsed buildings. The competition indicated that the technology still has a way to go.



Tag team. Search-and-rescue robots from the University of South Florida work in tandem at NIST's mock disaster site.

When a building tumbles down, rescuers have about 30 minutes to start searching for survivors, says Robin Murphy, a competitor and robot expert from the University of South Florida, Tampa. After that, the chance of survival drops precipitously. Flesh-and-blood rescue teams must wait 3 hours for the unstable building to settle before going in. Expendable robots, however, could get to work immediately, sniff out the survivors, give them food and first-aid supplies, and lead the rescue team straight to them.

Such robotic St. Bernards would have to be both agile and clever—mobile enough to climb over wreckage, smart enough to do it without human help. Radio control is too unreliable, and the clutter of a collapsed building makes tethers impractical. So rescue robots must solve one of the hardest problems in artificial intelligence: traversing a changing three-dimensional maze. To do that, an array of light, heat, and ultrasonic sensors feeds environmental information to the robot's computer brain. The robot then combines this with internal data about its moving parts to build up an internal map to guide it through the maze.

That's the theory, at least; the test course showed how hard it is to put it into practice. Designed by engineers from the National Institute of Standards and Technology (NIST), it resembled an Ikea showroom in hell. Meter-high walls of blue particle board and Plexiglas delineated several rooms in three increasingly realistic devastated buildings. Overturned chairs, tables, and a bed were spread through the spacious rooms of the easily navigable "yellow" course. The more difficult "orange" course was clogged with rubble piles and featured a loft reachable by a ramp, stairs, and a rope ladder. The extremely difficult "red" course was just an unstable pile of boards, aluminum siding, cinder blocks, chicken wire, and plastic tubing. Realistic plastic victims with internal heaters were hidden throughout the courses like gruesome Easter eggs.

In the last round of the competition, the robot finalists had 20 minutes each to conquer the course. Designs varied widely. Two contestants—from the University of Arkansas and the University of Kansas—mimicked the rolling-trash-can look of the "droid" R2D2 from *Star Wars*. The eventual winner, from Swarthmore College in Pennsylvania, resembled a Shop-Vac vacuum cleaner ringed with ultrasonic and infrared sensors and topped by a rotating camera. The brainy appliance mapped one room of the yellow course—and found one victim by crashing into him—without human help. But its small wheels faltered in the obstacle-strewn orange course.

The fourth team, Murphy's Floridians, fielded a pair of rugged radio-controlled robots, one resembling the tracks of a 61-centimeter-long bulldozer and the other an oversized Tonka truck. Watching for obstacles through the robots' camera "eyes" (a process Murphy compares to "driving while looking through a straw at mouse-eye level"), two graduate students guided the pair all the way to the end of the red course. Along the way they found several victims and a local TV news camera operator.

In the end, none of the robots came close to locating all the victims, and some wandered out of the course to "rescue" unsuspecting conference participants. "The teams aren't doing all that well," admitted contest organizer Alan Schultz after the preliminary rounds. Schultz emphasizes, however, that robots historically perform poorly in the first year of contests like the urban ruin course, but that engineers rapidly rise to the challenge. "This contest will be an inspiration to the community," he says. "I think in 5 years there is a reasonable chance that these robots will be able to work in real structures."

Lisa Meeden, a computer scientist at Swarthmore College who helped develop the winning robot, agrees that tough challenges are best. If the course is too easy, "you can fool yourself into thinking you have solved the problem when you haven't," she says. "We wanted to push the envelope." **–MARK SINCELL**

Mark Sincell is a science writer in Houston.

CREDITS: BILL ADAMS/NAVAL RESEARCH LABORATORY

ACADEMIC FREEDOM

Political Scientist Becomes Cause Célèbre

BERN—A right-wing political leader's successful defamation suit against one of Austria's most prominent political scientists, Anton Pelinka, has become a lightning rod for an international debate about academic freedom of speech. This suit and a second filed against Pelinka represent "a cynical effort to punish and suppress Professor Pelinka for his professional expression," contends Irving Lerch, director of international affairs for the American Physical Society, who sent a letter last month to Austrian President Thomas Klestil backing Pelinka's right to free speech.

On 11 May, a criminal court in Vienna found Pelinka guilty of defaming former Freedom Party leader Jörg Haider and fined him roughly $4500, although the court will not impose the fine unless Pelinka is convicted of making similar statements in the future. Haider, an outspoken populist who has made questionable comments about Nazism, accused Pelinka of defaming him for asserting in an interview on Italian television in May 1999 that some Haider statements had "trivialized" Nazism.

Haider is pursuing a second defamation suit against Pelinka for comments he made to CNN last year. (A decision is expected in October.) He has also sued two other Austrian intellectuals, including Wolfgang

* 30 July to 3 August 2000.

Punished pundit. International groups are defending Anton Pelinka's freedom of expression.

Neugebauer. Neugebauer is a history professor who directs the Archives of Austrian Resistance, which documents the country's resistance movement during the Nazi era.

Pelinka, a tenured University of Innsbruck professor who heads Vienna's Institute for Conflict Research, told *Science* that he is appealing the ruling to a higher court and, if necessary, will take his case to the European Court of Human Rights. At least two human rights conventions signed by Austria guarantee freedom of expression without undue interference by public authorities.

In the 3 months since the judgment, an array of academic and human rights groups have rushed to Pelinka's defense. "Everything Pelinka said was consistent with normal public discussion about political figures in a democracy," asserts Aaron Rhodes, executive director of the International Helsinki Federation for Human Rights, which is supporting Pelinka's case. Lerch's letter to President Klestil—sent on behalf of the scientific freedom and responsibility committee of the American Association for the Advancement of Science (AAAS, the publisher of *Science*)—states: "We are worried that the judicial system may be exploited for purely political purposes to intimidate scholarship and restrict freedom of expression."

Lerch, who chairs the AAAS panel, says his committee is concerned about possible political influence in the court case, because the man who is now Austria's minister of justice, Dieter Böhmdorfer, had represented Haider when the defamation lawsuit was filed last September. However, an Austrian government spokesperson says that Böhmdorfer withdrew his name from that Vienna law firm when he became justice minister in February—after Haider's Freedom Party became a partner in Austria's new center-right coalition government—and says there is no evidence that he sought to influence the case.

Pelinka—a prolific author on comparative political science and the winner of a 1998 award for his leadership in criticizing neo-Nazism—says he worries about the impact of such defamation judgments on the willingness of untenured professors to speak candidly on controversial issues. Fearing government reprisals, some academics might toe a less risky line to avoid losing out on tenure, as most Austrian universities are government institutions. "I'm not afraid to say what I think," Pelinka says. "But such rulings could have a chilling effect on the willingness of my younger colleagues to speak out."

–ROBERT KOENIG

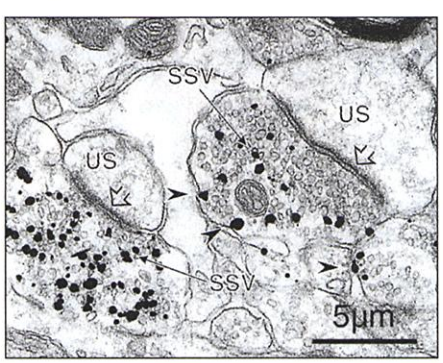
NEUROBIOLOGY

Long-Sought Protein Packages Glutamate

Among neurotransmitters, two stand out as stars, communicating most of the brain's urgent messages. These fast-acting, ubiquitous chemicals—GABA and glutamate—send the basic "stop" and "go" signals that most other neurotransmitters merely modulate. Glutamate is called into action wherever rapid-fire excitatory signals are needed—say, for vision or learning. For decades, researchers have been looking for the protein that packages glutamate for express delivery to other neurons. On page 957, Robert Edwards of the University of California, San Francisco (UCSF), and colleagues report that they've found this elusive transporter. "This has been a long time coming," says neurobiologist Marc Caron of Duke University, who points out that many labs have been on the protein's trail.

To prepare for launching from one neuron to another, neurotransmitters have to be stuffed at high concentrations into bubbles called synaptic vesicles. When it's time to send a signal, these vesicles fuse with the axon wall, and the neurotransmitter within bursts into the space between the cells. Vesicular transporters do the stuffing—they are proteins embedded in the vesicle wall that pump neurotransmitters, which are built in the cytoplasm, into the bubble.

Two other transporter families have been identified to date: the one that escorts GABA and another that waltzes monoamines such as dopamine and serotonin into their respective vesicles. But the glutamate vesicular transporter had defied such efforts, possibly



In the right place. Dark-stained VGLUT1 anchors on synaptic vesicles (SSVs).

ScienceScope

In or Out? A prominent scientific misconduct case has taken another turn. An independent scholarly panel last week concluded that misconduct allegations against University of Arizona (UA) biomedical researcher Marguerite Kay *(below)* were "without merit," and two members of the panel accused university officials of promoting "a pattern of harassment and unrelenting persecution" of Kay. But the report will have little immediate impact on the legal maneuvering surrounding Kay, an immunologist who was fired in 1998 after two university panels upheld charges of scientific misconduct and mismanagement. She was partially reinstated earlier this year after a court ruled that the university hadn't followed its own rules in dismissing her, and she now faces renewed termination proceedings (*Science*, 18 February, p. 1183).

Kay's supporters, who say that prior reviews of Kay's job performance were conducted by UA academics with little expertise in her field, assembled the five-member panel under university rules that allow faculty members to request an "enhanced" appraisal that includes outside academics. It teamed three researchers from UA's College of Medicine with immunologists Ronald Kennedy of the University of Oklahoma, Norman, and Vera Byers of the University of California, San Francisco. After reviewing documents and interviewing Kay and six other researchers involved in the case—but not prominent accusers—the panel evaluated 14 allegations.

"There has been no scientific misconduct" or lab mismanagement by Kay, the group concluded in its report to John Marchalonis, chair of UA's Department of Microbiology and Immunology and a vocal supporter of Kay. "We urge [her] immediate and full reinstatement." In an addendum, Kennedy and Byers accused UA administrators of making it "impossible for Dr. Kay to receive a fair hearing" at the university. "This is the most sordid, twisted situation I've seen," Kennedy told *Science*.

UA officials did not respond to a request for comment. But this week, they indefinitely postponed termination hearings against Kay, who is being paid but is barred from campus. Meanwhile, Don Awerkamp, Kay's attorney, is pursuing both state and federal lawsuits against the university.

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CREDITS: (TOP TO BOTTOM) DEPARTMENT OF POLITICAL SCIENCE, UNIVERSITY OF INNSBRUCK; C. RICHARDS; E. BELLOCCHIO *ET AL.*, *JOURNAL OF NEUROSCIENCE* **18** (21), 8648 (1998)