

targets in the worm, and possibly in people as well, says Choy.

By exposing *C. elegans* to a mutation-causing chemical, the scientists created several strains of worms that in response to Prozac, lay eggs but don't wrinkle their noses. The researchers have now identified two genes—and continue to search for more—that when mutated confer resistance to Prozac's effect on the nematode nose. The genes encode novel cell-membrane proteins and are part of a larger family of genes, the scientists report in the current (August) **MOLECULAR CELL**.

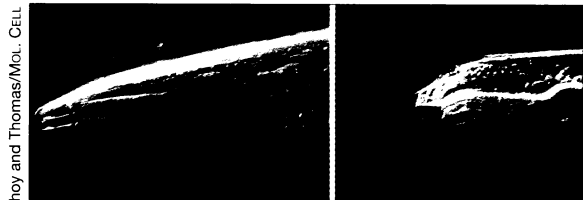
Choy and Thomas haven't yet found comparable genes in people or shown that Prozac and similar antidepressants interact directly with the worm cell-mem-

brane proteins. Only then, says Choy, can scientists address whether these proteins play any role in Prozac's antidepressant actions.

While he favors the prevailing serotonin hypothesis, neuroscientist Randy D. Blakey of the Vanderbilt University Medical Center in Nashville suspects that Choy and Thomas have uncovered interesting new targets of Prozac and related antidepressants. "They do make a very strong case that some side effects of these agents may be mediated through interactions with these proteins," he says.

In the future, scientists may bathe worms in drugs other than Prozac. Blakey, for example, plans to expose *C. elegans* to antipsychotic drugs that affect transporters for the brain chemical dopamine.

"Drugs have historically been effective tools for investigating how worm neurons work; worm neurons may prove equally effective for investigating how drugs work," notes William R. Schafer of the University of California, San Diego in a commentary in the Sept. 3 **CELL**. —*J. Travis*



Choy and Thomas/Mol. Cell.   
 A normal worm (left) and one wrinkling its nose in response to Prozac (right).

## Chinese dig sound from ancient flute

In one of the most unusual recording sessions ever held, a musician recently entered a sound studio and successfully played a Chinese folk song on a nearly 9,000-year-old bone flute. The flute, one of six unearthed in a prehistoric Chinese village, is the earliest known complete, playable musical instrument, a research group reports.

Analysis of the sounds from the seven-holed instrument indicates that a tiny opening drilled next to one of the holes corrected a slightly off-pitch tone, holds a team headed by archaeologist Juzhong Zhang of the Institute of Cultural Relics and Archaeology of Henan Province in Zhengzhou, China.

The researchers didn't analyze the other flutes' sounds because preliminary tests indicated that they would crack if played. Construction of replicas of each bird-bone flute will allow for a detailed comparison of the specimens' musical scales to two current Chinese musical scales. An account of the ancient flutes appears in the Sept. 23 **NATURE**, and the flute recording can be heard at <http://www.nature.com>.

"Aside from finding what we see as the earliest complete, playable musical instrument, what's surprising is the appearance of sharp social divisions in this very early agricultural village," says Garman Harbottle, a nuclear chemist at Brookhaven National Laboratory in Upton, N.Y., and a coauthor of the new report. Some graves at the ancient settlement,



Jiahu bone flutes include a playable specimen (second from bottom).

Jiahu, contain opulent offerings, while others are, literally, bare-bones affairs.

Jiahu excavations began in 1962. The ancient flutes were uncovered in burials in 1987 and then radiocarbon dated. Harbottle helped the Chinese scientists interpret their data.

"This new find is exciting but not surprising, since complex societies certainly existed by 9,000 years ago," remarks archaeologist April Nowell of the University of Victoria in British Columbia. About 30 partial bone flutes ranging in age from 12,000 to 36,000 years have been found in Europe, as well as a disputed Neandertal flute (SN: 4/4/98, p. 215). Nowell says that German researchers have recorded a tune with the piece that remains of a 30,000-year-old flute, making it the oldest playable musical instrument. —*B. Bower*

## Smart robot orbs to aid space crews

In one of the *Star Wars* movies, hero Luke Skywalker trains for his eventual clash with Darth Vader by wielding his light saber against a hovering robot orb. Soon, NASA will send similar-looking robots aboard spacecraft, the agency says.

Tests of the softball-size, red spheres, which will be packed with microelectronics and sensors, could start on the International Space Station in 2002. The spheres eventually would float around as mobile assistants to the crew.

This summer, NASA engineers demonstrated prototype navigation and control systems for the devices. They are now adding object-tracking and imaging capabilities to the machines.

Instead of martial training, the tag-along globes will offer information services, such as roving teleconferencing to Earth and optional reminding about scheduled tasks. The devices will be able to synthesize speech onboard and recognize language with the assistance of an external computer, says project engineer Hans Thomas of NASA's Ames Research Center in Mountain View, Calif.

The propeller-driven robots will also patrol the spacecraft interior, alert for gas leaks or other problems. They'll move approximately as fast as a person walks.

Howie Choset of Carnegie Mellon University in Pittsburgh has helped NASA develop this robot, as well as another to inspect spacecraft exteriors. He predicts spin-offs, including underwater versions to inspect seafloor drilling platforms.

Recalling the 1960s film *2001: A Space Odyssey*, Thomas predicts that the robots will nudge NASA "toward a 2001-ish vision where the spacecraft takes care of itself, and the astronauts worry about the high-level goals."

However, that vision has a dark side: The film's spaceship-controlling computer, named Hal 9000, went berserk. Hal's degree of autonomy remains far off, Thomas says. "Hopefully, we'll be able to figure out how to keep the programs from getting paranoid," he chuckles. —*P. Weiss*



Tom Trower/NASA Ames Home Page   
 This posed scene depicts a "personal satellite assistant" robot hovering over an astronaut at work.