CRUE president Saturnino de La Plaza says his organization may mount a court challenge. He defends last fall's mass job postings, which he says aim primarily to give permanent posts to researchers who have toiled for years on temporary contracts.

The education ministry dismisses CRUE's explanation. It said that the "hasty and massive" posting is an attempt to "avoid a more open, competitive, and transparent recruitment to ensure the quality of research in universities." Some see darker motivations for the rectors' opposition to the new law: As Rull-Fernández points out, it requires all rectors to step down in 6 months, paving the way for a new generation of academic leaders. **–XAVIER BOSCH**

Xavier Bosch is a science writer in Barcelona.

PHEROMONE RECEPTION

When in Doubt, Mice Mate Rather Than Hate

A new genetically modified mouse abides by the motto of the psychedelic age: Make Love, Not War. A male that can't sniff out the sex of its partner will, to put it delicately, try to partner with it rather than attack it. The same mutation could never lead to a peaceable kingdom among humans, however, because the part of the brain responsible for the mice's amorous behavior is as vestigial in humans as the appendix.

The research, led by Harvard molecular neuroscientist Catherine Dulac and published online by *Science* this week (www.sciencexpress.org), suggests that the default social interaction for mice is to mate. Only a scent-based cue from another male inhibits a male's urge to mate and spurs him to fight. The number of genes that control this behavior is precisely one; it encodes the protein TRP2 that sits on the surface of certain olfactory nerves that detect pheromones.

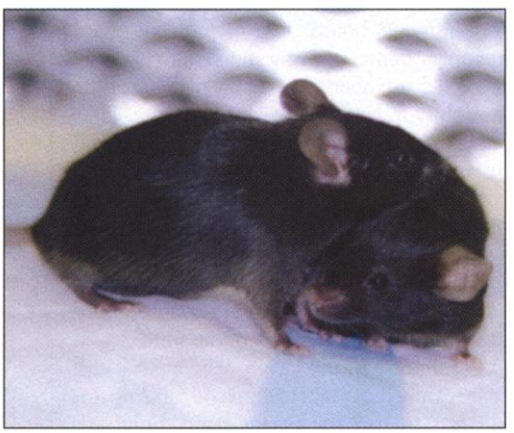
Calling the work "superlative," neurobiologist Emily Liman of the University of Southern California (USC) in Los Angeles says, "it opens the way for genetic analysis of a plethora of behaviors," including sexual maturation, gender recognition, and spontaneous abortions in mice, all of which are influenced by pheromones. It also debunks the notion that mating has to be evoked by a pheromone that tells a male it's in the presence of a female.

Mice have two olfactory systems. Airborne smells trigger the main olfactory epithelium that sends messages to the primary olfactory cortex. Pheromones—personal identification molecules that emanate from both males and females—stimulate a batch of 400 nerve cells in the nose-based vomeronasal organ (VNO). The VNO sends signals to the hypothalamus, a brain region involved in reproduction, defense, and eating. TRP2 resides only in these VNO cells.

To find out what TRP2 contributes to pheromone detection, Dulac and colleagues deleted the *TRP2* gene; they then bred mouse strains that had two, one, or no copies of the gene. All of the animals reproduced as if nothing were amiss. But controlled introductions between individual mice revealed the effect of the missing gene.

Male lab mice have a black-and-white worldview: They defend their cages aggressively from other males but put the moves on any females. The researchers dropped in an intruder mouse, observed the interaction, and monitored the nerves firing in the resident mouse's VNO. The team ensured that the intruders were giving off a strong pheromone signal by using either females in estrus or males that had been castrated (castrati are not aggressive and won't start a fight) and daubed with pheromone-rich urine from intact males.

As expected, resident males with one or both chromosomal copies of *TRP2* mounted introduced females. When a urine-daubed eunuch mouse was allowed entry, the males with *TRP2* picked a fight. Male mice with no copies of the gene, however, tried to mate with either type of visitor. If offered both companions at the same time, the *TRP2*-negative mice spent just as much time trying to mate with the males as the females. Males without *TRP2* also courted eunuchs that hadn't been spritzed with urine, suggesting that a pheromone signal isn't needed to enkindle mouse romance.



Mating games. Male mice lacking *TRP2* don't know they should be fighting with each other.

The knockout mice aren't entirely peaceniks; they will fight back if provoked by other males. Their VNO neurons looked normal and fired if stimulated. But the neurons were quiet, compared to the same neurons in normal mice, when the knockout mice interacted with pheromone-doused companions. The researchers conclude that *TRP2* is necessary for detecting pheromones that indicate whether a strange mouse is a male.

If the mouse VNO controls basic behavior such as mating and fighting, and humans have remnants of this system, at what point in our evolutionary past did humans "overcome" being controlled by pheromones? USC's Liman, who studies the *TRP* gene family in primates, is trying to answer that question. But not everyone is pleased that humans have apparently largely abandoned pheromones when making mating decisions. "The perfume industry would like consumers to believe it's not vestigial," Liman says.

According to many researchers, the fact that one gene has such a marked effect on sexual behavior was a surprise. Says neurobiologist Charles Zuker of the University of California, San Diego, "I would have expected that the sexual identity of a mate was not solely determined by one pheromone cue—mating is so extraordinarily important biologically." The bohemian mice seem to agree: Love is fundamentally more important—biologically speaking—than war.

–MARY BECKMAN

Mary Beckman is a writer based in southeast Idaho.

MYANMAR

Planned Reactor Ruffles Global Feathers

VIENNA—Western officials are raising safety concerns over Myanmar's plans to build its first nuclear reactor. The small reactor would produce medical isotopes and test the feasibility of bringing nuclear energy to the poverty-stricken country, formerly known as Burma. It would also give Russia, which would supply the reactor and technical support, a larger presence in the region.

A groundbreaking ceremony was scheduled for last week at a military complex near Magwe, a central region bearing Myanmar's richest uranium deposits, a U.S. Defense Department official told *Science*. The reactor would have a capacity of 10 megawatts and cost roughly $25 million. The Myanmar government confirmed privately to the International Atomic Energy Agency (IAEA) that more than 200 of its scientists and technicians have received nuclear training in Russia in recent months.

Both the Soviet Union and the United States built research reactors around the world during the Cold War as part of a competition to promote the peaceful use of atomic energy. Some reactors became huge proliferation risks. During the Vietnam War, for instance, U.S. Special Forces tried to recover plutonium from a U.S.-made research reactor in the south that had been seized by communist troops—only to find that the fuel was

CREDIT: L. STOWERS *ET AL*

already gone, says Stanford University's George Bunn, a former negotiator on the nuclear nonproliferation treaty. In recent years the United States has striven to help other countries convert research reactors that use weapons-grade nuclear fuel into ones that consume low-enriched uranium (LEU).

The U.S. government reviews U.S.-led projects to build reactors in foreign lands but has little sway over deals that other countries strike. In a press conference last week, a State Department spokesperson said the government expects Myanmar "to not produce unsafeguarded fissile material." According to the Defense official, the government is worried that the reactor could increase the threat of radioactive materials falling into the hands of terrorists (see p. 777).

Other analysts generally discount the proliferation risk. "From the size of it, it looks like an LEU reactor," says Fred Wehling of the Center for Nonproliferation Studies in Monterey, California. Indeed, as a member of the Southeast Asia Nuclear Weapon-Free Zone, Myanmar "has accepted significant restrictions on nuclear-related activities" under an agreement that allows member states to pursue peaceful research, says Ralph Cossa, president of the Center for Strategic and International Studies' Pacific Forum. "I see very little real threat," he says, "especially if the Russians insist on proper safety and monitoring procedures."

Whether that will happen is an open question. An IAEA team that visited Myanmar in November 2000 concluded that the country's radiation protection infrastructure was "not meeting the expected standards," says an agency official, and followed up with a list of improvements needed to operate the reactor safely. The agency has not yet received a response. Myanmar's foreign ministry declined to make officials available for interviews and referred inquiries to a press conference transcript on the government's Web site.

Perhaps most intriguing is what the deal may mean for regional stability. "It shows some concern [in Myanmar] with not getting too dependent on China, as well as Russia's efforts to increase its own footprint in Southeast Asia," says Cossa. Others add that Russia's cash-strapped energy industry could be tempted to strike additional deals if the Myanmar regime deems nuclear power vital to the country's future. **–RICHARD STONE**

CREDITS: (TOP TO BOTTOM) CENSUS BUREAU/DEPARTMENT OF COMMERCE; DOE

Role model? International authorities hope Myanmar will meet the same safety standards followed by U.S. reactors.

U.S. SUPREME COURT

Census Case Tests Statistical Method

Justices of the U.S. Supreme Court are hiking up their robes in preparation for another march through the political swamp of reapportionment. But more than a congressional seat may be at stake. In agreeing last week to hear a case (*Utah* v. *Evans*) stemming from the 2000 census, the high court will also be examining the legality of a time-honored statistical method for filling in the blanks.

The method, called "hot-deck imputation," goes back to the dawn of the computer age, says statistician Joseph Schafer of Pennsylvania State University, University Park. The term refers to the deck of punch cards that the Census Bureau once used to store data. When a statistician came across a card that was improperly or incompletely filled out, officials were forced to "impute"—essentially make an educated guess—about the missing data. One technique involved finding a household as similar as possible to the one with missing information. "Cold-deck" used cards from the previous census to do the imputation, whereas "hot-deck" drew on the then-current census.

Utah is the latest in a series of legal battles over census methods. In 1999, the Supreme Court declared in a 5–4 ruling that statistical "sampling"—performing a detailed survey of a subset of the population and using those data to compensate for flaws in the general census—could not be used to apportion congressional seats. Utah contends that it unfairly lost a congressional seat to North Carolina, because hot-deck imputation should not be allowed under the no-sampling rule. The Census Bureau and Commerce Department, two of several defendants, argue that imputation is consistent with the "actual enumeration" clause in the U.S. Constitution. They also argue that it is distinct from sampling.

"I've been wrestling with this [question] for a while," says Alan Zaslavsky, a statistician at Harvard Medical School in Boston. "It has some features in common, but it's not what I usually think of when I think of sampling." One complicating factor is that the census surveys the whole population rather than taking the more common approach of selecting a subset and then drawing inferences about the rest of the population. Clearly, that common use of sampling differs from imputation, which is used to draw conclusions from nonresponses and incomplete data.

Fighting mad. Old-fashioned punch cards lend their name to a statistical technique that is now before the court.

But getting rid of imputation would cause immense problems, according to Schafer and Zaslavsky, without obvious solutions. "Throw out imputation, and you throw out a lot of things," says Schafer. "You toss out editing of the data and making sure that it satisfies consistency checks. Now, if someone puts down an age of 145, that's not going to fly. [But] if imputation is not acceptable, what are we to do then?" Throwing the data away would be an implicit imputation, says Zaslavsky. "Another assumption is that there's no population in homes that don't respond. That doesn't seem like a likely story. But if you say you can't do any imputation, that's effectively what you're assuming."

Last year three Utah judges ruled that imputation was acceptable. If the Supreme Court disagrees, it could be difficult to impute the Census Bureau's strategy for 2010.
–CHARLES SEIFE

HIGH-ENERGY PHYSICS

Report Backs Collider And an Expanded Field

U.S. high-energy physicists want to redefine their field to include the entire cosmos. But they also have a very down-to-earth proposal for the government to back their next multibillion-dollar machine.

"Participation in a linear collider is absolutely essential to the field," says Barry Barish, a physicist at the California Institute of Technology in Pasadena and co-chair of the High Energy Physics Advisory Panel (HEPAP) subcommittee that drafted a 20-year road map with the Next Linear Collider