for Biochemistry in Martinsried.

As the society gets its act together, the U.S.-based Open Archives Initiative (www.openarchives.org) will hold a meeting in Berlin next week on creating the architecture necessary to link emerging European preprint archives, including the one at Max Planck, with those in the United States. CERN, the European laboratory for particle physics near Geneva, will get in on the action too next month with a meeting, co-sponsored by Open Archives, on archive melding. A decade late, perhaps, but the e-publishing revolution is finally crossing the Atlantic.

–VIVIEN MARX

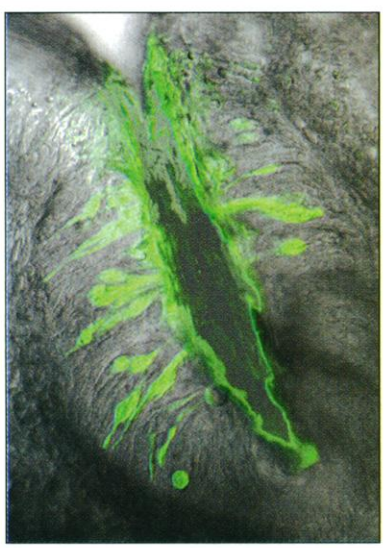
Vivien Marx is a science writer who lives in Boston and Cologne, Germany.

NEUROBIOLOGY

A Discriminating Taste for Bitter

Life has many bitter moments—sometimes of the culinary kind. Now, a new study suggests that our taste cells are much better at distinguishing between bitter flavors than some researchers have thought. On page 1557, University of Miami biologists Alejandro Caicedo and Stephen Roper report that—contrary to one popular theory—taste buds recognize the many unique bitter flavors that land on your tongue. Your mouth, they say, knows the bitter of beer from a bitter pill any day.

"In terms of evolution, this work makes good sense," says Sue Kinnamon, a neurobiologist at Colorado State University in Fort Collins. "It suggests that bitter taste perception involves multiple cells and mechanisms." This could be important, she adds, in a world with many different toxic compounds, which tend to taste bitter. Indeed, a well-developed system for recognizing bitters could enhance survival.



Flavor detectors. Taste cells, shown here labeled in green, may be able to tell one bitter flavor from another.

CREDIT: (BOTTOM) ALEJANDRO CAICEDO AND STEPHEN ROPER/UNIVERSITY OF MIAMI

Although there are five basic tastes—sweet, sour, salty, bitter, and umami (MSG)—researchers so far have identified the receptors for only umami and bitter. Taste has been tricky to study, because scientists don't know how to grow taste cells in the lab. Indeed, the bitter receptors were discovered just last year by two groups, one led by Nicholas Ryba at the National Institute of Dental and Craniofacial Research in Bethesda, Maryland, and Charles Zuker at the University of California, San Diego, and the other by Linda Buck of Harvard Medical School in Boston.

That work showed that the bitter receptor family consists of 50 to 100 related proteins, each of which seems to respond to a different bitter flavor. Because Ryba and Zuker's group found that individual taste bud cells express the genes for most of the receptors, they concluded that the cells couldn't discriminate between the many different bitter compounds they encounter. In this scenario, cells would send the same "bitter" signal up to the brain no matter what.

But Caicedo and Roper weren't so sure that all bitters taste the same. To pursue their hunch, they decided to catch the taste cells in action. When a receptor is activated by a bitter compound or other stimulus, it triggers a spike in calcium concentrations inside the cell, which in turn causes the cell to release its neurotransmitter. So first the researchers injected a fluorescent marker of calcium activity into taste cells taken from a rat's tongue. They reasoned that if the cells could distinguish between bitter flavors, some bitters would cause the telltale calcium boost—and an accompanying rise in fluorescence—while others would not.

Then, one at a time, Caicedo and Roper added five common bitter compounds—cycloheximide, denatonium benzoate, quinine hydrochloride, sucrose octaacetate, and phenylthiocarbamide—to the solution bathing the marked taste cells. Sure enough, 65% of the cells fluoresced strongly in response to just one of the bitter compounds. About 25% of the cells responded to two compounds, whereas just 7% reacted to three or more of the bitters. Cell responses to the different bitters also varied in amplitude, length, and sensitivity. "It appears that different taste cells are tuned to different bitter compounds," says Roper. "These cells are not generalists, as some suggest." At this point, however, the researchers can't explain the specificity of the taste cells' responses, given that each one makes so many different bitter receptors.

Even so, says David Smith, a neurobiologist at the University of Maryland, Baltimore, the study moves the field of bitter taste perception past molecular guesswork

ScienceScope

Young Blood The French government has tapped a leading hepatitis C expert, Christian Bréchot, to head its biomedical research agency, INSERM. The decision to appoint a clinician to the post is in line with the government's urge to spur life scientists into producing more new therapies and products.

Bréchot—who heads the liver unit at the Necker Hospital and a hepatitis research center at the Pasteur Institute, both in Paris—takes the reins of the $450 million INSERM at a time when the agency's star is on the rise. It is believed that Bréchot's predecessor, clinician Claude Griscelli, who at 65 had reached the mandatory retirement age, last year won INSERM a 16% budget increase by beefing up research in government priority areas such as gene therapy. Bréchot, however, is eager to quell fears that he will favor clinical over basic research. "My major concern ... is to arrive at a better balance," he told *Science*.

The government is hoping that the relatively young director—Bréchot is 48—can infuse fresh blood into INSERM, in which the average age of researchers has risen from 43 to 47 in the past decade. That won't be easy, says Gérard Orth, director of a papillomavirus unit at the Pasteur Institute. "He will have to be convincing" to persuade the government to create new jobs.

Reaching Out Sandwiched between Russia and the rest of Scandinavia, Finland and its scientists often feel isolated from the scientific mainstream. That could soon change. On 1 April, the Academy of Finland will get a new research director whose top priority is to forge stronger ties with the world's scientific community.

Finland is no science lightweight: It spends a higher percentage of its gross domestic product on R&D—3.1%—than any other country, amounting to $3.5 billion in 1999. But many fields "could clearly benefit" from more international collaboration, says physicist Mikko Paalanen of Helsinki Technical University, who praises the appointment of agricultural scientist Anneli Pauli to a 5-year term as research director. "Internationally coordinated research will add a new dimension" to Finnish science, says Pauli, who also plans to add up to 12 institutes to a "Centers of Excellence" program that now provides extra funds for 26 centers deemed globally competitive.

Contributors: Robert F. Service, Robert Koenig, John Pickrell, Peter Coles, Lone Frank

into real-time physiology. "I think the use of calcium imaging to visualize many cells at once is a big step in the right direction," Smith says. The study, he adds, clearly refutes the idea that a given taste-receptor cell responds to many different bitter flavors.

Ryba cautions that questions linger, however. Although the study is provocative, he says, its conclusions "go further than the data allow." For one, calcium imaging is an indirect—and somewhat imprecise—measure of bitter receptor activity. What's more, he adds, the pattern of taste-cell responses might change if more bitter compounds were tested. "When you look at five compounds, you may not see much overlap in taste-cell activity," Ryba remarks. "When you look at 25, that overlap might be considerable."

Caicedo and Roper agree that they focused on the "big bitters," or most common bitter compounds, but they predict their results will hold up in further studies. They note that the amount of a bitter compound needed to provoke a calcium response in their test cells correlates with the amount that affected rat behavior in previous tests—an indication that the result reflects what's happening in living animals. "We're very interested in expanding this work," Caicedo adds. "We have a lot of questions still to answer."

–KATHRYN BROWN

Kathryn Brown is a writer in Alexandria, Virginia.

WOMEN IN SCIENCE

Court to Hear Charges By Harvard Researcher

BOSTON—Harvard University goes to court next week to defend itself in a sex-discrimination suit brought by a researcher at its school of public health. Barring an unexpected last-minute settlement, it would be the first such case against Harvard brought to trial by a scientist and only the second such case to be heard by a jury. It will also shine a spotlight on Harvard Provost Harvey Fineberg, who attended last month's meeting on equitable treatment of women at elite U.S. research universities (*Science*, 2 February, p. 806).

The suit, by biomathematician Tamara Awerbuch-Friedlander, alleges that the school refused to promote her because of her sex and then harassed her for complaining about that decision. Fineberg, who was dean of the school of public health until 1997 and is seen as a strong candidate to succeed retiring Neil Rudenstine as president, declined to comment on the case. But he disputed Awerbuch-Friedlander's account in a 1998 deposition, explaining that "there were controversies over the qualifications of the candidate" and that the field of biomathematics—her specialty—"did not appear to have sufficient priority for a faculty appointment."

Awerbuch-Friedlander arrived at Harvard in 1983 as a postdoc from the nearby Massachusetts Institute of Technology. In 1989, an internal panel recommended 4 to 1 that she be given a tenure-track assistant professor job in the biostatistics department. But Fineberg overruled the internal committee's recommendation for an appointment—by his own account a very rare occurrence. And a biomathematics position never materialized. Awerbuch-Friedlander still works as a lecturer at Harvard, currently supported by a small grant from an outside foundation.

Several women faculty members at the school declined to comment on the case but praised Fineberg as a positive force for change as dean. "He's been wonderfully supportive of women," says molecular biologist Leona Samson. "When Harvey came, there were practically no tenured women, and by the time he left there were three female department chairs," says another. Biologist Bruce Demple, chair of an internal committee on the status of women, says that "the school has been willing to commit resources to recruit female faculty." In his deposition, Fineberg said that 34% of 125 faculty searches conducted during his 13-year tenure ended with the hiring of a woman. "I believe the situation has been rectified," he added.

Awerbuch-Friedlander paints a different picture. She says that after the tenure decision, Harvard cut off her phone, warehoused her office materials, and refused her requests for administrative support because she was a woman. In court filings, Harvard officials acknowledge some of the events described but say that their actions did not constitute harassment and that there was no pattern of sex discrimination. "We didn't have a job for her, and she didn't get the message," says one Harvard faculty member.

On trial. Tamara Awerbuch-Friedlander has accused Harvard of sex discrimination.

CREDIT: TAMARA AWERBUCH-FRIEDLANDER/HARVARD SCHOOL OF PUBLIC HEALTH

Although they declined to comment on this case, several women at the school say that there are gender-related problems. Julia Walsh, a former health professor now at the University of California, Berkeley, says she left several years ago in frustration over gender issues; another tenured faculty member is about to do the same. And Demple says that he was disappointed in the lack of response to a 1996 study on promotion rates by his panel, which has been hobbled by the reluctance of senior women to participate.

In 1993, Awerbuch-Friedlander switched to the population and international health department, and the next year she filed a complaint with the Massachusetts Committee Against Discrimination, which was rejected by the committee. In 1997, she filed suit in the Middlesex County Superior Court.

The trial is set to begin on 26 February. Neither side expects an out-of-court settlement, although court filings by Harvard describe a $100,000 offer that Awerbuch-Friedlander refused. Court documents show that she is asking for a guaranteed 5-year position as senior lecturer, $550,000 in lost wages, and $200,000 in lost benefits.

–ANDREW LAWLER

ASTROPHYSICS

Cluster Reveals Earth's Rippling Magnetic Field

PARIS—Four satellites flying in unison have revealed a hidden wild side to Earth's magnetosphere, the magnetic field enveloping the planet that acts like a gigantic deflector shield against blasts of solar radiation. The unprecedented view, unveiled here last week at European Space Agency (ESA) headquarters, could help scientists devise better defenses against crippling magnetic storms.

ESA launched the quartet of identical spacecraft last summer, 4 years after the original set of satellites was lost in an explosion seconds after lift-off (*Science*, 28 June 1996, p. 1866). The satellites of the resurrected mission—nicknamed Salsa, Samba, Rumba, and Tango—each carry 11 instruments designed to produce the first three-dimensional maps of the magnetic fields and plasmas surrounding Earth.

Project scientists are thrilled with the data so far. "We can see things we couldn't possibly see before," says André Balogh of Imperial College in London, the principal investigator of the fluxgate magnetometer