SEX LIVES OF THE SMALL AND FURRY

Hamsters have no moral misgivings about frequent sex with a wide variety of partners, but perhaps they should. Sex impairs the immune systems of the males for weeks afterward, with infection, illness, and death as possible consequences.

Weak immunity brought on by attempts to go forth and multiply seems a poor way to ensure the survival of any species, and psychobiologist Nancy Ostrowski of the National Institute of Mental Health began her research with hamsters expecting that "sexual activity would strengthen the immune response, not weaken it." She and her co-workers kept several hundred disease-free male and female golden hamsters in a sterile environment. Attentive human chaperons allowed each male to have a different degree of contact with a female, ranging from none at all to numerous sexual couplings during a once-a-week mating session.

In the fourth week the male hamsters were injected with a foreign protein, priming their immune systems to develop antibodies to it. Antibodies serve as warning flags, identifying foreign substances for the immune system to attack. When examined a week later the most sexually active male hamsters were found to have antibody levels that were less than 40 percent that of the other male animals. Further research showed that sex also reduced male hamsters' natural killer-cell activity for several hours after mating, which is ample time for an infection to take hold.

Observing the intimate details of hamster couplings, researchers uncovered a key to the puzzle. "What's really stunning," Ostrowski says, "is the relationship between antibody levels and the number of prolonged intromissions." Prolonged intromissions are several seconds of male thrusting after several ejaculations during a long encounter, apparently signaling sexual exhaustion and driving the female out of heat. "We found that the moment the hamsters hit sexual exhaustion," Ostrowski says, "antibody levels drop like gangbusters."


For male golden hamsters, sexual success may damage their immune systems.

The prowess of these rodents, ensuring that females are uninterested in any other male, could be the cause of their immunological undoing. Susceptibility to illness "may be nature's way of ensuring that one male doesn't contribute more than his share to the gene pool," Ostrowski says. "You don't want one male running around dominating the species."

UNBREAKABLE LANGUAGE BARRIERS

The French are notorious language snobs, known to insist that native English speakers can never truly master the language of Balzac or even Babar. Galling as it may be, a team led by a British researcher has now uncovered evidence that, on a very basic level, the French are right. Understanding spoken French requires the brain to process information differently than English does, and English speakers, even bilingual ones, can't seem to adapt.

People speak in continuous streams, and listeners must learn to divide these streams into meaningful bits, such as words. To do so, they've developed shortcuts: According to Anne Cutler, a psycholinguist at the Medical Research Council in Cambridge, England, English speakers stress words or sentences unevenly, and listeners pick up on the stresses. Native French speakers, on the other hand, tend to emphasize words evenly, and so listeners use syllables as cues.

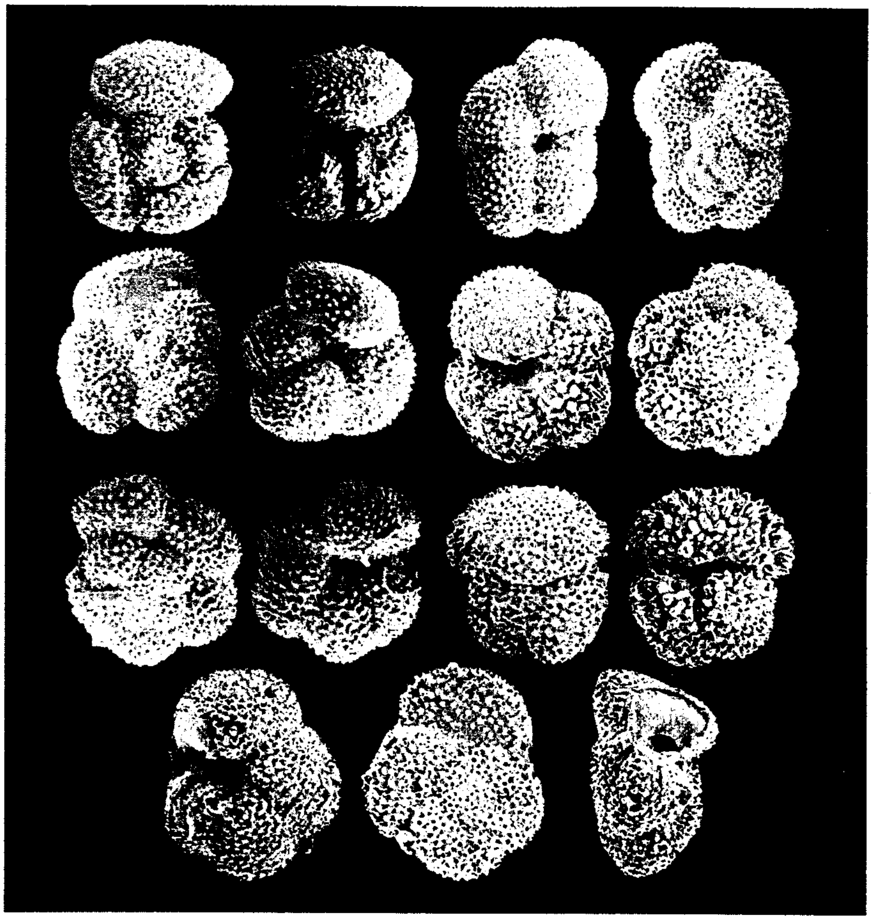
To learn whether bilingual people juggle these different processing shortcuts along with their languages, Cutler and her colleagues tested people who grew up speaking both French and English perfectly. Although fully fluent in two languages, each person did consider one of these languages more dominant.

The researchers then compared the abilities of French-dominant and English-dominant people to use syllables as cues, à la native French. Both groups listened to rapid strings of French words and pressed a button when they heard a word containing a specific sequence of letters, such as *b-a-l.* As expected, French-dominant people responded most quickly when

PHOTOGRAPH BY ROBERT MAIER/ANIMALS ANIMALS this sequence matched a word's full syllable exactly, as it does in the word for balcony, *balcon,* which divides syllabically into *bal con.* Their response was slower to the word *balance,* which stretches *b-a-l* across syllables: *ba lance.*

But when English-dominant speakers were given the same test, their responses were not appreciably faster when *b-a-l* matched a full syllable—they were not using the French syllable-based shortcut.

English-dominant people can't process words syllabically because their mother tongue doesn't emphasize it, the researchers concluded. Language processing shortcuts, they suspect, become fixed at an early age. "There might be something in the brain that's flexible at the beginning of development," says Cutler, "but the language input decides how it's set up."



Microscopic plankton shells tell tales of ancient, upside-down oceans. The shells come from a rise on the seafloor near Antarctica.

PHOTOGRAPH BY LOWELL D. SCOTT, UNIVERSITY OF SOUTHERN CALIFORNIA

UPSIDE-DOWN OCEANS

Today the surface of the oceans is much warmer than the bottom, but the situation may have been just the opposite 40 million years ago. The evidence for upside-down oceans comes from the Maud Rise, a 10,000-foot bump on the seafloor near Antarctica. The rise lies far from any geologic activity, and so its silt has been undisturbed for 75 million years. That silt includes tiny shells of prehistoric plankton, which is composed of calcium carbonate, a molecule that contains oxygen, some of which is the heavy isotope oxygen 18. The lower the temperature when the calcium carbonate was formed, the greater the level of oxygen 18.

James Kennett and Lowell Stott of the University of California at Santa Barbara drilled two holes into the Maud Rise and compared the oxygen 18 content of shells near the top of the rise with that of shells 1,000 yards down the slope, below the point where the ocean now changes from warm water to cold. They found that the greatest concentration of oxygen 18 was at the top of the rise, which indicates that the cold water was once there.

Kennett and Stott's findings made them rethink how ocean water once circulated. In today's circulation system water is carried by surface currents to the poles, where it is chilled. The chilled water is denser, and so it sinks to the bottom, where deep currents spread it over the entire ocean floor.

But 40 million years ago, the poles were not covered with ice. "Then the poles made ocean water cool but not cold," says Kennett. "The largest source of dense water was the Tethys Sea," an enormous ocean that separated Eurasia and Africa and was a forerunner of the Mediterranean. The Tethys was very shallow; it was warmed by the sun and consequently had a high rate of evaporation. When water evaporates, salt is left behind, which weighs down the remaining water. Kennett and Stott suspect that warm water pouring from the Tethys sank below polar water, and computer models suggest that there was enough of it to fill all the deep layers of the world's oceans.

This circulation system apparently changed around 28 million years ago, when Antarctica had frozen and the Tethys was shrinking, as Africa moved toward Eurasia. Together these events had a dramatic effect: over time currents dispersed the salt that the Tethys had dumped into the ocean, and polar-chilled water replaced the deep Tethys layer.

"If our theory is correct," Kennett says, "it will help show how subtly poised Earth's environment is. You don't have to introduce very much change before you can see a very large effect." To bolster their theory, sediment samples will need to be analyzed from sites far removed from the Maud Rise.