The only way to tell if the microbe is triggering heart disease through molecular mimicry, Penninger says, is to do epidemiological studies to see if people who have antibodies against the bacterial peptide have a higher rate of the disease. Boston University's Jick agrees. "One of the obvious limitations is that, so far, the effect has been shown only to occur in mice," he says. **–TRISHA GURA**

Trisha Gura is a science writer in Cleveland, Ohio.

NEUROBIOLOGY

Fruit Fly Odor Receptors Found

Although researchers identified the receptors mammals use to detect odors almost a decade ago, they've been unable to sniff out those of any insect. Now, the impasse has been broken. Two teams, one led by John Carlson of Yale University and the other by Richard Axel of Columbia University, have independently discovered the first odor receptors in the fruit fly, *Drosophila melanogaster*.

The work, described in the February *Neuron* by Carlson and his colleagues and in the 5 March issue of *Cell* by Axel and his, has so far pulled out a total of 17 genes encoding *Drosophila* odor receptors. Given that these came out of the 15% of the *Drosophila* genome that has been sequenced, the insect may have 100 to 200 odor receptor genes in all.

Their discovery will be a boon to neurobiologists, who hope to use the information to probe the more complex workings of mammal brains. By systematically knocking out the fly genes and observing the effects on odor sensitivity and behavior, researchers should be able to piece together a wiring diagram of the olfactory system of the fruit fly. "One can expect in the next few years that a lot will be discovered, providing important new insights into olfaction and probably into sensory coding," predicts Harvard University neurobiologist Catherine Dulac.

The first payoff, however, may be explaining how other insects behave. Already, researchers are using the sequences of the newfound *Drosophila* genes to track down odor receptors in insects that damage crops or transmit human diseases. Having these receptors in hand will make it much easier to find specific compounds that interfere with the insects' ability to detect odors. Because insects depend on smell to find mates and food, such substances could "really enhance our ability to control insect pests," notes Tim McClintock, a neurobiologist at the University of Kentucky College of Medicine, Lexington.

The key to success for both the Yale and Columbia groups was finding the first olfactory receptor gene. For years, others had tried to find these genes by looking for fruit fly genes whose sequences resemble those of known mammalian odor receptor genes. But those searches all came up empty. "These guys came up with a better way," says neurobiologist Dean Smith of the University of Texas Southwestern Medical Center, Dallas. They used a new method to search a growing fly DNA data set: the sequences accumulated by the Berkeley *Drosophila* Genome Project.

Aware that the odor receptor proteins would have to be embedded in the membranes of olfactory nerve endings, Yale's Peter Clyne, Junhyong Kim, and Coral Warr first looked for DNA sequences in the Berkeley data that might encode transmembrane domains, strings of hydrophobic amino acids that can tolerate insertion into fatty membranes. They then eliminated the nonsense DNA and the known genes. This got them down to 34 candidates. Two turned out to be elusive odor receptor genes, as evidenced by their location in the olfactory neurons.

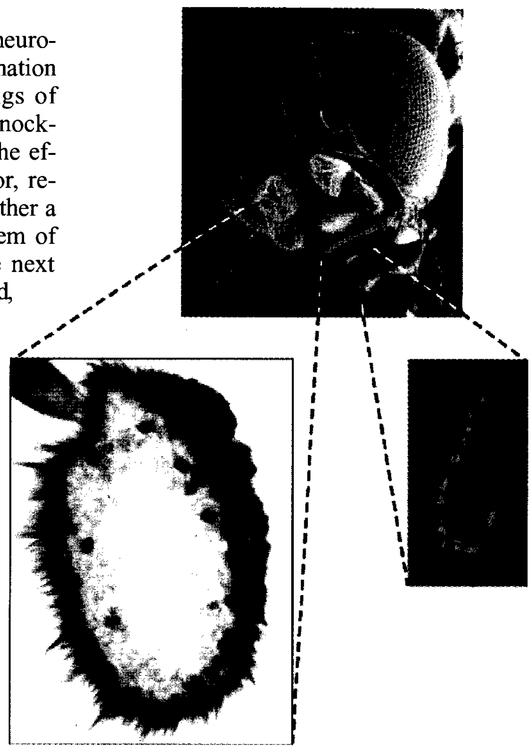
At Columbia, Leslie Vosshall and her colleagues found their first *Drosophila* odor receptor gene by searching for genes that are active only in the fruit fly olfactory organs, the antennae, and a rod-shaped projection on the head called a maxillary palp. The researchers did this by comparing messenger RNAs (mRNAs), which indicate active genes, from the olfactory organs with mRNAs from the whole body and the head. Vosshall gradually homed in on a small set of genes, which she could begin sequencing and testing whether they are active only in the olfactory sensory nerve cells. She found one such gene, and like the Carlson team, used it to find related genes in the sequence database.

Both groups now have clues about how the fruit fly brain perceives odors. They've shown that the genes are expressed differently in the various olfactory nerve cells. These data suggest that fruit flies, like vertebrates, may discriminate odors by decoding patterns of nerve activation that reflect the responses of many individual cells, each attuned to a single sensation.

Carlson's team also learned something from flies with a damaged sense of smell. In a separate study, they found a defective gene in the flies that codes for a protein that regulates gene expression. The defect appears to turn off certain receptor genes in some olfactory nerve cells. "The fact that some receptors are gone is pretty cool," Smith says, as it suggests this DNA regulatory protein helps set up the pattern of gene activity—and odor sensitivity—in the fly. In addition, as in vertebrates, Carlson notes, various fly odor receptor genes appear to be active at different times during development and may help organize the olfactory system.

He and his team plan to continue to look for more odor receptor genes and try to understand how these genes are regulated. "I feel like a kid in a candy store," Carlson says. "There's a million things we can now do."

–ELIZABETH PENNISI



Odor code. The dark staining *(lower left)* shows that an odor receptor gene is active in just a subset of *Drosophila* olfactory nerve cells, and the light blue staining *(lower right)* shows that the same is true for a gene regulating odor receptor expression.

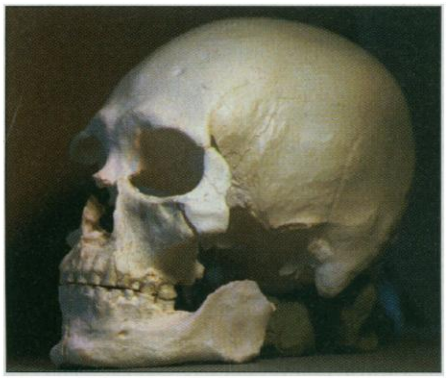
CREDIT: CARLSON *ET AL.*

ARCHAEOLOGY

Kennewick Man Gets His Day in the Lab

More than 30 months after a 9000-year-old skeleton was found on the banks of Washington's Columbia River, a government-appointed team of scientists has begun an examination to decide, once and for all, whether Kennewick Man qualifies as a Native American. Scientists are happy that the skeleton has made it into the lab, but they are worried that the government could put a crimp on the way the work is done and reported.

On 17 February, the Interior Department announced that five scientists have been appointed to help Frank McManamon, chief archaeologist of the National Park Service, perform a systematic analysis of Kennewick's 300-plus bone fragments. The work is being done at Seattle's Burke Museum,



Whose ancestor? Mold of skull made before Corps of Engineers seized Kennewick's remains.

where the bones have resided, per court order, since last October.

The skeleton already has a colorful history (*Science*, 10 April 1998, p. 190). Discovered in July 1996, the bones were seized by the Corps of Engineers on behalf of Native Americans under a 1990 law, the Native American Graves Protection and Repatriation Act. A group of scientists promptly sued for the right to study the remains, which have been claimed by a coalition of five tribes as well as a group representing ancient Nordics. A Portland court order kept them above ground but in limbo at Pacific Northwest National Laboratory in Richland, Washington, where tribal groups visited them occasionally for ritual purposes.

The Corps has turned decision-making over to the Interior Department, and last spring a federal judge gave the department permission to proceed to examine evidence bearing on Kennewick Man's identity. Now he's finally ready for a full inspection. The first step involves scrutiny of bones, teeth, soil samples, and a rock spearpoint embedded in the pelvis to establish whether the man fits the law's definition of a Native American, which includes the words "of, or relating to, a tribe, people or culture that is indigenous to the United States." McManamon says the term applies to anyone found to be in an area before the Europeans got there, and it's not necessary to find "a biological link between modern tribes and ancient remains."

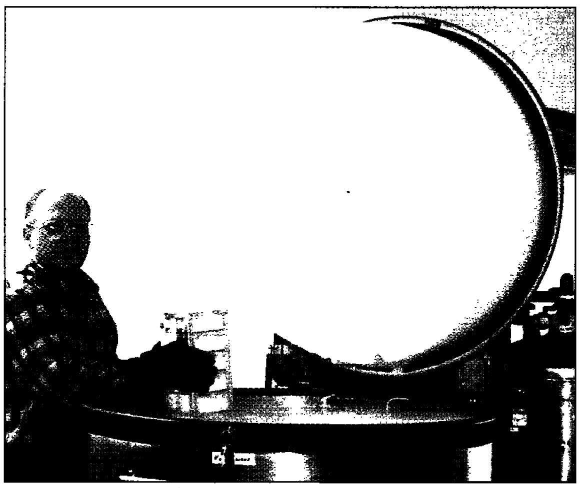
If the findings are inconclusive, McManamon says scientists will check with Native Americans, with whom they have been consulting continuously, before applying invasive procedures such as radiocarbon dating of bones and attempts at DNA analysis. If Kennewick is deemed to be a Native American, says McManamon, scientists will then explore the archaeological record and local tribal histories to establish whether he has "cultural affiliation" with any modern tribe.

Scientific observers are gratified that scientists are finally able to get at the bones, but they're upset with Interior's procedures and its definition of Native American. The term, by that interpretation of the law, encompasses "Norse remains in Maine … and a lot of Japanese shipwrecks," complains anthropologist Robson Bonnichsen of Oregon State University in Corvallis, one of the plaintiffs in the court case. He and others contend that the law requires a relationship to present-day populations. Bonnichsen is also dubious that the government will find any connection with modern-day Indians given that the only artifact is a spearpoint, and the skull—which looks like a cross between a Polynesian and a member of Japan's Ainu tribe—is quite different from those of today's Native Americans.

Interior spokesperson Stephanie Hanna says a preliminary report from the expert team is due in mid-March and data will eventually be made public. The remains will ultimately be given to the tribe in question if a cultural affiliation is established. But the scientists' suit is only "on hold," says plaintiffs' lawyer, Alan Schneider, pending the outcome of the current exercise. –CONSTANCE HOLDEN

Culture Collections Seek Global Help

TOKYO—The explosion of interest in biodiversity has generated a wave of popular support for preserving and cataloging the world's plant and animal species. But their less flashy brethren—organisms such as yeasts, bacteria, fungi, and cell lines—haven't been able to capitalize on that interest. "The collections are taken for granted," laments Jennie Hunter-Cevera, a microbiologist at Lawrence Berkeley National Laboratory in California. "What you cannot see, you don't value."



Heavy demand. Culture collections are struggling to serve a growing number of users and uses.

Help may be on the way, however. The Organization for Economic Cooperation and Development (OECD) is expected to launch a major study later this year that could lead to an international agreement on preserving these biological materials. Scientists and government officials who gathered here last week for two meetings* asked for OECD's help, and the idea has been embraced by officials at the Paris-based grouping of the world's 29 leading industrialized democracies. "There is a growing awareness among policy-makers beyond the scientific community that biological resource centers are vital … for future research in the life sciences and biotechnology," says Solomon Wald, who heads the OECD's working group on biotechnology. Adds Alan Doyle, a microbiologist with the Wellcome Trust in London: "It takes some wider group with enough influence to get policy changes, and the OECD seems to be the right vehicle for this."

The working group on biotechnology is expected to adopt the idea at its spring meeting. It would then probably form a task force to study six aspects of managing such collections: access and distribution; quality assurance; efficiency and the avoidance of duplication; funding and sustainability; education, training, and research; and networking. Wald says the task force, with experts from interested countries, will develop policy principles that could form the basis for an international agreement to promote the health of the biological resource centers. The study is expected to take a year or more.

Researchers say that such help is badly needed because efforts by the scientific community have fallen short. Many present-day collections trace their roots to a dedicated individual or group that collected specimens for academic interest, or to companies that collected materials for commercial purposes. Brewers, for example, often started collections of yeasts. But regardless of their origin, most of the major collections are now under the wing of universities or public institutions. Perennially short of money, they face major challenges in keeping up with the times.

One of the most pressing needs is to improve, or in many cases to establish, the capacity to manage the rapid accumulation of genetic information about their holdings. "The centers are being crushed by the volume of new strains and the avalanche of

* OECD Workshop on Scientific and Technological Infrastructure, Tokyo, 17 to 18 February, cosponsored by Japan's Ministry of International Trade and Industry; Microbial Resources Centers in the 21st Century: New Paradigms, Tokyo, 16 February, sponsored by World Federation of Culture Collections.

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