# Digging into Natural-World Insights

Scientists are beginning to unravel fundamental features of commonsense knowledge about the natural world, with intriguing and ironic results.

From rain forests in Guatemala to urban jungles and suburban parks in the United States, people construct strikingly similar mental catalogues of animals and plants. They also emphasize categories corresponding to the scientific level of genus, conclude two studies slated to appear in COGNITIVE PSYCHOLOGY.

However, people who know a lot about their local ecology intuitively reject an important facet of scientific reasoning—known as the diversity principle—when rendering judgments about plants and animals, the projects find.

According to that principle, a hypothesis requires confirmation from diverse rather than similar data sets. For example, if one knows that hippopotamuses have an ulnar artery, one would test whether all mammals have an ulnar artery by examining hamsters rather than rhinoceroses.

So while people may universally find it compelling to sort plants and animals into genus-level categories, sophisticated ecological knowledge tends to compete with or block the use of diversity-based reasoning, proposes psychologist Douglas L. Medin of Northwestern University in Evanston, Ill.

These findings indicate that science constitutes a specialized type of thought that need not play a role in thinking competently about one's everyday environment, adds anthropologist Scott Atran of the National Center for Scientific Research in Paris.

Medin and Atran took part in both of the new investigations.

"This is extremely important work," comments anthropologist Lawrence A. Hirschfeld of the University of Michigan in Ann Arbor. "I think they're looking at commonsense ways of reasoning about living kinds that are unlike ways of reasoning about anything else."

An initial study, directed by Alejandro López of the Max Planck Institute for Psychological Research in Munich, consisted of 12 U.S. college students and 12 Itzaj villagers, part of a Maya population in Guatemala's Petén rain forest.

When given cards bearing the names of 40 mammals native to their respective locales, members of each culture created six categories based on the animals' physical features and behaviors. They also distinguished between predatory and nonpredatory animals.

Most volunteers in both cultures showed a preference for combining animals into groups related at the genus level. Itzaj villagers displayed a richer base of knowledge about local mammals than their U.S. counterparts.

On reasoning tasks about mammals—such as assessing whether rats are more likely to have a disease that occurs in mice or one found in foxes—U.S. and Itzaj participants paid close attention to the perceived similarity between the animals and to the typicality of the animals in the local environment.

In contrast to the U.S. students, the Itzaj refused most opportunities to test premises with diverse rather than similar sets of mammals, often because of ecological considerations.

For instance, one Itzaj woman explained that a disease found in rats and pocket mice would more likely spread to other mammals than a disease found in tapirs and squirrels. The latter, more distantly related pair, she reasoned, could only contract the same illness through an outside agent, such as a bat.

A second study, directed by Medin, consisted of 24 Chicago-area adults with one of three tree-related jobs—scientifically trained taxonomists, landscapers, or maintenance workers who cared for city-owned trees. They were asked to set up several systems of categorizing 48 tree species.

Members of each occupation intuitively sorted trees into genus-level categories. Taxonomists devised additional science-based groups, whereas the others divvied up trees largely on the basis of job-related interests, such as desirable trees for planting along city streets, a landscapers' category.

In reasoning tasks on trees comparable to those for mammals, the diversity principle was embraced by taxonomists, employed to a moderate extent by landscapers, and rarely used by maintenance workers. Much like the Itzaj, maintenance workers relied on their detailed knowledge of local trees.

Future studies will examine biological knowledge and reasoning in children across cultures, Medin says. "We're still trying to understand why diversity reasoning occurs in some groups and not others," he remarks. — *B. Bower*

## Electric blanket boils PCBs from soil

*Engineers have long been able to destroy polychlorinated biphenyls (PCBs) and other organic pollutants. The challenge has been how to separate them cost-effectively from the material they contaminate. Scientists now report having solved that problem for soil by cooking it with an intensely hot electric blanket to vaporize the pollutants.*

*In the November ENVIRONMENTAL SCIENCE & TECHNOLOGY, William A. Edelstein of General Electric Corporate Research & Development in Schenectady, N.Y., and his coworkers offer results from day-long tests at an abandoned U.S. drag strip. Decades ago, PCB-laced oil had been sprayed there to control dust.*

*The researchers' prototype blanket, shown here, is edged with electric wires and partially folded back from a treated area. Operated at temperatures up to 925°C, it eventually brought the top 15 centimeters of soil to 200°C. A vacuum pulled the pollutant vapors that formed under the blanket into a flameless thermal oxidizer, which broke down the PCBs. The contamination—initially as high as 2,000 parts per million (ppm)—fell to less than 2 ppm over each 9 square meters treated. In follow-up tests, the researchers achieved comparable cleanup to depths of 16 inches at an even more heavily tainted area.*

*On Aug. 1, the Shell Oil Co. of Houston created a subsidiary, TerraTherm, to commercialize such blankets for the removal of dioxins, solvents, pesticides, and perhaps heavy metals such as mercury, cadmium, and lead.*

— J. Raloff

Edelstein/GE R&D