Press, 1999), adds: "It's an accident of birth, like having five fingers instead of seven."

More focused comparisons have yielded similarly provocative conclusions. In another talk, MIT linguist David Pesetsky, a former student of Chomsky's, examined the Question Rule, or the arrangement of parts of speech in a question. At first glance, questions appear strikingly different in many languages. In English, for example, we ask, "Whose book did Mary buy?" In Russian, the same question, "Chju Marija kupila knigu?" (translated word for word), comes out as "Whose Mary bought book?" Comparing these sentences and equivalents in Bulgarian and Okinawan, a Japanese dialect, Pesetsky and students Paul Hagstrom and Norvin Richards have discovered a recurring syntax theme: No matter what their native tongue, people consistently place variations on the word "whose" and accompanying words at one end of a sentence.

Both sets of findings are compelling, says Victoria Fromkin, a linguist at the University of California, Los Angeles (UCLA). "The universal properties they've found—combined with the fact that children show an amazing ability to pick up language—make a very strong case that our species is biologically endowed with a set of rules for communication," she says. But some researchers contend that Cinque, Pesetsky, and their colleagues are overreaching. "We all agree that humans have a language faculty," says UCLA's Edward Keenan. "What's at issue is how specific it is." But regarding precise rules for a universal grammar, he says, "the evidence just isn't in." Pesetsky demurs: "I think we're tapping something basic here."

–KATHRYN S. BROWN

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AAAS MEETING

▶NEUROBIOLOGY

Magnetic Cells: Stuff of Legend?

Many animals are attuned to a world hidden from our perception: Bats bounce sound waves off prey, snakes slither through grasslands awash in infrared light, and sharks hunt in the electrical trails of their next meal. Now scientists have taken a step closer to confirming the existence of another sense: the ability to use Earth's magnetic fields to navigate on starless nights or in turbid waters. Migratory and homing animals such as birds, bees, and fish seem to possess a built-in compass, and at the meeting Carol Diebel of the University of Auckland in New Zealand presented new findings on the iron-laden cells that may provide these creatures with a legend to Earth's magnetic road map.

Two years ago, a team led by Diebel's colleague Michael Walker showed that captive trout could be conditioned to nudge a bar and receive food when the fish detect a magnetic field. In a 1997 report in *Nature*, the group traced this magnetic sense to nerves rooted in tissue, rich in iron crystals, located in the trout's nose. Now Diebel and Walker have found that these crystals—presumably composed of magnetite, a mineral used in the first humanmade compasses—are polarized like a bar magnet, and that they appear to be strung together in chains inside so-called magnetoreceptor cells. Scientists who have been engaged in a decades-long hunt for these cells—and have endured derision for working in a field tarnished by dubious research—say they feel vindicated. "This is the last nail in the argument for these things being the magnetoreceptor cells," says Joseph Kirschvink, a geobiologist at the California Institute of Technology in Pasadena who first proposed the magnetite-based magnetoreception theory 20 years ago.

Over the past 3 decades, magnetite has been found in life-forms as diverse as bacteria, birds, whales, and humans. Although the 50-nanometer particles are just the right size to act as bar magnets in the body (crystals too large would set up interfering fields, while those too small would create unstable fields), locating the magnetite-bearing cells in higher organisms has been like trying to autopsy a living person: The tissue-dissolving methods used to identify magnetite turn the sample to mush.

Diebel knew her team was looking for a needle in a haystack. Organisms contain very little magnetite and the cells that harbor it could be anywhere, as magnetic fields pass through the body relatively unimpeded. "You could spend forever trying to find nanometers of crystal in millimeters of tissue," she says. "We had to invent new methods every step of the way." Her group turned to a magnetic force microscope, running it less than a hair's width above thin slices of trout nose tissue. Positive charges in a magnetic field attract the magnetized probe, and negative charges repel it. The trout snout lit up the computer screen. "We were jumping around the room when we saw this blip" representing a magnetic dipole, Diebel says.

The group next used a confocal microscope to map structures within the putative magnetoreceptor cells, arrayed in the shape of a three-leaf clover. They discerned what appeared to be chains of magnetite that resemble those in bacteria which respond to a magnetic field. How the chains may function in multicellular organisms is anybody's guess, but Kirschvink speculates that changes in Earth's magnetic field twist the chains, perhaps forcing open ion channels that send signals to the brain.

Not everyone is convinced the scientists have uncovered the whole picture. "These cells appear to be involved in magnetoreception, but their role in behavior is still unclear," says John Phillips, a neuroethologist at Indiana University, Bloomington, who studies how light helps newts orient themselves in their surroundings. To tie the mechanism to behavior, researchers still must try to disrupt the cells and show an effect on navigation. The work could open the door to exploring an enduring biological mystery: whether, unwittingly, we use the traces of magnetite in our own bodies to make more sense of this bewildering world.

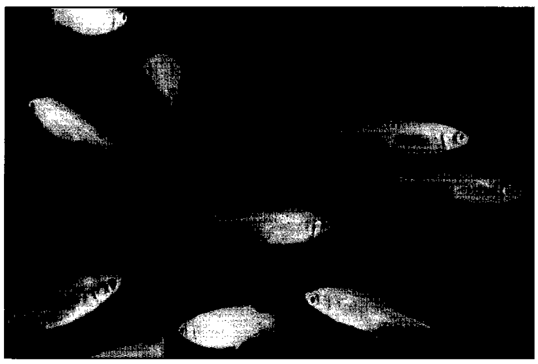
–MELISSA MERTL

AAAS MEETING

▶BIOENGINEERING

Fishing for Toxic Chemicals

Many toxicologists can remember being dogged at some point by people opposed to chemical tests on animals. But when Richard Winn, a toxicologist at the University of Georgia, Athens, asked one protester how she would feel if lab mice and rats were retired in favor of fish, she answered, he recalls, "that because fish don't have faces, she would be much more comfortable." If other animal activists feel the same way, then Winn has moved a step closer to



Guinea pigs with gills? Medaka fish could supplant rodents as the animal of choice for tox labs.

easing the disapproval that he and his colleagues often feel. At the meeting, he described a promising new line of fish for screening toxic chemicals.

To enhance their ability to detect the mutations that chemicals might cause, in the mid-1980s toxicologists began equipping lab mice with bacterial genes that can be pulled out and screened for damage. This is much easier than, say, screening the

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