

influence the flight of electrons traveling in the same direction as the laser light. But in the wiggler, when the electrons are forced to move askew, it does. "Those [electrons] sitting in the electric field get an energy kick," Schoenlein says. That boosts them into a slightly wider orbit as they travel around the ring, making it possible to separate them out. Finally, the synchrotron takes over, forcing the small bunch of higher energy electrons to emit short x-ray pulses, which are steered to the experimental chamber.

The result was a series of 10,000 x-ray pulses a second, each lasting 300 femtoseconds. A second's worth of pulses contained approximately 10^5 photons. That's well below the 10^{15} to 10^{18} photons per second the ALS normally generates. But it's likely to be plenty for use in a technique called extended x-ray absorption fine structure, which reveals the placement and movement of a core atom in a sample relative to its closest neighbors. By using fast pulses to probe a chemical reaction at various stages of completion, researchers can construct fast-action movies of chemistry in the making. Unlike similar movies made with laser pulses in so-called "pump-probe" experiments, a femtosecond x-ray pulse would reveal the position of atoms in the sample. Although the Berkeley team has yet to perform the experiment, it's the next step. Says Penner-Hahn, "This is something that could have a tremendous impact."

—ROBERT F. SERVICE

HUMAN EVOLUTION

Hominid Ancestors May Have Knuckle Walked

As countless cartoons of hunched brutes suggest, the evolution of an upright posture is one of the crucial features that makes hominids distinct from other primates. But exactly how our predecessors got around before they walked upright has been a mystery. Now a new analysis of casts of 3-million- to 4-million-year-old hominid bones suggests that humans evolved from an ancestor that walked on its knuckles, like chimpanzees and gorillas. "For the first time we are able to say early hominids bear the echo of a knuckle-walking ancestry that they shared with gorillas and

chimps," says paleoanthropologist Rick Potts of the Smithsonian Institution.

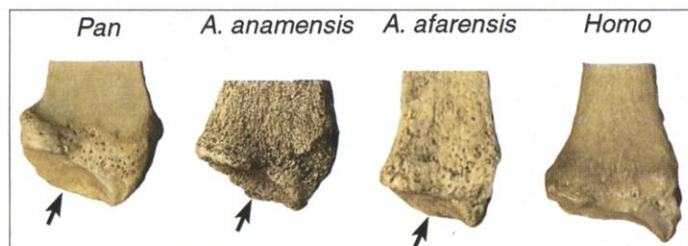
Anthropologists Brian Richmond and David Strait of George Washington University (GWU) report in this week's issue of *Nature* that two species of australopithecines, including the famed "Lucy" skeleton, have features in their wrist joints that resemble those seen in living African apes. Aside from shedding some light on the murky nature of the common ancestor of humans, chimps, and gorillas, the find helps resolve a conflict between anatomical and molecular evidence linking chimps and humans. "This makes things nice and neat," says Leslie Aiello, a paleoanthropologist at University College London.

When chimps and gorillas scamper on the ground, they curl their long fingers, plant the second segment of their finger bones on the ground, and shift their weight. A bony ridge near the base of the finger results from the hand bearing weight in this position. Humans don't have this ridge, nor did early hominids like Lucy, a member of the species *Australopithecus afarensis*, because she, like us, walked upright.

The lack of evidence for knuckle walking among human ancestors implied that chimps are closer to gorillas than to humans, yet strong molecular data and some subtle anatomical data suggest the opposite. But if chimps and humans are indeed closely related, as the genes suggest, then knuckle walking must have evolved twice, independently, in chimps and gorillas—a somewhat "untidy" theory that dissatisfied many anthropologists.

Then in 1998, Richmond, a predoctoral fellow at the Smithsonian Institution at the time, read some old papers on the evolution of the primate hand. He noted that early descriptions of knuckle walking in modern chimps and gorillas reported not only the ridges on the finger bones, but also ledges and notches in the wrist joint that help keep the arm rigid. He and Strait walked across the hall to check the collection of casts at the National Museum of Natural History. "I walked over to the cabinet, pulled out Lucy, and—shazam!—she had the morphology that was classic for knuckle walkers." Lucy herself wasn't a knuckle walker, notes Richmond; rather, these wrist traits are a leftover from her knuckle-walking ancestors.

Teaming up with Strait, a postdoc at GWU, Richmond found that chimps, gorillas, and two early hominids—*A. afarensis* and *A. anamensis*—had similar specialized wrist features that



Stiff wrist? Early hominids had a bony ridge (arrow) on their forearms. Chimps (left) use this to stabilize the wrist for knuckle walking.

ScienceScope

Donations Welcome Senior science policy officials from India and the United States have kicked off an effort to promote cooperation between the two countries. During President Clinton's visit this week to India, they inked an agreement to establish a joint science and technology forum. "We have neglected this relationship for more than 2 decades," said Clinton (with Indian Foreign Minister Jaswant Singh, center). "It is too important to ever fall into disrepair again."



The U.S. government has already committed \$7.5 million for the forum, which will commission studies and promote research collaborations. A 14-member board will coordinate its activities and seek private and corporate funds. Says V. S. Ramamurthy, secretary to the Department of Science and Technology, who worked for 2 years to set up the forum: "A channel for communication has been opened."

Further Food Fights In a new sign that the battle over biotech food is heating up in the United States, a coalition of 54 consumer, farming, and environmental organizations this week petitioned the Food and Drug Administration (FDA) to require mandatory safety testing and labeling for bioengineered crops—neither of which is required at the moment. In the meantime, the groups want FDA to remove all transgenic products from supermarkets. By law, the agency has 180 days to respond; if it doesn't come around, the coalition promises to go to court. "This is not howling in the wind," says Joseph Mendelson, legal director of the Center for Food Safety, the lead petitioner.

Meanwhile, to counter the "nonsense" and "unfounded attacks" coming from opponents, almost 1900 scientists have signed a pro-biotech petition posted on the Web (www.agbioworld.com) by Channapatna Prakashthat, director of the Center for Plant Biotechnology Research at Tuskegee University in Alabama. Among the signers are two Nobel laureates, geneticist James Watson and green revolution pioneer Norman Borlaug. Prakashthat says the petition, which urges policy-makers to use "sound scientific principles" in biotech regulation, will eventually be sent to world leaders.

Contributors: Jeffrey Mervis, Andrew Lawler, Pallava Bagla, Martin Enserink

are lacking in modern humans and other primates. (Two later hominids—*A. africanus* and *Paranthropus robustus*—lacked these specializations.) “These features in the early hominid bones can’t be explained except that they are uniquely related to knuckle walking,” says John Fleagle, a paleoanthropologist at the State University of New York, Stony Brook, the institution from which Richmond and Strait received their Ph.D.s. And these common traits imply that the common ancestor of australopithecines, chimps, and gorillas was a knuckle walker. The knuckle-walking traits were lost in hominids—by about 2.5 million to 3.0 million years ago, according to specimens of *A. africanus*, Richmond says.

But the finding raises other questions, such as why a climbing creature already adapted for traveling on the ground would evolve the ability to stand on two feet as well. “In some ways, for me, it makes it more difficult to understand the evolution of bipedalism,” Potts says. One idea is that walking upright freed the hands for other uses, such as carrying food, tools, or weapons, says Carol Ward, a paleoanthropologist at the University of Missouri, Columbia. “The big problem is that we don’t have a fossil record of the chimp-human-gorilla ancestor,” she notes. “So what you have to do is build an argument based on parsimony and hope for the best.”

—ERIK STOKSTAD

LOOKING AHEAD

Medalists Gaze Out on A Familiar Future

Who says good scientists need data to voice an opinion? Last week the newest winners of the national medals of science and of technology (*Science*, 4 February, p. 785) spent an hour speculating on what the world might look like in 2025 and whether “innovation will surpass science fiction.” The spirited discussion among the 15 medalists—part of a daylong series of events that culminated in presentation of the awards by President Clinton—flowed freely around

On stage. This year’s medalists include (top row, from left): Stewart Rice, Robert Solow; (second row): Leo Kadanoff, Jerome Swartz, Susan Solomon, Kenneth Stevens, Felix Browder; (third row): Judy Swanson (for Robert), John Ross, Lynn Margulis, James Cronin; (bottom): Glenn Culler, Ray Kurzweil, Jared Diamond, David Baltimore, Ronald Coifman. Not shown: Robert Taylor.



such knotty questions as the impact of technology on the quality of life and what drives human behavior. Not surprisingly, there was no consensus. But although a few scientists declined to venture outside their own discipline, most were happy to extrapolate from today the shape of tomorrow.

Computer scientist Raymond Kurzweil spoke glowingly of nanobots communicating directly with our neurons to repair damaged tissue, part of a panoply of technological advances that would bring good health and prosperity to all. His sunny view, however, clashed with conservation biologist Jared Diamond’s warning about a collection of 25-year “time bombs”—in particular the loss of biodiversity—that must be defused before humanity can prosper. Cellular biologist Lynn Margulis was even gloomier, fretting about how the desire to procreate could lead to unsustainable population levels that would overwhelm the capacity of any technology. In rapid succession, the three scientists gave thrust and parry, conceding nothing.

The issue of how to monitor where the world was headed proved equally hard to pin down. Economics Nobel Robert Solow objected to overly optimistic predictions of ever-expanding productivity from computers and electronic communications, saying that the slight gains in recent years have yet to survive a recession. Kurzweil disagreed, saying that traditional economic measures were no match for the new economy, but Solow stuck to his guns. Taking another tack, medicine Nobel David Baltimore opined that productivity itself was a poor measure of progress and that, for most people, an improved quality of life from modern pharmaceuticals was a more meaningful indicator.

Moderator Ira Flatow, a science journalist, seemed happy to let participants state their views and take their shots, leaving the audience to draw its own conclusions. But at least one panelist expressed displeasure at how the issues were being framed. “I don’t know what life will be like in 2025,

and I don’t think scientists have much that’s useful to say about the topic,” commented physics Nobel James Cronin after the roundtable ended. “But I can promise you that in 25 years we will know a lot more about the composition of the universe. That’s what science can give the world. And I think that’s pretty important.”

—JEFFREY MERVIS

NEUROSCIENCE

New Ion Channel May Yield Clues to Hearing

As every biology student learns, the sense of hearing depends on the operation of the hair cells in the inner ear. These cells bear microscopically fine projections, the hairs or cilia, that bend in response to passing sound waves, setting off nerve impulses that the brain recognizes as sounds—a clap of thunder, say, or a hushed whisper. But even though neuroscientists have learned a great deal about hair cells, they have been unable to track down a key element needed for the cells’ operation—the ion channel that opens when the hairs bend to produce the electrical signal. Now, working with a seemingly different system, they’ve made a discovery that may help them get their hands on the elusive channel.

On page 2229, a team led by Charles Zuker of the University of California (UC), San Diego, reports that it has cloned an intriguing ion channel from the neurons that underlie the sensory bristles of the fruit fly. It is a mechanically sensitive channel—in other words, it responds to mechanical force instead of voltage changes or biochemical modifications. At first blush, the fruit fly bristles, visible with a magnifying glass, appear to be quite different from the microscopic bundles of hair cells within the human ear. But the Zuker team has shown that the neurons beneath the bristles operate much like the hair cells as they convert movement into electrical impulses. That has some researchers thinking that the functioning of the two types of cells may depend on structurally similar ion channels. If so, the new gene could provide a useful probe for fishing out the channel in human hair cells—an accomplishment that could lead to new insights into the causes of hereditary deafness and perhaps ways to correct it.

“I am really excited about [this] channel,” says Cornelia Bargmann, who studies sensory systems at UC San Francisco. Although there are other candidates for such mechanically sensitive channels, including one discovered by Bargmann’s team, she calls Zuker’s the “most intriguing candidate right now” because of its possible connection to hair-cell channels, with their “clear medical relevance and interesting biophysics.”