held here last week—and it may well spread and cause disease come summer.

A first clue came in early February, when a red-tailed hawk was found dead in Westchester County, a suburb north of New York City. Lab tests at the University of Connecticut in Storrs and the Connecticut Agricultural Experiment Station in New Haven confirmed that the bird died from the West Nile virus. Because there were no mosquitoes around at the time, researchers don't understand how and where the hawk became infected. It may have been bitten by a mosquito in the fall and only succumbed recently, or it may have eaten an infected animal. Another theory is that it picked up the virus farther south and then flew north, perhaps disoriented from the disease. That's a troubling scenario, because it would mean that the virus has already gained a foothold somewhere in the southern United States.

More troubling news came from researchers from the Centers for Disease Control and Prevention (CDC) and New York City and state, who have been monitoring mosquito populations in sewers, abandoned hangars, swimming pool utility rooms, and other likely winter shelters. They had a hard time finding any mosquitoes at all, said CDC's Roger Nasci. But the whitewashed interior walls of Fort Totten, a historic site in the New York borough of Queens, proved an excellent hunting ground. Early last week, researchers found live West Nile virus in one *Culex* sample taken there. "This means the virus has survived the winter in a viable form," says Nasci.

The results have experts worried. Some entomologists question the region's ability to wage an effective war against mosquitoes this spring and summer—the only way to stop transmission of the virus. With viral epidemics such as AIDS taking a huge toll, insect-borne diseases have been "pretty far back on the burner" in New York and some other states, says John Edman, director of the Center for Vector-Borne Disease Research at the University of California, Davis. He points out that New York state is still hiring personnel for new surveillance and control programs. As a result, it may be difficult to start an aggressive larvae-control campaign in early spring, as experts recommended during a workshop in January, says Edman. "I'm really worried," adds Yale medical entomologist Durland Fish. "I don't think they'll be able to mount an effective response."

But city and state officials dismiss those worries, citing detailed plans of how they will monitor and battle possible outbreaks. "We have been working very diligently," says a spokesperson for the state Department of Health in Albany. "We will be prepared."

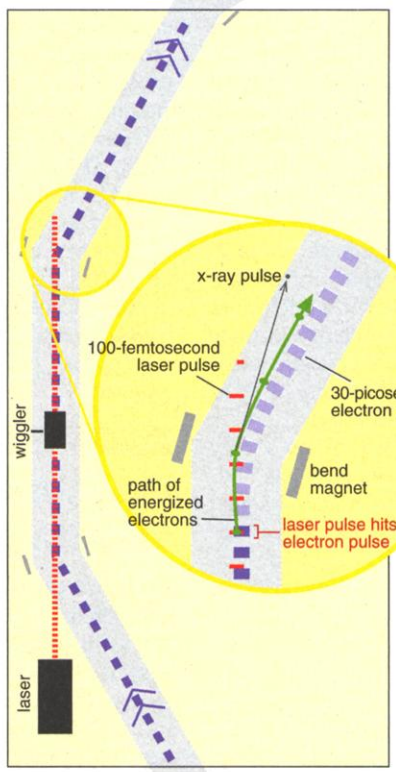
–MARTIN ENSERINK

SYNCHROTRON SCIENCE

X-ray Pulses Chopped To Femtoseconds

Nightclub operators aren't the only ones who like strobe lights. Chemists in recent years have increasingly turned to short pulses of x-rays to illuminate the dance of atoms in molecules as they undergo chemical reactions. Using nanosecond pulses of x-rays at synchrotrons, for example, researchers have made movies of proteins as they bind to molecular dance partners (*Science*, 27 June 1997, p. 1986). Now a team working at Lawrence Berkeley National Laboratory's Advanced Light Source (ALS) synchrotron in California has managed one better.

On page 2237, the team reports generating x-ray pulses lasting a mere 300 quadrillionths of a second, or femtoseconds. And the researchers are now building a fast-pulse beamline at the ALS, which is expected to shave those pulses down to 100 femtoseconds. The new pulses aren't bright enough at the moment to shed light on massive molecules such as proteins, but by giving freeze-frame views they may help unveil intimate details of key atoms in molecules in disordered solids and liquids as they undergo reactions. "It's an exciting experiment," says James Penner-Hahn, a chemist and fast-pulse x-ray expert at the University of Michigan, Ann Arbor, of the new work. By allowing researchers to see atomic close-ups of chemical reactions as they occur, "I think it would open up a whole new class of experiments," he says.



Flash! Electrons zapped by supershort laser pulses emit femtosecond x-rays as they round the bend.

X-rays aren't the only type of short-pulsed strobe out there. Chemists track chemical reactions with infrared laser pulses as short as a few femtoseconds. Laser pulses, however, tell researchers only about the chemical components of the compounds they are looking at. X-rays can illuminate the precise structure of atoms in a sample.

For that reason the Berkeley group—led by physicist Robert Schoenlein—has been working to generate ever shorter x-ray pulses. Four years ago, Schoenlein and his colleagues created the first 300-femtosecond x-ray pulses through a technique called relativistic Thomson scattering (*Science*, 11 October 1996, p. 236), which uses electrons careening through a linear accelerator to kick pulses of infrared photons up to higher x-ray energies. But the resulting x-ray pulses were too dim to be useful for most experiments.

This time around, the researchers turned to the ALS, which produces extremely bright bursts of x-ray photons. The catch is that those x-ray bursts last about 30 picoseconds each, over 1000 times too long to illuminate the fastest atomic movements. So the team had to come up with a way to chop out part of each long pulse while retaining enough photons to capture the action.

They started by manipulating not the synchrotron's x-rays, but the electrons that produce them. Synchrotrons accelerate bunches of electrons to relativistic speeds in a stadium-sized "ring," actually a 12-sided polygon. Magnets at the vertices of the polygon force the electrons to bend and travel around the ring; the change of direction causes them to shed x-rays, which can be used in experiments.

The Berkeley researchers wanted to slice off a portion of each electron bunch and use those to generate short x-ray pulses. They did so with the help of a femtosecond optical laser and a magnetic device called a wiggler, a gantlet of alternating north and south magnetic poles that force electrons traveling between them to shimmy back and forth, releasing additional x-rays with every wiggle. The researchers rigged their laser to fire light pulses into electron bunches as they passed through a wiggler in the straight section of the polygon. Light rays—like other forms of electromagnetic radiation—travel like waves with peaks and troughs in their electric field as they move. And in strong laser pulses, all the photons travel in lockstep, with their peaks and troughs coinciding.

This coherent motion creates a strong electric field. Ordinarily, the field would not

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.

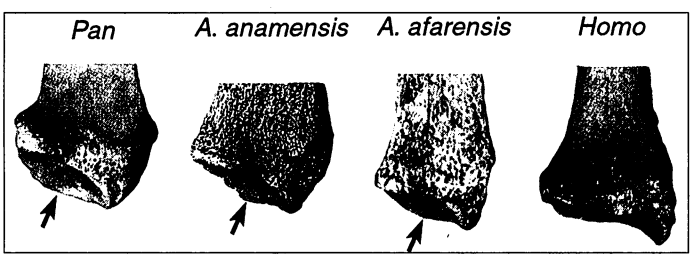
Anthropologists Brian Richmond and David Strait of George Washington University (GWU) report in this week's issue of *Nature* that two species of australopithecines, including the famed "Lucy" skeleton, have features in their wrist joints that resemble those seen in living African apes. Aside from shedding 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



CREDIT: (BOTTOM) D. STRAIT/GEORGE WASHINGTON UNIVERSITY

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.

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