says avian ecologist Trevor Price of the University of California, San Diego. Females may pay the highest price, amplifying the redstarts' skewed sex ratio (like many migratory songbirds, redstarts have a higher proportion of males than females) and spelling trouble for the species. For redstarts and other migratory songbirds, the decline of wet winter forests could turn already difficult winters into one-way tickets south.

—BERNICE WUETHRICH

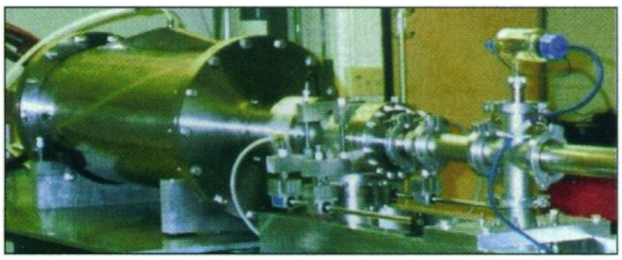
Bernice Wuethrich is an exhibit writer at the National Museum of Natural History in Washington, D.C.

X-RAYS

Tabletop Laser Packs a Punch

When materials scientists and x-ray crystallographers talk about "light sources," they are normally referring to facilities as big and pricey as electric power plants: synchrotron radiation sources, particle accelerators built to produce intense x-ray beams for probing the structure of matter. But now a team of scientists at Colorado State University in Fort Collins has made a light source you could take home: a tabletop x-ray laser that can deliver rapid-fire pulses of x-rays comparable to those of some synchrotron sources.

"We have right now the same coherent power … as a third-generation synchrotron beamline," says team leader Jorge Rocca. Described in an upcoming paper in *Physical Review Letters*, the tabletop device, powered by electric discharges, could relieve some of the seemingly insatiable appetite for new x-ray sources to study the structure of materials and biomolecules. Although the source emits very low-energy, or "soft," x-rays, verging on the ultraviolet, at a single frequency, all wavelengths are of interest to researchers. "There are biologists who use wavelengths from visible ultraviolet to x-rays on the same machine to determine structures," says Marie-Emmanuelle Couprie of LURE, which houses France's synchrotron in Orsay.



Rapid fire. Tabletop laser generates several x-ray pulses per second.

CREDIT: COLORADO STATE UNIVERSITY

In 1994 Rocca and his colleagues reported that they had demonstrated the world's first tabletop x-ray laser (*Science*, 4 November 1994, p. 732). While existing x-ray lasers use powerful pulses from a separate, usually huge, optical laser to ionize a gas into a plasma and then excite the ions so that they produce x-rays, Rocca's team used a different approach. They filled spaghetti-thin capillary tubes 18 centimeters long with argon gas and then used electric discharges both to create the plasma and excite the ions. Their laser was not very powerful, however, and it only produced one nanosecond-long pulse per minute. By 1996, the team had upped the power output per shot, but because of problems cooling the capillaries it could not improve on the rate of one shot a minute, well short of the millions of pulses achievable with a synchrotron source.

Since then, the team has made several improvements. Instead of capillaries made of polyacetal, a very tough plastic, they use water-cooled ceramic ones made from alumina, which are stronger and conduct heat better, allowing the team to apply more rapid-fire electric discharges. "We have also made electrical changes to supply the power at the right rate," says Rocca. In their upcoming paper, the team announces that it has achieved its goal. The device generates x-ray pulses with a wavelength of 46.9 nanometers at a repetition rate of 7 per second, producing an average output power of about 1 milliwatt—two to three orders of magnitude larger than produced by some older synchrotron sources.

Such a laser is no competition to the top rank of high-energy, or "hard," x-ray sources such as the European Synchrotron Radiation Facility in Grenoble, France, which structural biologists rely on to study the three-dimensional structure of proteins. "The study of proteins requires much harder x-rays" than the laser can produce, says Michel Bessiere of LURE. But the laser could conceivably fill the needs of some users of "soft" x-ray beams at sources like Berkeley's Advanced Light Source or Italy's Elettra for applications such as x-ray holography and spectroscopy. This could prove to be a boon for researchers queuing to run their experiment at today's facilities, which are seriously overcrowded. "You could fill every synchrotron-hour in Europe four times," says Bob Cernik of Britain's SRS synchrotron at Daresbury Laboratory.

The laser's potential for low cost and size could allow every university to have one of its own, but some synchrotron experts doubt that it is a serious contender yet. Couprie points out that it does not match the pulse rate or the reliability of synchrotrons, and its limited operating time—currently 30 minutes at five pulses per second—could also form an obstacle. Still, the intensity of the laser's pulses may make it useful for studying how the optical properties of plasmas change at very high radiation intensities, says Couprie.

Rocca is well aware of the laser's shortcomings, and he and his team are already testing the laser with different gases in the plasma and hotter temperatures. Although his tiny laser is unlikely to topple the mighty synchrotrons, Rocca is sure it will find a niche. Agrees Cernik: "You need lasers and synchrotrons as well."

—ALEXANDER HELLEMANS

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NEUROBIOLOGY

Steadying Influence For Neurons Identified

Like people, neurons sometimes need to be steadied a bit so that they don't overreact to stimuli. That role is one of several that fall to potassium channels, tiny protein pores that allow potassium ions to flow out of neurons. So far, researchers have identified the proteins that make up most of the 20 or so known types of potassium channels. But one channel with a major influence on neuronal excitability, the M-channel, has remained mysterious—until now.

On page 1890, David McKinnon and Jane Dixon of the State University of New York, Stony Brook, and their colleagues report that they have identified the two proteins that together make up the M-channel. Their success is being heralded partly because it will help researchers understand how neural excitation is controlled. "This channel represents the most important regulator of excitability in many neurons," says University of California, Berkeley, neuroscientist Ehud Isacoff.

The M-channel may also be a key target for drug development. Even before the Stony Brook work, others had discovered that defects in the genes encoding the proteins cause a form of epilepsy. And M-channels are found in many brain areas including the hippocampus, where neural responsiveness can affect learning and memory. Knowing the identity of the channel's components will help researchers learn what turns it on and off and could lead to new drugs for epilepsy or Alzheimer's disease.

McKinnon and Dixon study sympathetic neurons, which control things like heart rate and blood pressure. Like all neurons, sympathetic neurons fire in response to signals arriving from other neurons, which open channels that let positively charged ions flow into the cell. But some sympathetic