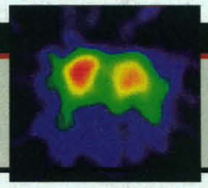


1797
Blocking cravings for nicotine

LEAD STORY 1800
The travails of education reform

1807
Signs of a martian ocean?

benefit analysis that she and other South African colleagues recently carried out indicated that her country's government would actually save money on health care costs to HIV-infected children by providing short-course AZT, which costs under $70 at the reduced price, to pregnant mothers.

Roberts says that he has not seen Gray's cost-benefit study. (Gray says, however, that she personally told Zuma about the study back in October and that preliminary details were presented at last June's international AIDS meeting in Geneva.) Roberts also cites the government's recent approval of a $14 million AIDS prevention campaign as evidence that "we are taking AIDS very seriously in this country." As for future plans to purchase AZT for pregnant mothers, "if Glaxo makes the drug affordable or gives it free, we will definitely use it." But some observers believe that South Africa's decision not to make AZT widely available to pregnant women reflects long-standing suspicions, dating back to the apartheid era, that pharmaceutical companies such as Glaxo Wellcome want to get a toehold in the South African market so they can later raise their prices. "There is a big issue in South Africa about affordable drugs for its population," says one source who asked not to be identified.

Piot told *Science* he agrees that the situation in South Africa is "complex" but adds that this is "no excuse" not to do something about the alarming rate of mother-to-child HIV transmission. "They clearly haven't done enough, that's for sure." **–MICHAEL BALTER**

Kick-Starting the AIDS Vaccine Effort

As the latest worldwide figures dramatically indicate, the AIDS epidemic shows no signs of slowing down (see main text). As a result, most AIDS experts have concluded that only a vaccine can turn the tide. But progress on this front has been painfully slow. Last week, the New York–based International AIDS Vaccine Initiative (IAVI) announced that it will invest $9.1 million in two new vaccine preparations, in hopes of breaking this deadlock. The vaccines could be ready for preliminary human testing by next year.

The move comes 6 months after the release last June of IAVI's "Blueprint for AIDS Vaccine Development," which argued that only a major acceleration of candidate vaccine testing could speed things up. "We are trying to widen the pipeline" of vaccine development, says Seth Berkley, president of IAVI, a private organization funded by an assortment of foundations as well as the World Bank and the British government.

Wider pipeline. IAVI President Seth Berkley.

IAVI chose to support two vaccine strategies that have shown promise in experiments with rodents and monkeys. The first, developed by immunologist Andrew McMichael's team at Oxford University, combines DNA that codes for proteins in HIV's core with a modified vaccinia virus engineered to also express these proteins. The second approach, developed by AlphaVax, a biotech company based in Durham, South Carolina, uses a modified version of the Venezuelan equine encephalitis virus as a vector to carry HIV genes into host cells.

Norman Letvin, an immunologist at Harvard Medical School in Boston and a member of IAVI's scientific advisory board, says that exploring new ways to expose the immune system to HIV proteins is a high priority in vaccine research: "We need to get as many new live vector technologies out there as possible." And Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases (NIAID) in Bethesda, Maryland—which coordinates U.S. government–supported vaccine research—says that "both of the IAVI vaccine initiatives hold promise." Should one or both of the approaches begin to show results in human trials, Fauci says, NIAID might eventually move in with additional support.

To ensure that any successful vaccine candidates will be affordable in the developing world, IAVI has negotiated intellectual property agreements with potential vaccine manufacturers that require them either to produce the vaccines at a "reasonable price" or give IAVI the right to recruit other companies that will. AIDS experts will be watching closely to see if IAVI's approach can indeed break through the logjam in AIDS vaccine development. Says Letvin: "The way to get these programs going is to just do it." **–M.B.**

CREDIT: (RIGHT) PETER P. MARRA/SMBC/NATIONAL ZOOLOGICAL PARK

ECOLOGY

Songbirds Stressed In Winter Grounds

Human inhabitants of North America may dream of relaxing winter escapes to the Caribbean, but for the American redstart, a diminutive migratory songbird, winters down south are a time of stress. The birds compete there for choice, insect-rich habitat—a contest in which young and female redstarts often lose out to older males. And as a study on page 1884 shows, a lean winter down south can have a lasting legacy, limiting the birds' reproductive success during the next breeding season up north.

Southern survivor. Female redstarts like this one spend winters in scrubby habitat.

The work, by avian ecologists Peter Marra and Richard Holmes of Dartmouth College in Hanover, New Hampshire, and Keith Hobson of the Canadian Wildlife Service in Saskatchewan, is the first to show that the quality of a migratory songbird's tropical wintering grounds can affect its survival and breeding success when it arrives in the north—an achievement avian ecologists call the Holy Grail of songbird biology. "Before now, no one has ever even come close to linking up quality of habitat in winter with reproductive success in the breeding grounds," says avian ecologist Scott Robinson of the Illinois Natural History Survey.

Based on an isotopic marker in the bird's blood that is keyed to winter habitat type, the work has also provided a crucial piece of information for conservation. Many Neotropical songbirds are in decline, but many biologists have concentrated their efforts on northern breeding grounds rather than southern wintering grounds. But for the redstart, at least, it seems that winter habitats can be limiting. "Conservation ef-

forts will need to focus on habitats used by these species throughout their annual cycle," says Marra.

Although researchers have long sought to link northern and southern populations of migratory birds, that goal has been as elusive as a tiny songbird in a forest canopy. Songbirds are too small to carry radio transmitters, and although thousands have been color-banded, only rarely has one been identified in both the north and south.

The isotopic method offers a clever solution. Marra and Holmes measured levels of the naturally occurring stable isotope carbon-13. They capitalized on the fact that plants in certain habitats, such as wet mangrove or wet lowland forests, have less C-13 than do plants typical of dry scrub, due to differences in water use efficiency and photosynthetic pathways. This isotopic signature is passed up the food chain to plant-eating insects and insect-eating birds and shows up in their blood.

Marra captured, weighed, and bled redstarts at the beginning and end of the winter season in Jamaica and Honduras. As expected, birds that had wintered in the mangroves and wet lowland forests had low levels of C-13, while birds that had wintered in dry scrub had high levels. Furthermore, the wet forest birds—which were 65% male—had maintained or gained weight, while the scrub-dwellers—which were 70% female—had lost up to 11% of their body mass and had elevated levels of the stress hormone corticosterone. Marra also witnessed the tactics older males use to retain control of choice habitat. In as yet unpublished work, he put decoys into the mangroves and watched the males dive-bomb them; that aggression apparently forces females and younger males into the scrub.

Winter hot spot. Redstarts find plenty of insects in black mangrove swamps like this one in Jamaica, but many mangroves are in decline.

CREDIT: (LEFT) PETER P. MARRA/SMBC/NATIONAL ZOOLOGICAL PARK

The team predicted that because of their better physical condition, birds wintering in wetter habitats would be able to get an early start on the long spring flight to northern breeding grounds, where they would then have the pick of real estate for courting and nesting. Indeed, previous studies have shown that early comers of both sexes have more young. Birds that wintered in the scrub were predicted to leave late, setting them up to be losers in the mating game, says Marra.

To test these predictions, he captured and bled arriving redstarts in the New Hampshire forest. Sure enough, he found that early arrivals—singing and ready to mate—carried the wet forest signature; they were mostly older males. Later arrivals carried the dry scrub signature and were typically scraggly younger males or females. Among the late arrivals, males were probably worse off than females, who could pair up as the second mate of an established male. It all points to the importance of winter habitat for redstart populations, suggesting that "when choice habitat is limited, individual fitness and ultimately populations can suffer," Holmes says.

That's important news for conservationists. Dramatic population fluctuations in migratory songbirds over the past 30 years have raised alarms. Although the American redstart is generally holding its own, populations in the Adirondacks and New Hampshire have been declining by about 3% per year. The take-home message, says behavioral ecologist Sidney Gauthreaux of Clemson University in South Carolina, is, "You may do everything on the breeding grounds to protect these Neotropical migrants, but we can still lose the species by having the winter habitat destroyed." For example, mangroves, which shelter large numbers of migratory birds, are in decline worldwide; the Caribbean lost about 10% of its mangroves in the 1980s and continues to lose about 1% a year, says biologist Elizabeth Farnsworth of Harvard University.

As prime habitat grows scarce, more and more birds will be forced into the scrub. "When good winter habitat is limited, even those birds that survive will be worse off and have less breeding success,"

ScienceScope

NEW FACES ON FUNDING PANEL

Washington wonks are weighing how a leadership shuffle on Congress's powerful House Appropriations Committee will influence R&D budgets.

The ascension of former Chair Bob Livingston (R–CA) to Speaker of the House prompted a spate of seat shifting on the committee, which approves all federal spending. Florida Republican Bill Young inherited the top spot, while James Walsh (R–NY) steps in as head of the subcommittee that sets spending for the National Science Foundation, EPA, and NASA.

Walsh

Although Livingston and Walsh haven't been outspoken supporters of research spending, both are well versed in science politics, congressional aides say. Predicts one: "There will be a significant change is style but not substance. These are pragmatic leaders the science community can work with."

WILDLIFE SCIENTISTS LEFT OUT IN THE COLD

The buckshot is flying over a proposal to strip some scientists of their vote in determining which of Canada's species are endangered.

Late last month, as part of a new national conservation policy, provincial wildlife ministers proposed elevating the 25-member Committee on the Status of Endangered Wildlife in Canada, which identifies species in need of legal protection, from an advisory to a stronger decision-making panel. As part of the makeover, they want to reduce the number of voting members, which would deprive six scientists of their balloting rights. They also want to replace three other researchers nominated by conservation groups with government appointees. Government officials say the changes are needed to streamline operations.

Conservationists charge that the move will reduce the panel's diversity and politicize deliberations. But there are signs that the ministers may reconsider their plans prior to producing a final draft in March. "It's not over till it's over," says Steve Curtis of Environment Canada.

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

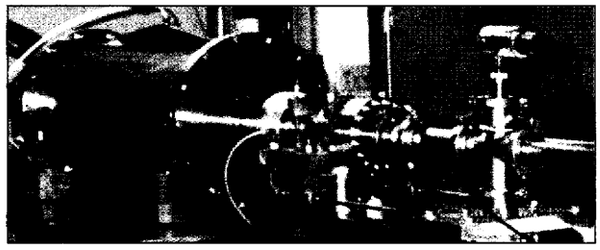
Bernice Wuethrich is an exhibit writer at the National Museum of Natural History in Washington, D.C.

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.

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

Alexander Hellemans is a writer in Naples, Italy.

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

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