tionary biologist Richard Shine of the University of Sydney in Australia. Larry Wolf, a behavioral ecologist at Syracuse University in New York, adds that researchers have long thought that carib bills might closely match their favorite flower's shape. "Now someone has actually gone out and shown it," Wolf says. "That's pretty neat."

Across the wild kingdom, of course, animals compete for food. And Charles Darwin long ago suggested that food competition could cause, or maintain, different male and female hummingbird bills. But the scientific evidence has remained scanty. Most evolutionary studies explain male-female differences by sexual selection. Male peacocks, for instance, grow flashier plumes than females in order to attract mates. By comparison, few studies have shown that the sexes might, when faced with a new environment, evolve differently in order to divvy up food. One unappreciated example may be mosquitoes: In some species, male mouthparts pucker perfectly to slurp nectar, whereas female mouthparts are specialized for sucking blood. Some water snakes, too, have varying head sizes for swallowing lunch.

The purple-throated carib makes a prettier case study, with its small, black body tucked inside iridescent emerald wings. "Sitting in the rainforest," says Temeles, "you see this gorgeous glittering green just shooting through the canopy." And he's had plenty of time to see it. Last summer, Temeles and three students hiked through four rainforest reserves on St. Lucia. To see whether male and female caribs dined differently, they spent 4 weeks watching the birds at distinct patches of *Heliconia* plants. A pattern soon emerged: 15 of 15 males fed on patches of *H. caribaea*, whereas 11 of 18 females chose *H. bihai* instead. The birds are the sole pollinators of these plants.

To learn how closely the carib bills and their favored flowers fit, the team measured both. The male birds sport short bills that curve down at a slight 15° angle. Their preferred flower, *H. caribaea*, averages just 38 mm long and curves out at about 21°. By contrast, the bills of female caribs are 30% longer than male bills and curve down twice as much, at a 30° angle. Accordingly, their favored flower, *H. bihai*, averages 44 mm long, with a 31° curve. What's more, Temeles says, both male and female caribs feed more quickly—and presumably efficiently—at the flower that best matches their bill. Bolstering the case, notes Temeles, in some rainforest areas, another plant has essentially replaced *H. caribaea*, again attracting male birds with its similarly shaped flowers.

How, exactly, did the hummingbirds evolve such pointed differences? Temeles speculates that thousands of years ago, when hummingbirds first arrived on St. Lucia, the larger, dominant males probably favored *H. caribaea*, a plant that bears more flowers. That left females with the less effusive *H. bihai*. Over time, Temeles says, the bills of both male and female caribs have adapted to fit their flower of choice, enabling the birds to make the most of their food source. "Food is really running the show," he suggests, although he cautions that biologists can never really know what, exactly, kick-started a chain of evolutionary events so long ago.

There's more to learn from these birds and blossoms, Temeles says. Does this hummingbird-*Heliconia* relationship hold up season after season? What about on other islands? And how have the flowers also evolved, welcoming caribs with just the right curves? Hunting for answers, he intends to return to the West Indies next summer.

–KATHRYN BROWN

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TOXICOLOGY

## Mercury Report Backs Strict Rules

The debate, finally, seemed to be settled. After an 18-month review, a panel of the National Academy of Sciences (NAS) last week weighed in on the health risks of mercury, endorsing strict safety levels adopted by the Environmental Protection Agency (EPA) in 1995. But already some scientists are contesting the panel's conclusions, and federal agencies are grappling with how to reconcile competing regulations.

Released largely from coal-burning power plants, mercury is converted by bacteria to a form called methylmercury that accumulates in the aquatic food chain. Humans are exposed when they eat fish. Although the neurotoxic effects of methylmercury are well

CREDIT: KEN HAMMOND/USDA

**Fishy findings?** Experts can't agree on the risk of eating fish containing mercury.

## ScienceScope

**Defining Distress** The U.S. Department of Agriculture (USDA) is asking for help in developing a better system to document the pain and distress experienced by lab animals. In a 10 July *Federal Register* notice, USDA's Animal and Plant Health Inspection Service (APHIS) notes that many critics consider the current system "outdated and inadequate." Among the flaws: no definition of "distress" and no scale to measure the intensity or duration of pain. APHIS is asking concerned outsiders to study pain classification systems used elsewhere and suggest how to modify existing rules. "Change is coming," a USDA official predicts. Comments, however painful or distressing, are due by 8 September.

**Boom Times** U.K. scientists can look forward to 3 years of prosperity. A government-wide spending plan announced on 18 July gives the Office of Science and Technology a budget boost averaging 7% per year for the years 2001–04. In addition to increases for grad student stipends and stemming lab decay (*Science*, 14 July, p. 226), the plan calls for spending more than $100 million to commercialize university research. The various research councils are now vying for their shares of the spending, which will be decided in the next few months.

**Environmental Royalty** A proposal to create a science czar at the U.S. Environmental Protection Agency (EPA) is winning support from Congress and even the agency itself. Last month, a National Academy of Sciences panel recommended creating the position to bolster EPA's use of science (*Science*, 16 June, p. 1943). Now, Congress and the Administration seem to be listening.

At a House subcommittee hearing last week, Representative Vernon Ehlers (R–MI) announced that he's drafting legislation to create the deputy-level science position and institute other recommendations, such as one to set a 6-year term for the head of EPA's Office of Research and Development. Says Ehlers: "Scientists need more clout." In the Senate, George Voinovich (R–OH) has told EPA chief Carol Browner that he foresees similar legislation. And EPA deputy administrator Michael McCabe wrote Congress that the agency likes the report, too. "Perhaps most significantly, we agree" with creating the deputy science position, he wrote. But don't look for anything to happen quickly because of a packed congressional calendar and the need to navigate any bill through several committees.

number of phalanges—four—and the overall shape of a ring finger. "That really told us it's the interdigital regions that lay down digit identity," says Dahn. It also suggested that interdigital signals are transmitted "downstream" toward the thumb: That's why the digit became a ring finger and not a pinkie.

The next step was to probe how the webbing gives these marching orders. For years scientists have known that interdigital cells churn out bone morphogenetic proteins (BMPs), a family of signaling molecules crucial to the proper development of many tissues in organisms from fruit flies to humans. BMPs are also known to influence structural identity: A team led by Paul Sharpe at Guy's Hospital in London recently demonstrated that altering BMP levels in the lower jawbone of mice results in molars sprouting where incisors should be. Following this lead, when Dahn and Fallon implanted tiny beads in chick feet that slowly released a BMP inhibitor into the webbing, downstream digits always developed fewer segments than expected. Conversely, a BMP-boosting protein increased the segment number downstream. "The stronger the BMP signal, the more phalanges," Dahn says.

He and Fallon suggest that the BMP signal from the chick interdigital regions rises stepwise in strength from thumb to pinkie, programming an increasing number of digit segments along the way. Although "there's no evidence yet for a gradient of BMP signaling," says developmental biologist Gail Martin of the University of California, San Francisco, she says the duo has proposed an extremely promising model that may well explain how digit identity is assigned.

–MICHAEL HAGMANN

ASTRONOMY

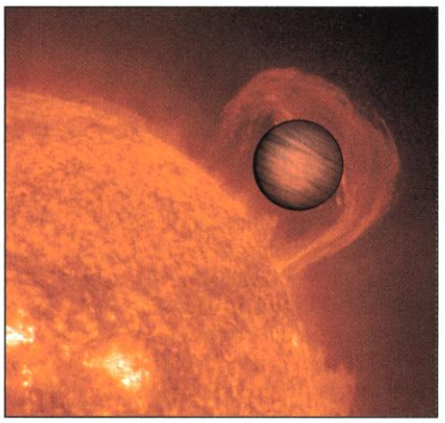
## Brown Dwarf's Flare Opens X-ray Eyes

When the Chandra X-ray Observatory pointed its snout at a failed star 16 light-years away, astronomers expected it to see little sign of activity. Instead, the orbiting telescope got smacked in the eye by an x-ray flare—and astrophysicists are still trying to explain why.

The source of the flare, a brown dwarf called LP 944-20, is a stellar underachiever. When it formed, about 500 million years ago, there wasn't enough hydrogen in the area to start nuclear fusion at its core. As it collapsed under its own gravity, it warmed up slightly, but since then it has been cooling and fading.

So when Gibor Basri, an astrophysicist at the University of California, Berkeley, and colleagues pointed Chandra at the dwarf, they expected little in the way of high-energy light. "We wanted to put a new upper limit on the x-ray flux from brown dwarfs," says Basri. "According to what happens at low temperatures to stellar activity, we expected to see nothing."

For the first 9 hours of Chandra's 13-hour run, they saw exactly that. Then the observatory's x-ray counter started ticking: The brown dwarf was flaring. "It was quite exciting," says Thomas Fleming, an astronomer at the University of Arizona's Lowell Observatory in Flagstaff. "It's a fly in the ointment."



**Sunstroke.** Though not active stars, brown dwarfs can emit bursts resembling solar flares.

The problem posed by LP 944-20's sudden outburst is that in general, x-ray flares go hand in hand with other powerful x-ray activity. Both arise because stars are huge dynamos that create magnetic fields. A rapidly spinning star stretches and twists the field lines. The greater the kneading, the fiercer the blast of x-rays from the star's corona, its halo of wispy, million-degree plasma. Sometimes the magnetic field lines get so tangled that they snap and reconnect, causing an explosion, or flare.

Our sun, which spins on its axis roughly once a month, is constantly belching flares and glowing with x-rays. Brown dwarfs, however, can spin much faster; LP 944-20, for example, rotates once every 5 hours. If brown dwarfs had sizable magnetic fields, astronomers concluded, then they would have hot coronas and powerful x-ray emissions, too. But nobody had seen much x-ray activity; therefore, brown dwarfs had to have weak magnetic fields.

The first 9 hours of the Chandra observations backed this theory up, as Chandra detected almost no x-ray activity from the dwarf. But the flare threw a wrench in the works. "The flare tells us that magnetic fields are still there," says Basri. So why no sign of a corona? "It's quite curious that there are only flares and no hot plasma at all," Fleming says. "We have to find a reason or an explanation."

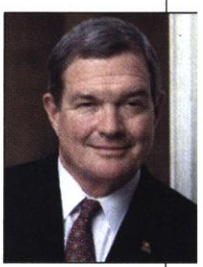
One possibility is that the outer atmosphere of the brown dwarf consists of electrically neutral atoms; deeper inside, the atmosphere contains many charged ions. The neutral atoms wouldn't knead the magnetic

CREDIT: (TOP) SOHO/NASA (SUN), CXC/K. KOWAL (BROWN DWARF)

## ScienceScope

**Czech Rebound** After enduring a decade of bleak postcommunist science budgets, Czech scientists are celebrating a bigger budget and a new program. The government this year gave science a 20% boost to $300 million, fulfilling an earlier promise to raise R&D's piece of the budget pie from 0.5% of GDP in 1999 to 0.6% in 2000 toward a goal of 0.7% by 2002. Besides fulfilling the country's contributions to the European Framework 5 research program, the extra money will endow a new 5-year program to strengthen research groups within top institutes. Starting this month, 33 competitively chosen centers studying everything from humanities to genetics will get grants for equipment, overhead, and salaries for postdocs and young scientists. Each center will receive, on average, $3 million for 5 years. And to bolster university-based science, each must recruit an academic partner. "We're trying to improve the quality of research," says Josef Syka, vice chair of the government's Research and Development Council.

**Double Trouble** Thirteen senators have so far thrown their weight behind an effort to double the National Science Foundation's (NSF's) budget to $8 billion by 2006. In a 12 July letter to Senate leaders Trent Lott (R–LA) and Tom Daschle (D–SD), the lawmakers touted investments in R&D and education as "the building blocks of the new economy" and noted that Congress has already put the budget of the National Institutes of Health on a doubling path. "It is now time to launch a parallel effort" for NSF, concluded Senators Kit Bond (R–MO, above) and Barbara Mikulski (D–MD), the letter's lead authors and senior members of the appropriations subcommittee that funds NSF.



Science lobbyists say the letter should revive a bid to double the NSF budget, currently bogged down in politics (*Science*, 7 July, p. 31). "It signals that the idea is being taken seriously," adds a Senate appropriations aide. But he notes that House lawmakers have already severely trimmed the Administration's $675 million requested increase for 2001, a major step toward doubling. The question now, he says, is whether the Senate "can muster the votes to turn things around."

**Contributors: David Malakoff, Richard Stone, Jocelyn Kaiser**