tance of projects approved for its major research equipment account. The growing number of big projects approved by the National Science Board but not yet funded has become an irritant for Congress, which has warned NSF that it will be hard to fend off efforts to fund specific projects that are stuck in the queue unless NSF signals which are most important (*Science*, 12 July, p. 183). Colwell has told legislators that such rankings would limit her ability to adjust priorities according to the timeliness of the science, the size of her budget, and the current lineup of projects being supported.

The most objectionable portion of the Senate bill, according to Colwell's letter to Wyden, is a provision giving the science board authority to hire its own professional staff. Senate appropriators have proposed similar steps to strengthen the board's independence, and legislators in both bodies see it as an innocuous way to improve government oversight at a time when corporate boards are also being encouraged to be more accountable. But Colwell says the language "would fundamentally change" the relation between the board and the foundation, as well as create a needless bureaucracy to deal with personnel issues now handled by NSF.

Board chair Warren Washington says he can see both sides of the issue. "I don't think it's a huge impediment to our doing our business," he says. "But some members don't see a need to fix something that isn't broken."

–JEFFREY MERVIS

ASTROPHYSICS

Rings of Light Could Reveal Black Holes

The fertile mind of astrophysicist John Archibald Wheeler has conjured another nifty notion: a direct way to detect a black hole that might wander near our solar system. Sunlight would dance rings around the hole and return to Earth, briefly creating a flare in otherwise empty space. Searching for such an exceedingly rare vision might not be practical for decades, but the elegant analysis has delighted other physicists. "It's an ingenious and charming idea," says Wheeler's Princeton University colleague, astrophysicist Bohdan Paczyński.

Albert Einstein's general theory of relativity predicts that a black hole's intense gravity bends passing rays of light. Near the event horizon—the threshold beyond which nothing can escape the hole's gravitational well—this deflection becomes extreme. Some photons orbit at least once before darting back into space on new paths. Black holes thus spray incoming light in all directions, like water drops from a whirling sprinkler.

Wheeler and his former undergraduate student, astrophysicist Daniel Holz, realized that light from our sun redirected in this way could expose a black hole. If Earth sat between the sun and the hole, some sunlight would reflect back as concentric rings. Photons returning after one-half orbit (π radians, or 180 angular degrees) would create a sharp outer ring. Fewer photons would stream back after a tighter encounter of 1.5 orbits (3π radians) around the hole, forming a fainter and smaller ring, and so on. Wheeler dubbed the shadowy mirror a "retro-MACHO," after the "massive compact halo objects" in our galaxy that deflect light from more-distant stars. (Nor could he resist adding "Pi in the sky?" to the paper's title.)

Holz worked on the details for the last few years with Wheeler, who pioneered the study of black holes in the 1960s and is still active in retirement at age 91. Their results, to appear in the 20 October issue of *Astrophysical Journal*, suggest that a black hole 50 times farther away than Pluto's orbit with 10 times the mass of our sun would flare for about a day as Earth orbited between the hole and the sun. The rings would be too tiny to resolve, but giant telescopes just might catch the faint solar reflection. "It's a clean calculation," says Holz, now a postdoctoral researcher at the University of California, Santa Barbara. "If there are black holes out there, this effect would happen."

Scanning the sky for the flare is another matter. Paczyński notes that it's not feasible—at least not yet. Current telescopes could barely perceive light reflected from a hole at the outskirts of our solar system, even if they knew where to look. Further, astronomers suspect that isolated black holes typically are dozens of light-years apart, making it unlikely that one would drift nearby. "There's maybe a 50–50 chance it has happened in the history of our galaxy," says astronomer David Bennett of the University of Notre Dame in Indiana.

Holz and Wheeler acknowledge the caveats. "It's incredibly speculative, but we don't know what our telescope sensitivities will be in 50 years," Holz says. In the far future, arrays of telescopes could detect a more distant flare. Our descendants might even probe for rogue black holes with lasers that search for their own reflections—a Wheeler-esque vision indeed.

–ROBERT IRION

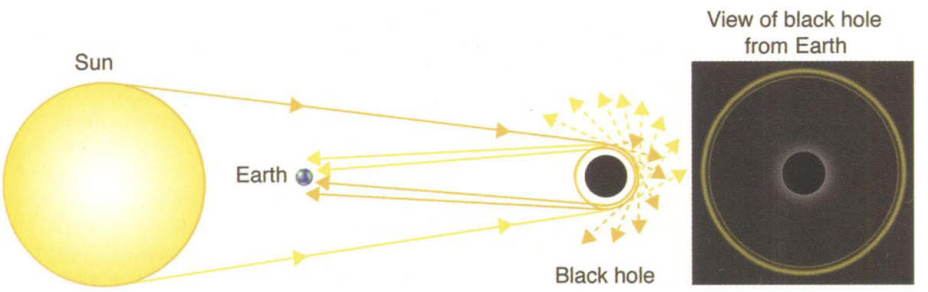


ILLUSTRATION: C. SLAYDEN

Wheels of light. Sunlight reflected from a nearby black hole would return to Earth as sharp, concentric rings, caused by light rays that orbit the hole either 0.5 or 1.5 times.

AIDS RESEARCH

Mystery Anti-HIV Factor Unmasked?

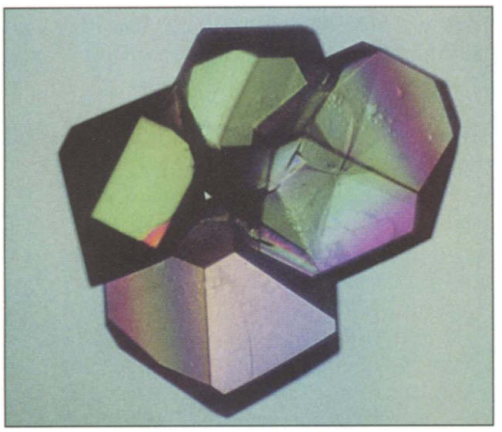
Sixteen years ago, in the relatively early days of the AIDS epidemic, virologist Jay Levy of the University of California (UC), San Francisco, proposed an answer to one puzzle about the AIDS virus and created another. He had tantalizing evidence that immune system cells secrete a chemical that can stop HIV, and he suggested that HIV-infected people who have high levels of this factor could live for decades without damage to their immune systems. This would explain in part why HIV kills at such disparate rates. But just what is the mystery factor? Legions of AIDS researchers have searched for this treasure, unearthing half a dozen different candidates, none of which has been completely convincing. Now a team led by Linqi Zhang and David Ho of the Aaron Diamond AIDS Research Center in New York City claims to have the elusive factor in hand. But other researchers who have been digging for answers and have seen the new data say they're not throwing away their shovels.

In a report published online by *Science* this week,* Zhang, Ho, and co-workers finger three tiny molecules known as α-defensins. The researchers discovered that white blood cells with CD8 receptors secrete these molecules, but infection by HIV appears to shut down production. However, the CD8 cells of people who remained unharmed by the virus a decade or more after being infected continued to produce them. "It largely solves a mystery that's been out there for 16 years," says Ho. Robert Siliciano, an AIDS virologist at Johns Hopkins University in Baltimore, Maryland, says the work is "cer-

* www.sciencemag.org/cgi/content/abstract/1076185

tainly a big advance." Robert Lehrer, who first described human defensins in 1985, agrees. "The data are very convincing," says Lehrer, a researcher at UC Los Angeles.

But several leading AIDS researchers aren't convinced. Levy himself applauds "the great effort" to find the defensins in CD8s, but he says that it's not the factor he postulated. Levy says his lab has tested defensins and found that they did not meet his criteria for the factor, which he called CAF (for CD8 antiviral factor). Robert Gallo,



On the defensive. A claim that α-defensins (shown above in crystal form) are the long-sought factor is drawing fire.

head of the Institute of Human Virology in Baltimore, says that although he finds the work "technically sound," the paper relies on too few patients, offers no mechanism for how defensins stop HIV, and dismisses other factors that he believes are likely to be more important. Bruce Walker, whose lab at Harvard Medical School in Boston also recently described a candidate CAF, says the new data show that the defensins have "a very modest effect" against HIV.

In the study, the Aaron Diamond researchers teamed up with scientists from Ciphergen Biosystems Inc. in Fremont, California, to compare secretions of CD8 cells from three HIV-infected "long-term nonprogressors," four HIV-infected "progressors," and 15 uninfected people. Ciphergen makes tiny arrays of proteins that, with the help of mass spectrometry, allowed them to analyze the components in each sample. Company scientists found that only the long-term nonprogressors and uninfected people produced three small, related proteins that a database search revealed as defensins.

As first reported by Lehrer, human defensins are secreted primarily by neutrophils and break down bacterial walls, acting like natural antibiotics. A group in Japan 9 years ago showed that defensins from guinea pigs, rabbits, and rats could inhibit HIV, but the work received little notice. Some AIDS researchers also have incorporated defensins into their vaccines because the molecules can act like an adjuvant, boosting the immune response to the HIV components of the preparation.

When Ho and his colleagues depleted the defensins in the cell secretions from the long-term nonprogressors, they found that the secretions had markedly less anti-HIV activity. And when they depleted both defensins and immune messengers known as β-chemokines—which Gallo's lab in 1995 showed powerfully prevent HIV entry into cells—the secretions had almost no antiviral activity. In what's sure to be the paper's most controversial assertion, the researchers state that the α-defensins "collectively account for the anti–HIV-1 activity of CAF that is not attributable to β-chemokines." As for the mechanism, Ho and Zhang say the shortage of clean defensin material makes it difficult to conduct experiments that might tease out how it combats HIV. But they have now begun those experiments.

Gallo takes exception to the entire concept that a single mysterious, undiscovered CAF exists. "This is ludicrous," he says. He argues that CD8 cells secrete many substances that inhibit HIV, including one his lab has yet to describe that he says appears to be much more powerful than defensins. "We don't use the word 'CAF,' " says Gallo. "Throw it out."

Zhang agrees that CD8s might well secrete other, undiscovered molecules that inhibit HIV. "CAF is a black box," he says. "Different molecules could play different roles in different circumstances. We have no idea in vivo." Still, the α-defensins' apparent anti-HIV powers are likely to provide a new focus for research and, if they pan out, open new avenues for treatment. **–JON COHEN**

CREDIT: R. I. LEHRER, T. GANZ, M. E. SELSTED, *ASM NEWS* 56, 315–318 (1990)

CHEMISTRY

Catalyst Boosts Hopes For Hydrogen Bonanza

Solar cells are the best known way to turn sunlight directly into usable power. But green-energy aficionados have long dreamed of using the sun's rays to make a chemical fuel as well, by splitting water molecules to release hydrogen gas, which produces only water when it burns. For decades researchers have tinkered with light-triggered catalysts that encourage this water splitting. But although a handful of efficient catalysts have been found, none are both cheap and stable enough to be practical. Now researchers at Duquesne University in Pittsburgh, Pennsylvania, have come up with a novel catalyst that might bring the long-sought goal within reach.

On page 2243, chemist Shahed Khan and his graduate students Mofareh Al-Shahry and William Ingler Jr. report that

ScienceScope

Overseas Students Scrutinized U.S. graduate schools that train foreign bioscientists are looking for better ways to prevent cheats from slipping onto campus. The problem broke into the open earlier this month when University of California, Los Angeles (UCLA), dean David Meyer announced that his school will be heightening scrutiny of foreign applicants to its bioscience graduate programs. The change came after UCLA officials learned that a Chinese applicant had added phony courses to his transcript. To prevent future fraud, UCLA has begun verifying transcripts of foreign students—about half of them Chinese—accepted by its bioscience admissions program. Chinese students pose a special problem, Meyer says, because their universities don't directly supply transcripts. Meyer will also be briefing members of the Association of American Medical Colleges, with an eye toward holding a meeting next April in Montreal on screening out fraudulant applicants.

Curbing Conflicts U.S. medical colleges are attempting to set their first standards for limiting conflicts between their corporate financial interests and their duties as overseers of clinical research. A task force of the Association of American Medical Colleges (AAMC) this week issued a report that calls on members to manage "institutional conflicts of interest" more aggressively.

The task force, headed by former Washington University chancellor William Danforth, does not offer specific rules. But it recommends that institutions separate the management of finances and research and create special committees to examine every financial relationship that might "reasonably appear to affect human subjects research." For example, the panel says a university should conduct a "fact-driven inquiry" whenever it acquires more than a $100,000 equity interest in a publicly traded company that also sponsors human subjects research at the school.

Reaching agreement on the guidelines was a "very significant accomplishment," says AAMC's David Korn, a former dean of medicine at Stanford University. He says the panel wants to "set a very high standard of oversight and management" that will convince Congress and federal regulators that the government doesn't need to intervene. Korn expects AAMC to undertake a follow-up study in 18 to 24 months to learn how its members responded.

Contributors: Dennis Normile, Daniel Clery, Constance Holden, Eliot Marshall