massive star, it causes a small but noticeable wobble in the star's motion. Due to the Doppler effect, this wobble appears as a subtle variation in the star's color as it gets redshifted, blueshifted, and redshifted again.

To detect those changes, the planet hunters use a sensitive spectrometer. Before the light enters the instrument, it passes through a cell full of iodine vapor, which absorbs some of it, superimposing dark lines upon the spectrum at well-known wavelengths. From the way the spectrum shifts relative to that standardized grid, the scientists can get a precise measurement of the motion of the star. By charting stellar motions in a database of over 1000 stars, Marcy and Butler have found a score of planets, each about the size of Jupiter or larger. Naturally, the smaller the planet or the more distant its orbit, the weaker its tug on its mother star—and the subtler the corresponding wobble. Because of this, Marcy and Butler had not been able to detect planets smaller than about half of Jupiter's mass—until now.

To detect fainter wobbles, Marcy says, the astronomers beefed up a computer program that corrects the "idiosyncrasies" of their equipment at the Keck Telescope on Mauna Kea, Hawaii. "Up until 1 year ago, the precision we could measure in stars was plus or minus 8 meters a second," he says, noting that the equipment can now pick out wobbles with a precision of 3 meters a second.

Within months, the newly honed equipment had spotted two planets smaller than Saturn, each roughly a third of Jupiter's mass. The first orbits the star HD43675, located 109 light-years from Earth in the constellation Monoceros, with a period of 3 days; the second orbits the star 79 Ceti, 117 light-years away in the constellation Cetus, with a period of 74 days. By detecting such small planets—particularly the one around 79 Ceti, with its larger orbit—Marcy and Butler have shown that they would be able to spot a twin of our solar system, with a Jupiter-mass planet fairly distant from its star: 79 Ceti's planet sets it wobbling at 11 meters per second, just a shade less than the 12-meters-per-second wobble Jupiter causes in the sun.

Although it's risky to extrapolate from such a small sample, the newcomers hint that big, gassy planets come in an unbroken range of sizes, says Carnegie Institution astrophysicist Alan Boss. "It suggests that there is a continuous distribution of masses" from relatively rare super-Jupiters to fairly common sub-Saturns and below, Boss says. "What we're seeing is really just the tip of the iceberg."

The planets' masses aren't known precisely. The Doppler effect reveals only motion toward us or away from us; side-to-side motion does not affect the color of starlight. Thus, if the orbit of a planet is sharply tilted with respect to our view of the star, astronomers on Earth would detect only part of the star's wobble and would underestimate the planet's mass. For that reason, the two new planets' masses may be larger than announced. But Butler thinks it's unlikely that scientists would greatly underestimate the masses of both planets, as well as others that the astronomers have hinted at but haven't yet unveiled.

Marcy and Butler think that they can refine their technique by another factor of 3, according to Hammel. If so, she says, they should soon be turning up planets about the mass of Uranus, a mere twentieth of Jupiter's. To get much beyond that, however, they will need space-borne instruments such as the ones slated for NASA's Space Interferometry Mission in 2006. "We'll be out of business in 10 years" when it starts working, Marcy says. But until then, says NASA scientist Anne Kinney, there are plenty of planets out there waiting to be discovered. "This is brand-new," she says. "We're going to learn what kind of animals are in that zoo."

–CHARLES SEIFE

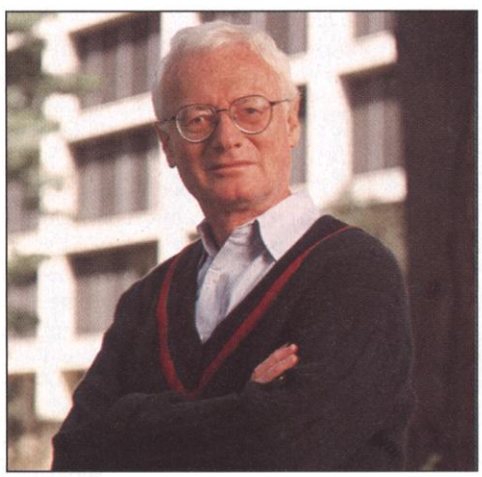
CREDITS: (TOP TO BOTTOM) ILLUSTRATION BY PAT RAWLINGS/NASA; SAM KITTNER

BIOMEDICAL RESEARCH

AIDS Research Head to Retire From NIH

The widely respected, hyperkinetic overseer of the $2 billion AIDS research program at the National Institutes of Health in Bethesda, Maryland, announced last week that he will retire from NIH on 1 September. "That's my 73rd birthday, and the family said, 'You've paid your dues and it's time to come home,' " says Neal Nathanson, director of the Office of AIDS Research (OAR).

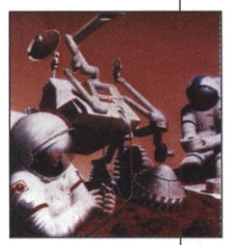
Nathanson, a renowned viral epidemiologist, was coaxed from his longtime lab at the



Going home. Neal Nathanson says his family told him he had paid his dues.

ScienceScope

Weightless Watchers NASA has long studied the effects of weightlessness on the human body, knowing that sending people to Mars would expose the crew to the deleterious effects of microgravity for months and even years. But a new report from the National Research Council urges NASA not to forget the hardware. The panel, chaired by engineer Ray Viskanta of Purdue University in West Lafayette, Indiana, calls for an extensive new research program aimed at understanding how gravity's absence affects fluids, flames, and flow controls—and thus fire-prevention, power-production, and sanitation systems critical for a safe flight.



NASA microgravity chief Eugene Trinh praised the soon-to-be-released study: "We've looked at this piecemeal, but this puts it all together." But the panel also complains that "territoriality" at NASA centers is getting in the way of existing research, which it describes as "poorly communicated" and sometimes duplicative. And it concludes that such problems pose a major stumbling block to implementing the report's recommendations. But Trinh believes the agency is "doing a very good job," although he says it will take the criticism seriously.

Money Talks Scrambling to keep up with the debate over genetically modified crops, several big ag biotech companies this week unveiled a public relations campaign "based on objective scientific research." A new Council for Biotechnology Information may spend as much as $50 million a year on ads, speakers, and a Web site to counter what a spokesperson calls "inaccuracies" in the media and to "create a public dialogue." The sponsors are Aventis CropScience, BASF, Dow Chemical, DuPont, Monsanto, Novartis, and Zeneca Ag Products Inc.

The council is still looking for a director, says Dan Eramian of the Biotechnology Industry Organization of Washington, D.C., which will serve as its home. But organizers have already recruited several heavy hitters to the group's advisory board, including former Health and Human Services chief Louis Sullivan and Nobel Prize biologist James Watson.

Biotech critic Jeremy Rifkin, president of the Foundation on Economic Trends in Washington, D.C., thinks the council's efforts will "backfire." More publicity, he says, will only help his cause.

department of biomathematics at UCLA, and Freimer will direct a new center for neurobehavioral genetics.

UCSF officials dispute Blower's allegations. In a statement on 23 March, Bishop said that a 1-month inquiry by a UCSF associate dean into Blower's allegations found "no evidence of institutional sexism, gender discrimination, sexual harassment or professional misconduct directed against Dr. Blower." But at least one administrator agrees that the status of women in medical schools in general needs improvement. "The quality of academic environment for women … is not ideal in academic medical centers anywhere in this country," says Diane Wara, associate dean for minority and women's affairs at UCSF.

Leaving. UCSF's Sally Blower seeks balmier academic climate at UCLA.

Blower, 42, completed a postdoc 10 years ago with Robert May at Oxford University, then worked at the UC Berkeley School of Public Health before taking a position as adjunct professor at UCSF in 1995. Over the past decade she has published a steady stream of articles in high-profile journals, including *Nature Medicine* and *Science*, modeling the transmission dynamics of infectious diseases. As a theoretician, Blower's space needs upon arriving at UCSF were modest: an office for herself and one for her postdocs. She had her own grant to pay salaries and research expenses, and she says she was not "looking for red-carpet treatment," but just wanted to be left "alone with a few postdocs [to] do some excellent research."

Instead, in an e-mail circulated in February to colleagues, she complains of mistreatment by a group of faculty members, whom she calls "the Senior Boys." The experience, she writes, left her feeling "powerless and voiceless" against "a vicious brutal sexist system, run by a bunch of bullies."

In a written response to questions from *Science*, the university said that Blower "was not repeatedly evicted from space. On the contrary, extraordinary efforts were made to accommodate her requests," including the offer of premium space at the Parnassus Heights campus and salary support when she was between grants. "Sally was not picked on uniquely," says Wara. "Space is precious here, and all of us have to be flexible."

Blower is neither suing UCSF nor filing a grievance. Her intention, she says, is to "shine the light … on the status and treatment of women at UCSF." She says many female UCSF faculty members support her but have remained silent "based on a fear of retaliation." But others vigorously deny that UCSF is a notably sexist place. "In the basic science departments at UCSF, I firmly believe there is about as little sex discrimination as anywhere in the world," says geneticist Cornelia Bargmann. "One of the reasons I came to UCSF was because I knew that was true. It was clear you could do well here."

Some attribute Blower's dissatisfaction to the fact that she has been a highly accomplished scientist serving in an adjunct position. And Bargmann notes that although her female tenure-track colleagues are thriving in the basic science departments at UCSF, the situation is very different for adjunct professors at most U.S. medical schools. "You look around and you see they are not treated well," she says about this group, often women, whose soft-money, non–tenure track positions give them little clout. "People feel that they are doing them a favor by giving them a position at all."

Wara acknowledges that assisting women in a historically male-dominated system and protecting the rights of adjunct faculty are more difficult than achieving such numerical goals as increasing the ranks of women faculty and providing pay equity. "We have tried for over a decade to put in place strategies to at least diminish the power differential" that female faculty members experience, she says, but "we still have a long way to go."

The university began an inquiry into the status of women before Blower made her charges. It is designed, according to a statement, to "research the issues and get beyond the numbers." A good place to start, say some researchers, may be the concerns of women in adjunct faculty positions.

–MARCIA BARINAGA

CREDITS: (LEFT TO RIGHT) S. BLOWER; RICK KOZAK

BIOMEDICINE

Hazel Trees Offer New Source of Cancer Drug

SAN FRANCISCO—Taxol is a potent and popular cancer drug, but it is harvested from the needles of an endangered tree, and demand for the drug could outpace the trees' productivity. Last week, researchers here at the American Chemical Society's semiannual meeting announced that they have isolated the compound from hazelnut trees and fungi, a finding that could lead to an abundant new source of the drug and possibly lower its cost.

Generically known as paclitaxel, Taxol is

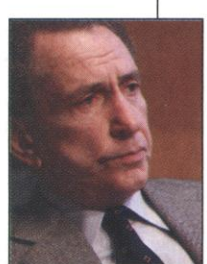
ScienceScope

Costly Benefit? An ounce of prevention may still be worth a pound of cure, but a new vaccine may cost Americans more than it saves them, according to a study published 15 March in *The Journal of the American Medical Association.*

The recently approved vaccine Prevnar wards off seven strains of bacteria that cause ear infections, pneumonia, blood infections, and meningitis. Vaccinating infants could save more than $750 million in medical expenses, missed work, and other costs, according to researchers at the Harvard Medical School in Boston. But the vaccine's cost will outweigh savings if it exceeds $46 per shot, the researchers say. The vaccine's manufacturer, American Home Products of Madison, New Jersey, intends to charge $58 per dose.

Prevnar may still be a good deal in spite of the bottom line, says pediatrician Tracy Lieu, lead author of the study. "It would prevent a lot of suffering," Lieu says, "and it's not easy to put a number on that benefit."

Ready to Rumble Senator Arlen Specter (R–PA, below), head of the Senate Appropriations subcommittee that oversees the National Institutes of Health's (NIH's) budget, says he is ready for a "knock-down, drag-out battle" over legislation to endorse taxpayer funding of research on stem cells derived from human embryos. But at a hearing last week, NIH officials—who agree with Specter's position—fumbled a bit when their champion asked for some ready-for-prime-time sound bites he could use to press his case.



Last year, Specter and Senator Tom Harkin (D–IA) inserted language into NIH's spending bill that would have clarified government support for the controversial research, but they agreed to withdraw it after antiabortion lawmakers threatened to stall the bill. In return, Specter got a promise from Republican leaders that he would get substantial time on the Senate floor this year to debate the issue.

With that clash possibly just weeks away, Specter asked NIH officials to remind listeners "why stem cells from embryos are so valuable." But after Gerald Fishbach, director of the National Institute of Neurological Disorders and Stroke, produced two responses that were too unwieldy for political wordplay, a visibly agitated Specter took another tack. Could NIH leaders, he asked, take pen in hand, "sharpen up the answer, and provide it to me in writing?"

might carry fewer side effects, Voorhees says. "There's nothing else like it" for getting compounds into cells, he states. In fact, the new transporter group has proven so successful that the Stanford team has created a company called CellGate to commercialize the technology.

The new peptide is far from the first molecule researchers have tried to use as a chemical pass card. Researchers have long known that positively charged, or cationic, peptides and synthetic polymers make decent access keys. But progress toward a universal key has been mixed. Recently, help has come from a surprising source: the AIDS virus. In the early 1980s, researchers discovered that a protein fragment called Tat helps HIV viral proteins enter cells and initiate synthesis of RNA. And researchers at the Massachusetts Institute of Technology and elsewhere went on to show that linking HIV Tat to drugs can boost their uptake as well.

Unfortunately, HIV Tat is so complex and hard to synthesize that it is too expensive for widespread use, Wender notes. So he and his colleagues set out to find a cheaper, more effective alternative. They started by looking carefully at HIV Tat. Like other cell entry tags, HIV Tat is made up of cationic subunits—in this case six arginine amino acids, two lysines, and a glutamine. That structure initially seemed to confirm the conventional wisdom that a tag's positive charge is what gets it inside cells, says Jonathan Rothbard, head of research at CellGate. But when the researchers looked further, that turned out not to be the case. By testing a variety of cationic peptide chains, the Stanford-CellGate team found that peptides composed entirely of arginines were orders of magnitude more effective at infiltrating cells than counterparts made from leucines or glutamines. "So it's not just a cation story," Wender says.

To find out why, Wender's team synthesized short amino acid chains made from ornithine, an amino acid that differs from arginine in just one respect: It harbors a nitrogen in place of an oxygen, a change that does away with arginine's ability to form weak hydrogen bonds with its neighbors. To their surprise, the researchers found that the ornithine chains were virtually useless at shuffling drug cargo into cells, suggesting that arginine's ability to form hydrogen bonds is the key. And as it turns out, that hydrogen-bonding capability is a talent leucines and glutamines don't share.

Just what the peptides bond to and how polyarginine wends its way into cells are still mysteries. But whatever the mechanism turns out to be, it is clearly effective. At the ACS meeting, Wender reported that his team has used polyarginine tags to spirit drugs such as cyclosporin and Taxol into cells, and they are working to extend the method to other compounds. Apparently the new tags and their cargo don't just diffuse across cell membranes, Wender says; rather, it looks as if cells actively pump them inside.

In one sense, in fact, the peptide may be too effective. "It works with every cell type we've looked at," Rothbard says. That could make it difficult to target drugs only to particular cells such as cancerous ones. For that reason, Wender says that he and his colleagues are initially focusing on linking their tag to drugs that can be applied locally, such as topical creams to treat skin diseases. Still, even if that's as far as they get—and that seems doubtful—a new access key for getting drugs into skin cells could make a profound difference for patients suffering from psoriasis and other chronic skin conditions.

–ROBERT F. SERVICE

TV CRITIQUE

Dinosaur Docudrama Blends Fact, Fantasy

Amid the majestic sequoias of what could be a state park in Northern California, the silence is broken by an unearthly, guttural bellow. An enormous beast plods across the television screen. She kicks out a shallow nest and begins to lay her eggs. Each white egg, the size of a soccer ball, slides gently down an ovipositor and comes to rest in the ground. Then, as a velvet-voiced narrator intones about the dangers that await the young hatchlings-to-be, the giant scrapes soil over the clutch and abandons her brood to their fate.

On the move. A herd of 4.5-ton iguanodons kicks up surf in the Cretaceous.

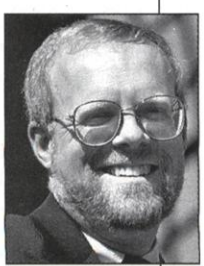
It looks and sounds just like a wildlife documentary—so much so that, if you watch long enough, you almost forget that the animals it shows have been extinct for more than 65 million years. But this is *Walking With Dinosaurs*, a sometimes stunning dino-extravaganza that uses computer animation and detailed puppets to resurrect the creatures

CREDITS: (TOP TO BOTTOM) STANFORD UNIVERSITY; BBC/DISCOVERY CHANNEL

ScienceScope

New Blood Following its history of finding new leadership within, Stanford University this week tapped Provost John L. Hennessy (below) to take over as president beginning 1 September. Hennessy, who succeeds Gerhard Casper, is expected to place the university in a strong position to reel in donations from supporters who have struck it rich in neighboring Silicon Valley.

Hennessy, a professor of electrical engineering and computer science, is also a Silicon Valley entrepreneur; he founded MIPS Technologies, which specializes in microprocessors. He was also instrumental last year in securing a $150 million donation from Netscape founder Jim Clark, who worked down the hall from Hennessy when both were Stanford professors. As president, Hennessy's early priorities are expected to include expanding interdisciplinary research and ensuring affordable housing for faculty and students.



Initial reaction to the pick was glowing. "I'm thrilled," says Richard Zare, a Stanford chemistry professor and former chair of the National Science Board. Hennessy's experience in academia and high-tech, Zare says, made him "the obvious natural choice."

Too Cautious? In what many view as a victory for science, a U.S. court last week slammed the Environmental Protection Agency (EPA) for proposing tighter guidelines for safe drinking water than its scientists thought necessary.

The case is the first test of draft risk guidelines that use molecular data to assess whether low doses of a substance can cause cancer. After reviewing studies suggesting that tiny doses of chloroform—a carcinogenic byproduct of chlorinating water—are harmless, EPA scientists in 1998 proposed increasing the goal for maximum tap-water levels from 0 to 300 parts per billion. But under pressure from environmentalists, the agency nixed the change. The Chlorine Chemistry Council sued, claiming EPA had violated a law that requires it to base decisions on the best science.

On 31 March, a federal judge agreed, finding that EPA "openly overrode" the scientific evidence. Toxicologist Jay Goodman of Michigan State University in East Lansing says the ruling should be "a wake-up call to EPA," which now plans to reevaluate its stance.

Contributors: Andrew Lawler, Eliot Marshall, Adrian Cho, David Malakoff, Robert F. Service, Jocelyn Kaiser