a dim dwarf star known as Gliese 876, just 15 light-years from Earth in the constellation Aquarius. Two planets are waltzing around the star in lockstep, the inner one completing two orbits as the outer one circles the star once. Computer simulations by Hal Levison of the Southwest Research Institute in Boulder, Colorado, indicate that planetary resonances are fairly common. "We encounter them in 25% of all cases," Levison says. In our own solar system, in fact, Pluto and Neptune share a 3:2 resonance, while three of the four large satellites of Jupiter display a 4:2:1 resonance. What makes Gliese 876 different is that it is poised on the brink of instability. Calculations by Jack Lissauer of NASA's Ames Research Center in Moffett Field, California, show that a slight change in masses or orbits would cause the planets to fly into their star or out into space. The near-instability suggests that the system may have had a turbulent history, although the details are still unclear.

"It's a very exciting discovery, with profound theoretical implications," says theorist Douglas Lin of UC Santa Cruz. Lin suspects that the system once contained more planets in larger orbits. Gravitational interactions with the gaseous disk from which they formed then caused the planets to slowly spiral inward. Some of the planets may have been flung into outer space; the remaining two became locked into the mutual resonance.

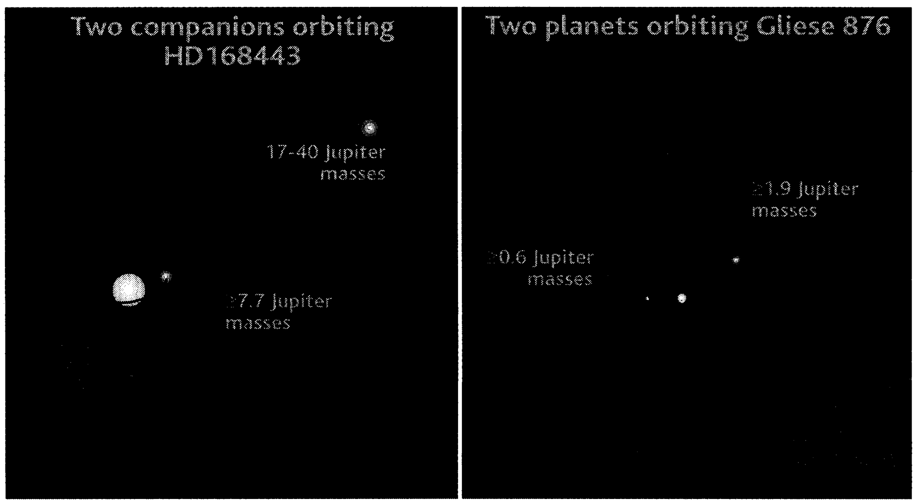
While theorists may scratch their heads over resonance, it's the second discovery that really has them flabbergasted. It's a humongous gaseous planet, at least 17 times more massive than Jupiter. "We've never seen anything like this before," says team member Paul Butler of the Carnegie Institution of Washington. "This is a whopper."

The Goliath planet orbits a sunlike star known as HD 168443, 123 light-years from Earth in the constellation Serpens. In 1998, Marcy's team found another planet, weighing at least 7.7 Jupiter masses and circling the star every 58 days at an average distance of just 45 million kilometers. The new giant orbits the star every 4.8 years at an average distance of 410 million kilometers, almost three times the distance between Earth and the sun.

The "whopper planet" is clearly too massive to be a normal planet, Marcy says. Most astronomers agree that planets form in a swirling disk of gas and dust surrounding a nascent star. In Levison's computer simulations, however, planets forming in such disks never grow more massive than 8 to 10 Jupiters before sweeping their surroundings clean. Larger objects can form outside disks, but above 13 Jupiter masses or so, the core of a gas ball becomes so hot and dense that deuterium (heavy hydrogen) starts to burn, turning the object into a failed star, or brown dwarf.

But that label doesn't quite fit, either, says Butler: "Calling this object a brown dwarf means you're sweeping all of the mysteries under the rug." Brown dwarfs, he points out, are thought to form directly from collapsing clouds of interstellar gas. That couldn't happen so close to the parent star. Moreover, HD 168443's other companion, a planet, presumably formed in an accretion disk. No one understands how both processes could occur together.

A few astrophysicists suspect the new finds may be less mysterious than they appear. David Black of the Lunar and Planetary Institute in Houston, Texas, an outspoken exoplanet skeptic, points out that the technique Marcy's team uses to find exoplanets—deducing their gravitational pull on the star from Doppler shifts in the star's light—likely underestimates the planets' masses. The more an object's orbit is tilted with respect to



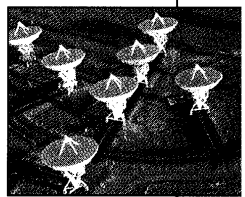
Weird worlds. The latest two-planet systems are the hardest for astrophysicists to explain.

CREDIT: (LEFT TO RIGHT) GEOFFREY W. MARCY/UC BERKELEY; DAVE FINLEY/NATIONAL RADIO ASTRONOMY OBSERVATORY/ASSOCIATED UNIVERSITIES INC.

ScienceScope

Astronomical Pressure They have yet to hire an enforcer. But Canadian astronomers last week began some serious arm-twisting in their bid to get the federal government to spend the $100 million needed to fund a long-term plan that includes promises to help build several international observatories.

Following a road map for the field (*Science*, 4 February 2000, p. 781), Canada's National Research Council this month inked pacts with the U.S. National Science Foundation to buy into the two facilities. One tentatively commits Canada to providing $20 million for the $400 million Atacama Large Millimeter Array project in Chile, a U.S.-European project with possible involvement by Japan. The other promises $10 million toward an upgrade of New Mexico's Expanded Very Large Array (above).



Now, "it's time for the government to ante up," says astronomer Peter Janson, co-chair of the Coalition for Canadian Astronomy. Supporters hope that the government will back both projects, if only to avoid the embarrassment of voiding letters of intent signed by its foremost in-house laboratory. The government's answer may appear in a new budget that goes into effect on 1 April.

Staying Cool A prominent standard-setting group for animal care is struggling to stay neutral in the increasingly testy fight over whether the U.S. Department of Agriculture (USDA) should regulate the use of laboratory rats, mice, and birds, which constitute 95% of research animals.

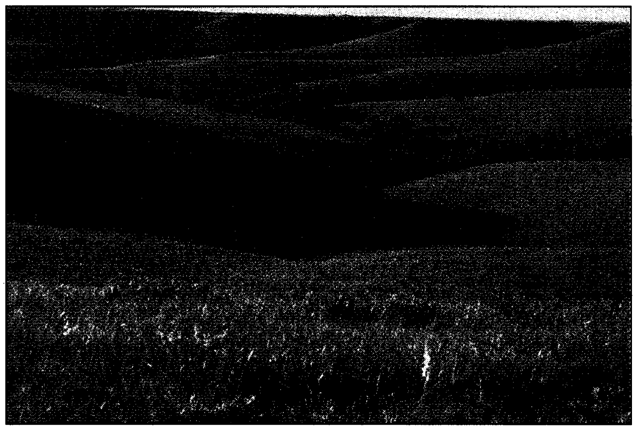
Two years ago, the Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC), which sets voluntary standards that are widely used by major U.S. research universities, gave its qualified support for USDA regulation, heartening animal rights activists. The activists then cited AAALAC's statement in responding to research community claims that regulation would be too onerous. But AAALAC chief John Miller now suggests that the activists stop mentioning his group: "AAALAC is neutral on this issue," he told *Science*.

In a clarification last month, Miller noted that the statement never won the support of AAALAC's entire board, which includes 50-odd major science societies, some of which have opposed regulation. Instead, board members opted to take their own positions on possible new rules, which a congressional moratorium has put on hold for at least a year.

ECOLOGY

How Rain Pulses Drive Biome Growth

Most ecologists trying to picture how climate change will remold the world's ecosystems have been fixated on temperature. Piles of studies have predicted that as North America heats up a couple of degrees over the next century, the distributions of everything from oak forests to tundra may shift far to the north. But these ecological modelers haven't factored in the dramatic changes in storm frequency—and the droughts and heavier rains and snows those changes will bring to some regions—also predicted in a greenhouse world. Now, on page 481, researchers describe the first study to look at how swings in precipitation alter landscapes across an entire continent. This new research finds that some ecosystems respond much more strongly than others to pulses in rainfall, which can spur surprisingly dramatic bursts in plant growth.



Ecological bellwether? Grasslands like this one in Kansas are more responsive than other biomes to fluctuations in rainfall.

Scientists had suspected that fluctuations in rainfall could strongly affect productivity, says ecologist David Schimel of the Max Planck Institute for Biogeochemistry in Jena, Germany. "But it hadn't been confirmed, and it hadn't been quantified at the ecosystem scale." One of the first papers to synthesize data from a network of ecological sites set up by the National Science Foundation (NSF) 20 years ago, the study highlights the value of long-term data sets for understanding broad ecological patterns, adds Schimel: "It speaks to the importance of having these measurements made in the right place at the right time."

The amount of plant growth—or more precisely, productivity—of a patch of land is "the fuel on which ecosystems run," determining why deserts are so barren and rainforests so lush, notes Alan Knapp, an ecologist at Kansas State University in Manhattan. To explore how tightly precipitation drives productivity in different biomes, Knapp and co-worker Melinda Smith turned to NSF's Long Term Ecological Research (LTER) sites. At the 24 LTERs, researchers routinely track precipitation and what's known as "aboveground net primary production"—recorded by painstakingly measuring the growth of plants each year. Because measurements are taken in a consistent way at the various sites, the LTER network offers an unparalleled storehouse of data for comparing ecosystems, says Knapp. He and Smith drew on data spanning 6 to 23 years from 11 North American sites, including arctic tundra, grasslands and old fields, and eastern forests.

Some results were expected. Productivity was higher at sites with more average annual rainfall. And forests, with their relatively huge plants, had the highest production from year to year, with grasslands coming in second and deserts third.

But to their surprise, the duo found a different pattern in how these biomes responded to *fluctuations* in precipitation. Forests, which receive fairly stable amounts of annual rainfall, grow roughly the same amount in wet or dry years. Deserts, which were hit by the wildest swings in rainfall and thus could be expected to vary enormously in productivity, fluctuated only moderately. Instead, grasslands proved the most extreme, four times more variable than forests—a sizable difference. Grasslands may be so variable, the Kansas team surmises, because of their underlying growth potential: Compared to deserts, grasslands have more leaf area and can grow more densely. And compared to forests, grasslands receive and retain much less water, so they're less buffered against dry years.

Another unexpected result was that in all of the biomes, wet years had a much greater effect on plant growth than did dry spells. Knapp and Smith think that reflects plant properties that enable them both to resist drought and sprout new growth when well watered. Plant physiologists have noticed this resilience, Knapp says. "The question was, does it scale up to the ecosystem level?" he says. "We've shown that it does."

These new data should enable ecologists to improve their models of how biomes may respond to human-induced climate change, as well as to short-term patterns such as El Niño, says ecologist Ian Woodward of the

CREDITS: (LEFT TO RIGHT) ALAN K. KNAPP/KANSAS STATE UNIVERSITY; ADAM BUTLER/AP

ScienceScope

Vision Thing The National Eye Institute (NEI) is getting a new chief this spring: Paul Sieving, an expert in the genetics of macular degeneration.

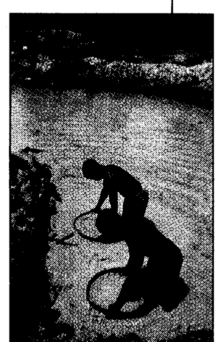
Sieving—who was recruited from the Kellogg Eye Center at the University of Michigan, Ann Arbor—has a broad record of academic achievement: an M.S. in physics from Yale (seasoned with a year of law school) and two degrees from the University of Illinois, an M.D. and a Ph.D. in biomedical engineering.

"I am honored to be joining the NEI" at a time of great scientific opportunities, Sieving said in a statement. "His experience as a senior administrator will be invaluable," says Ruth Kirschstein, acting director of the National Institutes of Health (NIH).

His appointment leaves just three unfilled vacancies in biomedicine's upper reaches: director of the NIH, director of NIH's AIDS office, and director of the National Institute of Neurological Disorders and Stroke.

Discerning Diamond Origins Wondering whether science can quell a threat to peace, the White House held a diamond summit last week to discuss how scientists might help identify gemstones that are fueling conflicts in Africa.

So-called conflict diamonds, which represent an estimated 4% of all diamonds sold annually, fund rebel forces in Sierra Leone, Angola, and the Democratic Republic of Congo. Once the gems enter the trade, however, their origins are difficult to discern. Researchers say spectroscopic and physical analyses might yield a unique signature that identifies a stone's origins, but the methods are untested and likely to be expensive, time consuming, and sometimes destructive to the jewels.



To get around such problems, a conflict diamond working group led by the White House Office of Science and Technology Policy (OSTP) will submit recommendations for future research to the National Science Foundation. NSF has not yet committed to funding the work, but outgoing OSTP technology chief Duncan Moore hopes to "move forward even this year."

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