ruled out distortions of the magnitude Gray found. Cochran and Hatzes are quick to note that they may have made too few observations to see the changes Gray has spotted. But Wolszczan agrees that resolving the discrepancy will be a crucial first step toward reaching a verdict on the planet.

Even if the data prove to be correct, however, few astronomers are ready to accept Gray's explanation for the changes in line shape: massive, persistent upheavals of the star's surface roughly analogous to ocean swells. Gray and Hatzes are collaborating on a scenario in which these swells, sloshing across the star's visible face, could both shift the lines—explaining the Doppler shift that the planet searchers detected—and change their shape. But "nonradial" oscillations with such long periods, while theoretically possible, have never been detected in the sun or other stars, says Timothy Brown, who studies stellar pulsations at the High-Altitude Observatory of the National Center for Atmospheric Research in Boulder, Colorado. He adds that if 51 Peg were oscillating as Gray proposes, it would probably flicker in overall brightness—which it apparently doesn't.

"We rule out any reasonable kind of pulsations," says Sallie Baliunas of the Harvard-Smithsonian Center for Astrophysics, who with her collaborators showed that 51 Peg's overall brightness stays constant to within 0.04%. "Of course, that leaves the bizarre." The explanation "is not impossible," agrees Brown. "But if it is nonradial pulsations, then it's much stranger and more interesting than the planetary hypothesis."

Ironically, say some astronomers, the regular gravitational tug of a closely orbiting planet is one thing that might amplify an otherwise small oscillation into something strong enough to explain Gray's data. And a team that includes Athena Coustenis and Jean Schneider of the Observatoire de Paris-Meudon in France thinks that another effect might reconcile the data with a planet: the boiling off of its upper atmosphere due to its closeness to the star. The team's preliminary estimates show that an ionized cloud could form around the planet and pass periodically between 51 Peg and observers on Earth.

What Gray's claim about 51 Peg might mean for the other planets reported recently is still less clear. His oscillation scenario may have a hard time explaining them away, say other astronomers: They have different orbital periods but similar parent stars, whose oscillations would be expected to be similar as well. "This is a very interesting situation," says Queloz, who adds that he and Mayor are now searching for traces of the spectral distortion in their own data on 51 Peg. "I don't know who is right and who is wrong. This is just science. You try to do your best."

–James Glanz

MEETING BRIEFS

Scientists Go Sleepless in Seattle at AAAS Meeting

SEATTLE—Over 5000 people turned out for the Annual Meeting and Science Innovation Exposition of the American Association for the Advancement of Science (AAAS, which publishes *Science*), held 13 to 18 February. Last week, we covered early sessions (*Science*, 21 February, p. 1061); in this issue, we cover talks on mechanisms for resisting HIV, the maritime skills of early Americans, neutron stars, the demographic transition, and public attitudes about science.

A New Way to Resist AIDS?

One mystery that has long puzzled AIDS researchers is why some people who have been repeatedly exposed to HIV—including, for example, some prostitutes in Kenya and some hemophiliacs and intravenous drug users—seem to resist infection by the virus. At the Seattle meeting, Miles Cloyd of the University of Texas Medical Branch in Galveston presented new data suggesting that some of these individuals may carry immune cells that, even after having been invaded by the virus, don't allow it to replicate.

This resistance mechanism, if it is confirmed, would join one identified last year. Scientists studying exposed but uninfected people found that in a small number of these individuals, HIV could not enter, or infect, immune cells in the first place. As several labs reported, these resistant people had inherited a defective version of a coreceptor on the surfaces of immune cells that HIV uses to dock onto the cells and gain entry—a defect that protected them from the virus (*Science*, 27 September 1996, p. 1797).

Cloyd's mechanism would operate at a different stage in the viral life cycle. His group was studying CD4 lymphocytes—the white blood cells selectively destroyed by HIV—from about 50 randomly chosen, healthy people at low risk for HIV exposure. The researchers found that when they added HIV to the CD4 cells, the virus couldn't reproduce itself in cells from up to 15% of the individuals, depending on the strain of virus. HIV replication seemed to run into a roadblock, the researchers found, some time after the virus had entered the cells and copied its RNA into DNA. Cloyd speculates that the cells may have inhibited viral proteins, called Gag proteins, involved when HIV pastes the DNA copy into the host cell's DNA. Children appeared to inherit protection against specific strains from their parents, Cloyd says, so the factor may be genetic.

Whether this mechanism seen in cell cultures offers people real-world resistance to HIV is another question. But Cloyd has tentative evidence that it may. His group examined CD4 cells from two men whose blood cells initially tested positive for HIV but several months later tested virus-free—even though the men weren't taking AIDS drugs. "It could be hiding in lymphatic tissues, but the virus seems to be shut off," Cloyd says. In cell cultures, these men's CD4 cells seemed to act the same way as the resistant CD4 cells did in the earlier study: Although the virus successfully invaded the men's CD4 cells, once inside it could not replicate.

Other researchers at the session say that Cloyd's new work, while provocative, is still preliminary. "It's highly believable that there will be host factors that will block HIV post-entry, but it's too early to say how important this will be in HIV transmission," says Richard Koup of the Aaron Diamond AIDS Research Center in New York City. Cloyd says the group is now hoping to firm up its findings by checking for resistance in CD4 cells from 50 HIV-free men who are at risk of contracting the virus from their infected partners.

–Jocelyn Kaiser

First Floridians Found Near Biscayne Bay

Recently dated fish bones and artifacts reveal that Indians were basking in the Florida sun almost 10,000 years ago. The finding, reported at a session on the use of maritime resources by early Americans, pushes back by at least 3000 years the time that people are known to have inhabited the Atlantic Coast of North America, says archaeologist James Dunbar of the Florida Bureau of Archaeological Research in Tallahassee. It also adds to a picture of impressive maritime skills among early Americans on both coasts.

Dunbar's colleague, Dade County archaeologist Robert Carr, discovered the bones and tools in a limestone sinkhole at a site known as Cutler Ridge, overlooking Biscayne Bay on the Atlantic Coast. While several maritime sites from this era have been

found on North America's west coast, this is the first found on the east coast, notes Jon McVey Erlandson, an archaeologist at the University of Oregon, Eugene. He adds: "Some researchers thought the lack of early coastal sites along the Atlantic was a real cultural pattern." They concluded that early people did not inhabit the shoreline or make use of its resources, he says, "but this work at Cutler Ridge shows that was not the case."

The new radiocarbon dates, which put the site at 9670 years old, also push back by 3000 to 4000 years the earliest known time on either coast when people braved the seas to catch large fish. While most early Native Americans are thought to have subsisted primarily on game, such as deer, these first Floridians clearly were keen fishers, says Dunbar. At the site's middens—places where the inhabitants dumped refuse—the archaeologists unearthed the remains of sand sharks, barracuda, and tuna, indicating "a surprising level of maritime knowledge," he says.

Similar surprises are emerging from a West Coast site, Erlandson told the meeting. During excavations in the past few years on San Miguel Island, in the Santa Barbara channel off California, Erlandson recovered bits of charcoal, a handful of stone chips, and fragments of shellfish dating to 10,500 years ago. The campsite attests to the maritime skills of these early Californians, says Erlandson: "They had to have seaworthy boats to make the crossing [from the mainland]," because treacherous seas near the island are notorious for capsizing modern craft.

Oddly, sites further north along the coasts of Oregon, Washington, Canada, and Alaska are younger (the oldest dates to about 9700 before the present). That's not the pattern expected if the west coast peoples arrived in North America as part of a coastal migration of skilled maritime people, as some archaeologists believe. Erlandson points out that there has been less archaeological research along these northern coasts, and adds that rising sea levels, coastal erosion, and glaciers could have destroyed most early coastal sites.

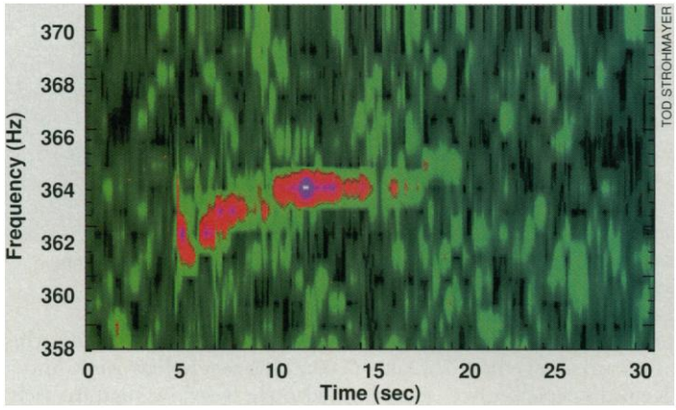
But in Florida, more of the maritime archaeological record may be regained. Dunbar and his colleagues have identified several underwater sites offshore right where the coast would have been about 10,000 years ago. "We've got a series of sinkholes in 70 to 120 feet [21 to 37 meters] of water," he says, adding that some of his colleagues hope to begin exploring these within the next few years.

–Virginia Morell

Whirling Neutron Stars May Brake and Accelerate

Astronomers studying bursts of x-rays from rapidly spinning neutron stars may have seen the thin atmosphere of one superdense object brake and accelerate like a spinning figure skater, all in the space of a few seconds. The finding, from NASA's X-ray Timing Explorer (XTE) satellite, which was presented at the Seattle meeting, offers an intimate view of these exotic objects, which pack the mass of the sun into a diameter of a few tens of kilometers, and their eruptions of x-rays.

It also resolves a puzzle about how the fastest spinning pulsars—neutron stars that emit radio waves rather than x-rays—acquire spin rates of tens or hundreds of times a second. Theorists believed that these millisecond pulsars gain their spin during an x-ray emitting phase, when an ordinary companion star sheds gaseous material onto the neutron star. When enough hydrogen and helium has fallen onto the neutron star, the surface heats to the temperature of fusion and erupts with bursts of x-rays. The infalling material, spiraling onto the neutron star, should also add to its spin.



X-ray vision. When the neutron star's atmosphere expands, it spins more slowly (drop in red signal at 5 seconds) and then accelerates again.

Astronomers hoped that XTE, the first satellite to clock the superfast flickers of these x-ray sources, would reveal this rapid rotation as the x-ray "hot spots" from nuclear burning whirled into view and away again. And last year, Tod Strohmayer, an astrophysicist at NASA's Goddard Space Flight Center in Greenbelt, Maryland, and his colleagues picked up what seemed to be a signal of rotation when they pointed the XTE toward a neutron star called 4U 1728-34. They found that the number of x-rays collected during bursts, which occur about once every 3 hours, oscillated at a frequency of 363 cycles per second.

The problem was that the oscillations varied by a few cycles per second. Something as massive as a neutron star should not change its rotational speed that much in a few seconds, says theorist Lars Bildsten of the University of California, Berkeley.

Now, with more detailed x-ray observations, Strohmayer has a simple explanation. The new data show that the number of cycles per second drops in the first second, then recovers over the next few seconds. The reason, he believes, is that after the heated gas near the surface ignites a thermonuclear reaction, the reaction transfers heat to the atmosphere of the star, which inflates by just a few meters. Like a figure skater extending her arms, the atmosphere rotates a little more slowly. Then, as the blasted plasma cools, the atmospheric layer contracts and returns to its higher spin rate. Throughout this swelling, Strohmayer speculates, the star continues to rotate at 363 cycles per second.

Other astrophysicists like the idea. "It has a nice, simple ring to it," says Michiel van der Klis of the University of Amsterdam in the Netherlands, who also found a fast-spinning neutron star last year. The explanation could also shed more light on the magnetic field of neutron stars, says Bildsten, who calls the swelling of the atmosphere "the best explanation yet." Bildsten is intrigued by the idea that the star and its atmosphere are briefly rotating at different rates, a process which might twist the magnetic field lines. It may also provide insight into how the nuclear fires spread across the star's surface. Best of all, says Bildsten, the new observation "breathes more life" in theorists' picture of where neutron stars get their spin.

–Erik Stokstad

Do We Want More Kids, or Fewer, Richer Kids?

People who are concerned about global population growth often take comfort from the fact that as a country becomes more prosperous, its birth rate typically falls. From the United States and Europe in the late 19th century to Thailand in the 1960s, family size has shrunk dramatically as countries have gotten richer. This trend has puzzled biologists, though: One might expect that, given our deep-seated drive to pass on our genes, parents who have more resources would put them into raising more children. At the AAAS meeting, behavioral ecologist Monique Borgerhoff Mulder of the University of California, Davis, presented new data suggesting that the key to this puzzle may well lie "way back in our evolutionary heritage."

In studies of a traditional society in Africa, Borgerhoff Mulder and her colleagues found

that as men accumulate wealth over the course of their lives, they tend to hold on to their resources instead of spending them on expanding their families. This suggests, says Borgerhoff Mulder, that as societies get richer, people may be more successful at passing on their genes if they maximize not their total number of children but the amount of resources, or wealth, they pass along to each child. "This may be a factor of human psychology that [runs] pretty deep," says Eric Smith of the University of Washington, Seattle, who organized the session and describes the work as "very promising."

Many demographers have suggested that changing economic and social conditions were primarily responsible for the so-called "demographic transition" in Europe and the United States during the industrial revolution. A ban on child labor and the greater value placed on education made it advantageous for parents to put more resources into raising fewer children, so birth rates plummeted, or so the argument goes. But this didn't seem to be the whole answer, says Borgerhoff Mulder. This behavior seemed so counter to what would be expected of any animal that it seemed humans were likely to have evolved some psychological trait that was at least nudging them toward smaller families long before the 19th century.

Borgerhoff Mulder and other evolutionary psychologists have speculated that, in fact, the deep-seated drive might not be to have lots of children, but to have fewer, wealthier ones. Indeed, there is some evidence that people who bequeath more to their offspring end up with more descendants several generations down the line. To support the idea, Borgerhoff Mulder studied a society that had not undergone a demographic transition—the Kipsigis, an agropastoral society in Kenya in which wealth is inherited by sons and men take as many as four wives. If people in this society were focused on producing wealthy children, it would suggest that the drive toward accumulating wealth preceded any changes that might have come with the industrial revolution.

Borgerhoff Mulder and her Davis colleague Barney Luttbeg, together with Marc Mangel of the University of California, Santa Cruz, constructed a mathematical model of Kipsigis men's marriage patterns that took into account such factors as wealth—measured in cattle and land—and the costs of marrying a wife and of raising children. Then they looked at men's decisions over their lifetimes to take additional wives (a proxy for their number of children). When the researchers ran their model on a computer and examined which assumption best fit the data—maximizing total number of wives (and, by extension, children) or maximizing wealth per wife (or child)—they found that, indeed, men were "much more concerned with wealth than with [total number of] kids," Borgerhoff Mulder says.

Of course, at the end of the 19th century, richer families actually started having fewer children than the poorer ones. But Borgerhoff Mulder says the reason could be that this wealth-maximizing psychology went into a sort of maladaptive overdrive, and the rich, whose incomes rose the most, downsized so much that they were no longer boosting their numbers of descendants: "Maybe when there was this glut of resources, we kind of forgot about kids and focused on wealth."

MONIQUE BORGERHOFF MULDER

Love or money? A typical polygynous Kipsigis household, with only the younger children pictured.

Smaller families may not be quite what nature intended, but population experts with an eye on the developing world will herald Borgerhoff Mulder's results. For if she is correct, as incomes rise in developing countries, family size has nowhere to go but down.

–Jocelyn Kaiser

New Studies Explore Public Attitudes About Science

Where do people get their attitudes about science? The question has bedeviled any number of scientists who have encountered incomprehension—even hostility—in their conversations with nonscientists. But new research is uncovering some answers—and some surprising differences among people from different nations.

At the AAAS meeting, Jon Miller, vice president of the Chicago Academy of Sciences, discussed his most recent analyses of survey results from 14 countries—the United States, Japan, Canada, and 11 European nations. Using statistical models, Miller has linked attitudes about science with such factors as age, gender, education, and levels of scientific literacy. While the results show striking commonalities across borders, according to Miller, they also reveal the influence of deep-seated cultural differences.

For instance, in 10 of the 14 nations studied, including the United States, levels of education were the strongest determinant of scientific literacy, with the most educated individuals the most knowledgeable about science. But in some countries, including France and Japan, scientific literacy is not strongly correlated with education, suggesting that people in those countries get more of their information about science from their jobs and the media.

While some scientists might think that knowing a lot about science would lead people to view it in a more positive light, in fact, the two measures are only moderately related in the United States. Indeed, the more important impact of scientific literacy seems to be reducing a person's reservations about scientific endeavors. "While the scientific community might like to have more cheerleaders, informed people are not necessarily cheerleaders, they're more thoughtful," says Miller.

In general, there were fewer negative beliefs about science in the United States than in any of the other countries studied, which may help explain Americans' strong support for government funding of research. But Miller's surveys also reveal that only about one in 11 Americans is well enough informed to participate in a dispute involving a scientific issue. Accordingly, public support could be eroded by major, public controversies involving science, he asserts.

This attitudes research has important implications for public policies, according to Miller and other social scientists at the meeting. Miller contends, for instance, that one of the best ways to increase levels of scientific understanding in the United States is to improve college science courses for nonscience majors—because surveys reveal such a tight link between education and science literacy. "We put our graduate students or youngest faculty in freshman survey courses, and we save our best teachers for the majors. It would be better for the country if we took those survey courses more seriously," he says.

According to Jennifer Bond of the National Science Foundation, which sponsors Miller's work, policy-makers are beginning to take notice of this new attitudes research. A symposium on the public understanding of science and technology held by the Organization for Economic Cooperation and Development in Tokyo last November, for instance, pointed to the need to measure the effects of public policies on scientific literacy. "More and more countries are starting to do this kind of work," says Bond.

–Steve Olson

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