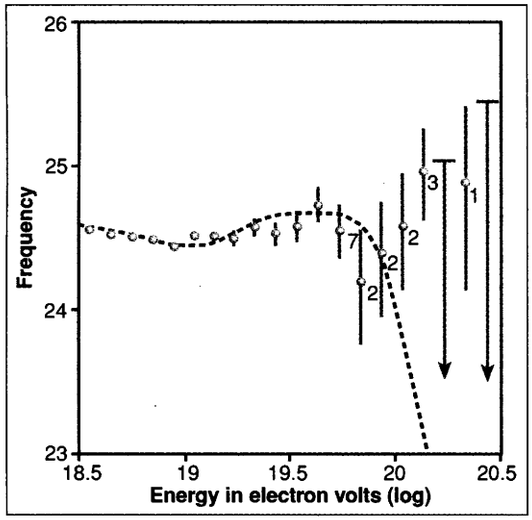
ray traveling through space with an energy above about 5×10^{19} electron volts (eV) would tangle with the photons of the microwave background—the low-energy radiation that pervades the universe—and gradually lose energy. This process should set an upper limit to the energies of cosmic rays originating in the distant universe, called the Greisen-Zatsepin-Kuz'min (GZK) limit for the scientists who described it. But the AGASA findings, reported in the 10 August *Physical Review Letters*, show that "there is really no evidence for the GZK cutoff," says Cronin. The finding suggests that the particles originate from some unidentified sources close to our galaxy and sets a puzzle for a new generation of cosmic ray detectors to probe.



SOURCE: TAKEDA *ET AL., PRL*

Topping the limit. Cosmic rays from the distant universe should peter out at about 10^{20} electron volts (red), but AGASA has detected six events at higher energies.

AGASA, the current state of the art, is made up of 111 detectors scattered over 100 square kilometers around the mountain town of Akeno in Yamanashi Prefecture, about 120 kilometers west of Tokyo. When an ultrahigh-energy cosmic ray particle—a proton or an atomic nucleus—slams into the atmosphere, it sets off a cascading chain reaction of particle collisions that ends in a shower of electrons or positrons falling on the detectors. Computer analysis can derive the original particle's approximate energy and direction of travel from this jumble of data.

AGASA is currently the world's largest facility for detecting the most energetic cosmic rays. Even so, particles above 10^{20} eV are so rare that it has detected just six of them since 1990. But Masahiro Takeda, an astrophysicist at the University of Tokyo's Institute for Cosmic Ray Research, which heads the collaboration, says that's enough to suggest that the GZK limit can be topped by statistically significant numbers of events.

If the microwave background does set a limit to the energies of cosmic rays coming from great distances, then these highest energy cosmic rays must be coming from within about 50 megaparsecs, or 163 million light-years, of Earth—somewhere among the nearby galaxies. Just where is the question, says Raymond Protheroe, an astrophysicist at the University of Adelaide in Australia. "We have this problem of trying to find what objects could possibly accelerate particles to such energies," he says.

Tracking down the mystery sources will require larger arrays that can quickly gather statistically meaningful numbers of these rare events. One, the High-Resolution Fly's Eye project, based in Utah, is partly operational and when completed in late 1999 will be capable of picking up five or six events greater than 10^{20} eV per year. An even more ambitious project that has been on the drawing boards since 1992, the Pierre Auger Project, passed a significant milestone in late July when the U.S. Department of Energy and the National Science Foundation approved $7.5 million in funding for design and engineering work on the first phase of the project: building an array of 1600 detectors on a 3000-square-kilometer site in Argentina. The $50 million array will be 30 to 40 times as sensitive as AGASA.

Construction could start as early as this October, says Cronin, who is the spokesperson for the project, which involves 40 institutions in 19 countries. If the effort continues to secure funding, the array could be completed in 4 years. Later, the collaboration hopes to build a second array of a similar size in Utah. Cronin says the recent AGASA results "show that what we started 6 years ago was really on the right track."

–DENNIS NORMILE

MICROELECTRONICS

IBM Puts Fast Chips on a New Footing

IBM announced last week that it will soon begin producing microprocessor chips embodying a technology that it says could boost operating speeds by as much as 35%. The new chips are also expected to use about a third less electricity than today's microprocessors, extending battery life for portable devices such as cellular phones and handheld computers. Competitors say IBM is betting on the wrong horse. But if the gamble pays off, the new chips could help extend Moore's law, the famous trend of performance improvements that has driven advances in microelectronics

ScienceScope

NASA Woos Astronomer at Caltech for Top Science Job

NASA officials have been hunting fruitlessly for a new space science chief since spring, when Wes Huntress announced he would leave the agency this fall after a 5-year stint in the job (*Science*, 27 February, p. 1293). But they are hoping they have found a successor in Charles Beichman, an infrared astronomer with the California Institute of Technology (Caltech) in Pasadena.

Beichman directs a Caltech center that handles data from a number of NASA satellites carrying infrared instruments. He also has specialized in the search for planets outside the solar system, a favorite topic of Administrator Daniel Goldin. NASA officials and Beichman declined comment, but sources close to the selection process say they hope to have him on board soon to run the $2-billion-a-year program. One person long familiar with Beichman noted that although he is not well known in the space science community, he is politically savvy.

NASA/AMES RESEARCH CENTER

Artist's view of NASA's Galileo.

Scientists Lose Round in Database Privacy Fight

House and Senate lawmakers are headed for a fall showdown over controversial legislation that would extend to electronic collections of information the same legal protections afforded creative works such as books and films. Some scientists say the measure will stifle data sharing and make it a crime to conduct research on everything from computer viruses to database security.

Last week, the House approved a bill that would bring the United States into compliance with the World Intellectual Property Organization Internet copyright treaty, which aims to prevent theft of electronic information (*Science*, 25 October 1996, p. 494). The vote rebuffed scientists who say the measure would hinder research. "No one even wanted to discuss our concerns," says Purdue University's Eugene Spafford, one of 50 computer scientists who signed a 1 August plea to House leaders for changes in the bill. The Senate will consider how to reconcile its markedly different version with the House bill in September.

CCD was built for a suite of 1-meter Air Force telescopes that track satellites and artificial debris orbiting Earth. But after NASA started pushing its asteroid goal, scientists realized the system was ideal for finding NEOs, too. "No commercially available CCD comes close to having these capabilities," says space-surveillance physicist Grant Stokes, manager of the Lincoln Near-Earth Asteroid Research (LINEAR) program.

The chip records more light than any other CCD and reads out 5 million pixels of data in hundredths of a second. When combined with fast Air Force telescopes, says Stokes, LINEAR can scour huge swaths of the heavens for faint, moving blips: "We're just about capable of covering the entire visible sky from a single site during 1 month."

LINEAR came online in late 1997 at Lincoln Lab's Experimental Test Site in Socorro, New Mexico, and hunts NEOs 10 nights per month. To date, it has unveiled 64 of them, more than all other search programs combined during the same period. A NASA effort at the Jet Propulsion Lab (JPL) in Pasadena, California, called NEAT (Near-Earth Asteroid Tracking), finds almost as many kilometer-sized NEOs, but LINEAR detects many more of the smaller objects, any of which could still wreak havoc if it struck Earth. LINEAR also has spied 10 comets and seven objects called "unusual" by Marsden's clearinghouse. "Whichever category you look at, the rate [from all search programs] has increased five- to 10-fold," says Gareth Williams, the Minor Planet Center's associate director.

So astronomers would like more of a good thing, and they're hoping the Air Force will consider asteroid hunting part of its "planetary defense" mission—and pay for it. The Air Force seems willing to contribute. It may build at least one more LINEAR system dedicated to NEO research, says senior scientist John Darrah of the Air Force Space Command in Colorado Springs.

Meanwhile, other veteran asteroid programs are forging ahead. Spacewatch, at the University of Arizona, will open an additional, larger telescope in 2 years. NASA's NEAT search has new computer equipment and 6 nights per month on an Air Force telescope in Hawaii. Researchers expect that the Air Force will agree to triple NEAT's telescope access at the next meeting between the Air Force and NASA, set for 19 August at JPL, says NEAT principal investigator Eleanor Helin. NASA also anticipates more contributions from NEO observers in the Czech Republic, Italy, Japan, and France.

This meteoric increase in detection rates will force scientists to collaborate more closely, says Donald Yeomans, director of NASA's new NEO Program Office at JPL: "We will want an efficient overall system rather than a group of individuals all vying for the same prize." But principal investigator Robert McMillan of Spacewatch notes that NASA's competitive grants program has thus far not fostered cooperation among the groups. He also wonders whether today's asteroid fad will fall to Earth. "Ten years crosses three Administrations," sighs McMillan. "I'm somewhat skeptical that NASA's enthusiasm will last."

–ROBERT IRION

Robert Irion is a science writer in Santa Cruz, CA.

SCIENCE AND ETHICS

Tobacco Consultants Find Letters Lucrative

Scientists who consult for industry get a lot of grief for being "hired guns." Now, some critics of the practice are squeezing off a few rounds of their own in response to revelations that surfaced last week. The *St. Paul Pioneer Press* reported that several scientists received payments from the Tobacco Institute—the industry's public relations arm—in 1992 and 1993 for writing letters to journal and newspaper editors criticizing studies on the health effects of secondhand tobacco smoke. The information, mined from a mountain of documents assembled in Minnesota's lawsuit against the industry, indicates that nine individuals received as much as $10,000 for a letter and that the letters were often reviewed by lawyers before being sent to publications such as the *Journal of the National Cancer Institute* (*JNCI*) and *The Lancet*.

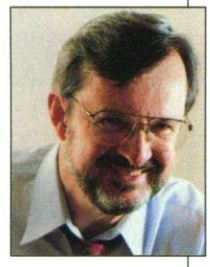
To some industry critics, this is yet more evidence that tobacco companies tried to twist science to further their aims. "It's an even bigger perversion of the scientific process than I thought it was," fumes cardiologist Stanton Glantz of the University of California, San Francisco. He and others argue that such letters, which undergo less stringent review than journal articles, may have helped persuade a district judge last month to throw out a 1993 Environmental Protection Agency (EPA) report finding that environmental tobacco smoke (ETS) causes about 3000 cases of lung cancer per year. "They're basically building up a record they could use for political and legal purposes," says Glantz, whose own work has shown how the tobacco industry has funded research to try to debunk the scientific evidence against tobacco (*Science*, 26 April 1996, p. 494).

But authors contacted by *Science* defend their work, arguing that the letters, based on time-consuming analyses, constitute valid scientific communications. And editors have few qualms about publishing them, noting that in most cases the authors disclosed their industry ties. "This is a tempest in an ink pot," says George Lundberg, editor of the

ScienceScope

BIOMEDICAL LOBBYING ANGERS KEY DEMOCRAT

One of the nation's leading biomedical research societies is seeking to mend fences with a key congressman. Last month, the Federation of American Societies for Experimental Biology (FASEB), which represents 56,000 researchers, angered Representative David Obey (D–WI) by pushing for passage of a House spending bill that includes a whopping 9.1% budget boost for the National Institutes of Health (NIH). Obey, the senior Democrat on the powerful Appropriations Committee, supports the NIH increase but was incensed because a 21 July letter from FASEB to lawmakers appeared to support a Republican plan for cutting welfare programs to pay for it—a strategy Obey called "selfish" and "myopic" in a 28 July reply. It's all a misunderstanding, according to FASEB President William Brinkley of Baylor College of Medicine in Houston, who says the society hopes Congress will find new welfare funds when it returns to work next month. Meanwhile, he wants to meet with the lawmaker. "Hopefully we can appease Mr. Obey and get out of his woodshed," he says.



Obey

COORDINATED ATTACK ON ECO THREATS?

The White House has asked federal ecologists to follow the lead of climate scientists and fashion a blueprint for working together and with academia. The idea is to better concentrate the government's scientific firepower on ecological problems involving "multiple stresses," such as a lake hit by both pollution and exotic zebra mussels. For starters, the "Integrated Science for Sustainable Ecosystems" initiative, expected to begin in 2000, would beef up research in four areas—harmful algal blooms, habitat conservation, invasive species, and data networks—say officials with the White House Committee on Environment and Natural Resources, which unveiled the plans last week. Its price tag, which still must win approval from White House budget officials, will be revealed in the president's budget request next February; the big question is whether Congress will agree to pay the bill.

Contributors: Andrew Lawler, David Malakoff, and Jocelyn Kaiser