

cific moment of time? Brian is demonstrating that you can move to a much more detailed depiction throughout the space environment. It's a novel and elegant way of doing it."

Combining their magnetic field data with electric field measurements collected by SuperDARN, a network of 12 ground-based polar radar antennas, Anderson and Waters also calculate that the Solar wind dissipates about 40 billion watts poleward of 60 degrees in quiet conditions. These calculations don't work when the Sun acts up, however, since geomagnetic activity moves the current systems to lower latitudes, outside of SuperDARN's range.

Indeed, a full view is one of the key advantages of piggybacking on the Iridium satellites, which encircle the planet at 780 km altitude. "It's the first time we can watch these currents evolve through an entire storm. We are not limited spatially or temporally," says Anderson.

But the piggyback ride nearly ended when the original owner, Iridi-

um LLC, failed to attract enough users to its pricey telephone services. The new Leesburg, Virginia-based venture, Iridium Satellite LLC, chaired by Dan Colussy, a former president of Pan American World Airways, will seek mainly industrial and government customers. The bailout was made with the help of a \$72 million contract from DOD, which buys the department two years of unlimited use for 20 000 people. DOD has its own gateway in Hawaii, and wants cryptographically secure phone service and global access for communicating in combat, polar, and remote areas. Iridium Satellite LLC has contracted with Boeing Co to run the satellites, and estimates total monthly operating costs of \$7 million. "There certainly is risk involved—and a high one at that," says Jose del Rosario, an industry analyst with the consulting firm Frost & Sullivan. "The potential is large, but it's a slow market." Still, the new company doesn't have to recoup the original \$5 billion investment.

**TONI FEDER**

## Spy Station Retooled into Astronomy Institute

Fifty kilometers southwest of Asheville in the woods of western North Carolina, an abandoned satellite tracking station is finding new life observing heavenly objects of a different sort. Originally used by NASA for monitoring early space flights in the 1960s, then for National Security Agency (NSA) intelligence-gathering operations, the station's transformation into a radio observatory is now nearly complete. The nonprofit Pisgah Astronomical Research Institute (PARI) plans to boost educational astronomy programs in the area and eventually host visiting astronomers.

Facilities include a 4.6-meter, 12-meter, and two 26-meter radio tele-

scopes, and a new 0.2-meter optical telescope. Among the paraphernalia that PARI got with its purchase of the old spy station were part of a sophisticated security system; some bullet-proof windows; a tunnel; a paper shredding building; and a bunkerlike, white noise-producing conference room. In total, the site has about two dozen buildings.

The National Forest Service had planned to bulldoze the site, after being stuck with expensive maintenance since NSA abandoned it in 1995. But then Don Cline, a retired computer executive, stepped in. He bought other land, organized a swap with the Forest Service, and in early 1999 founded PARI—a several-million dollar investment that the institute will need to supplement with grants and donations. "It was a last ditch effort to save some

TELESCOPES turn their eyes from surveillance to science at the Pisgah Astronomical Research Institute near Asheville, North Carolina.

very useful astronomy equipment," Cline says.

The telescopes were in good shape, but to make astronomical observations, their tracking rate had to be slowed to the speed of Earth's rotation. That, says Mike Castelar, PARI's only full-time astronomer, was quite a challenge. "It was all analog electronics, and they were going three degrees a second." One of the 26-meter antennas has now been overhauled and can observe pulsars at 73 cm, the galaxy's background hydrogen radiation at 21 cm, and methanol lines from masers at 4.5 and 2.4 cm. The other large dish will be upgraded this summer, with the hope of eventually hooking the two together into an interferometer.

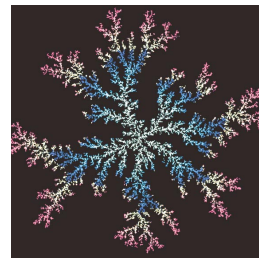
Education will be a major focus: About 30 undergraduate physics departments and even more primary and secondary schools are within a few hours' drive of the institute. PARI has purchased a portable planetarium, will host undergraduate research students this summer, and is planning continuing education workshops for teachers. And starting this spring, K-12 school groups will operate the 4.6-meter radio telescope via the Internet.

David Moffett, a radio astronomer at Furman University in South Carolina, plans to use the 26-meter telescope as a demonstration tool for undergraduate research. They'll monitor the brightest pulsars in the sky as well as observing masers. "It's an important resource because it's close," says Moffett. "It isn't cutting edge, but it's cutting edge for an undergraduate institution that doesn't have access to major facilities."

**LYNLEY HARGREAVES**

## NEWS NOTES

**Michigan theory center.** "2001: A Spacetime Odyssey" is the title of the Michigan Center for Theoretical Physics's inaugural conference, to be held 21-25 May. That event will be followed in August by a workshop on pattern formation and diffusion-limited growth. In addition to conferences and workshops, the new theory center, based in the physics department at the University of Michigan, Ann Arbor, plans to host visiting scientists and postdocs,



PARI



fund graduate and undergraduate research, and hold public lectures and other outreach activities. The MCTP combines the physics department's aims to build up theoretical physics and break down barriers between fields, and fits with its aspirations to become one of the "Top Ten" in physics, according to founding director Michael Duff, a string and M-theorist. The center is starting out with 34 faculty members from the physics, math, astronomy, and chemical engineering departments, and with \$450 000 a year for four years from the university. Much of the first year's startup money will go to renovating the physics building to make way for the new center.

**European grid funded.** Datagrid, a project for pooling computing power, will receive 9.8 million euros (about \$9.2 million) over the next three years from the European Union. The project's 21 partners, headed by CERN, will need to match the EU money two to one. The grid is needed to cope with the petabytes of experimental data expected to accumulate annually after the 2005 scheduled start of CERN's Large Hadron Collider. Thousands of European physicists will need access to the data. The project will be developed alongside other grids worldwide (see PHYSICS TODAY, November 2000, page 48). Biologists will also be involved in planning the grid, since data-rich genomics experiments are likely to be the next testbed of grid technology.

**Funding physicists to do biology.** The Human Frontier Science Program, an organization that funds international interdisciplinary research collaborations in neuroscience and molecular biology, is broadening its net to support researchers from the physical sciences, computer science, and engineering who work in biology. Founded in 1989, the Strasbourg, France-based HFSP was the brainchild of Japan's former prime minister Yasuhiro Nakasone. With money from G7 countries, the European Union, and Switzerland, the HFSP spends about \$50 million a year on research worldwide. Upcoming deadlines are 30 March for research grant letters of intent and 1 September for postdoctoral fellowships. For further information, see <http://www.hfsp.org>.

**Natural hazards journal.** Tsunamis, volcanoes, earthquakes, landslides, meteorology, and hydrology are among the topics to be covered in a new peer-reviewed journal published by the European Geophysical Society. Spanning theory, modeling, forecasting, measurement, and risk media-

tion, *Natural Hazards and Earth System Sciences* will appear quarterly beginning this month. See the journal's Web site, <http://www.copernicus.org/EGS/nhess/nhess.htm>, for subscription, submission, and related information.

**New editor at applied physics journal.** P. James Viccaro is the new editor of the *Journal of Applied Physics*, published by the American Institute of Physics. Viccaro, a University of Chicago physicist who uses x rays for materials studies and was one of the planners of the Advanced Photon Source at Argonne National Laboratory, took the reins on 1 January. He succeeds Steven Rothman, who remains a consulting editor. During his 11-year watch, Rothman says, the number of submissions skyrocketed, and the fraction coming from the US dropped from 60% to 25%—although the fraction accepted from the US remains higher than that.

**NOAO director appointed.** Australian astronomer Jeremy Mould has been named as the new director of the National Optical Astronomy Observatories (NOAO), Tucson, Arizona, succeeding astronomer Sidney Wolff, who announced more than a year ago her intention to step down as soon as a new director could be found (See PHYSICS TODAY, January 2000, page 45). Mould

is both an administrator and an active researcher, having recently played an important part in the Hubble Space Telescope Key Project on the Extragalactic Distance Scale. Most recently he was the director of the Australian National University's Mount Stromlo and Siding Springs Observatories. The announcement was made by the Association of Universities for Research in Astronomy, which oversees NOAO. "I'm delighted that Jeremy will join AURA in this new capacity," said AURA president William Smith. "I am confident that he will fulfill the role of the National Observatory as recently called for by the Astronomy and Astrophysics Survey Committee." Mould said he is looking forward to NOAO's playing a role in several of the projects called for by the committee, including the development of a segmented mirror telescope; a facility aimed at surveying the whole sky every week; and establishment of a national virtual observatory. "NOAO ought to play a role in each of these, and it is finding the right role in the entire system of US astronomy that is interesting," Mould said. ■



**MOULD**

## Web Watch

**<http://www.triax.com/vlfradio/natradio.htm>**

Coined in the late 1980s, the term "natural radio" refers to the very-low-frequency radio waves that emanate from lightning storms and disturbances in Earth's magnetosphere. Because their frequency range overlaps the audible range of the human ear, the waves can be converted to sound and listened to with relatively simple equipment. Stephen P. McGreevy's Web site **The Realm of Natural VLF Radio** provides a wealth of information about natural radio and includes audio files of the waves.



**<http://duszenko.northern.edu/joyce>**

In his online essay **The Joy of Science: New Physics in *Finnegans Wake***, Andrzej Duszenko explores the "multiplicity of similarities between new physics and the universe of *Finnegans Wake*." Duszenko, who is an English professor at Northern State University in Aberdeen, South Dakota, argues that James Joyce incorporated elements of relativity and quantum mechanics into his novel because he found them consistent with his own view of the world as mutable and uncertain.



**<http://www.microgravity.com>**

Sponsored by NASA's Marshall Space Flight Center, **Microgravity News and Research** seeks to encourage public interest in NASA's microgravity program. Alongside news of upcoming microgravity missions, the site contains tutorials on areas of microgravity research, such as combustion and protein crystal growth.



To suggest topics or sites for Web Watch, please e-mail us at [ptwww@aip.org](mailto:ptwww@aip.org).

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