

[the energy gap] from the ground and below [it] from space. It's often occurred—it's the case for [the blazars] Markarian 421 and 501." Narrowing the gap in observation energies, he adds, will give more constraints on cosmic accelerators, allowing better checks between observations and theories.

Comparable competition

The planned arrays will vary in detail, but be comparable in capability, according to scientists on the projects—VERITAS, HESS, and the Japanese-Australian CANGAROO III (Collaboration between Australia and Nippon for a Gamma Ray Observatory in the Outback).

VERITAS is planned as an array of seven 10-meter telescopes arranged in a hexagon, 100 meters to a side, with one telescope at the center. It will be built near its predecessor, the 32-year-old Whipple Gamma Ray Telescope, in the mountains not far from Tucson, Arizona. Most of the \$21 million for construction is expected to come from the Smithsonian Institution, the National Science Foundation, and the Department of Energy, with about 10% coming from partners in the UK and Ireland.

But before the project can go ahead, a resolution is needed to a site dispute with Native Americans, who have a sweat lodge near where astronomers want to build VERITAS. "We are connecting to our spirituality and bringing our Indian community together. We don't want the telescope anyplace nearby," says sweat lodge keeper Cayce Boone. "We would fight it all the way." For its part, the VERITAS team hopes the two communities can coexist. "We don't want to disturb the sweat lodge," says Weekes.

Last fall, the National Forest Service, which manages the land, rejected the VERITAS site request, but it's now reconsidering. As a backup, the telescopes could be built a bit to the west, where, says Weekes, the array wouldn't be as well shielded from artificial light. The forest service is expected to rule on the sites later this year. VERITAS is scheduled to see first light in 2005.

In Namibia, meanwhile, the local community is enthusiastic about hosting HESS (named in honor of Victor Hess, who discovered cosmic radiation in 1912). It will be the country's largest scientific project, and University of Namibia physicist Riaan Steenkamp, for one, hopes it will convince more students to stay home for university.

HESS will be built on the Khomas Highland, about 100 km southwest of Namibia's capital, Windhoek. Construction on the first four 12-meter telescopes starts this summer. They'll form a 120-by-120-meter square, and are scheduled to go on-line in 2002. The plan is to expand to 16 telescopes. Germany is putting up about three-quarters of the building costs, with most of the rest coming from France. The project also has partners in Armenia, the Czech Republic, Ireland, Italy, Namibia, South Africa, and the UK.

And at a former rocket-launching range in Woomera, 500 km north of Adelaide, in Australia, the first of four 10-meter telescopes planned for CANGAROO III is already up and running. A square array with 100-meter spacing, CANGAROO III is scheduled to be completed by 2004.

Construction on the larger, single telescope, MAGIC (Major Atmospheric Gamma Imaging Čerenkov Telescope), is also well under way—it's supposed to start collecting data next year on La Palma in the Canary Islands. In opting

for a larger, single telescope, the project gives up energy resolution to buy a lower energy threshold. In the long run, however, the German-led team, which has partners in a half dozen countries, hopes to expand MAGIC into an array of three telescopes.

More is better

If the planned telescopes are so similar, why build four of them? For one thing, astronomers like to search the skies in both the northern and southern hemispheres—VERITAS and MAGIC, in the north, will focus more on extragalactic gamma-ray sources, while HESS and CANGAROO III, in the south, will have a better view of our galaxy. And scientists from the four experiments plan to collaborate to watch time variations in gamma-ray sources. What's more, the price is right, says HESS's Heinrich Völkel: At about \$3 million per telescope, or \$12 million to \$48 million per array, "It's not efficient—politically, organizationally, or financially—to build a big, global experiment."

TONI FEDER

Jordan Will Likely Host Middle East Synchrotron Light Source

Jordan is the first-choice site for a synchrotron light source intended to promote peace and science in the Middle East. That outcome of a vote this past April by representatives from 10 of the project's 11 member states is expected to be ratified in late June at a meeting in Amman, Jordan. However, supporters of opening the facility in Armenia, the backup site, continue to campaign for a fresh vote.

Envisioned as a topnotch international facility, SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East) will be an upgraded reincarnation of BESSY I, a synchrotron donated by Germany. Science programs are being planned in, among other fields, biology, physics, materials science, environmental science, and

archaeology. (See PHYSICS TODAY, August 1999, page 54, and February 2000, page 52.)

"At all levels, we are highly committed to this project," says Khaled Toukan, president of Jordan's Al-Balqa' Applied University and a member of the SESAME council. "We want it to be a success, because we want our country to become a center of science in this region, and an active member of international science." Jordan's King Abdullah II has pledged \$1 mil-



lion a year for five years. Toukan adds that Jordan "has already launched a political and diplomatic campaign to persuade other Arab countries to join SESAME, starting with the Arab Gulf states."

Of the seven bids to host SESAME, Jordan's was favored because of location. The potential sites could be easily reached by Israeli and Palestinian scientists, whose participation is key if SESAME is to help improve relations in the region. Siting SESAME in Jordan, says Joel Sussman, a structural biologist at Israel's Weizmann Institute of Science, "would be superb for us—we could throw our samples in the back of a van, and be there in two or three hours." The Palestinian Authority, whose bid to host SESAME was defeated, would also have been an excellent choice, he adds.

At least one of the losers in the contest hasn't given up yet. In terms of technical know-how and existing infrastructure, "Armenia's [site] proposal was and still is the only realistic one," insists Varduhi Asaturian, a physicist who represents Armenia at the United Nations Educational, Scientific and Cultural Organization (UNESCO), which is acting as midwife to the project. Armenia's distance from the Middle East conflict worked against siting SESAME there—but supporters note that the facility could promote good relations among other traditionally hostile neighbors. The Yerevan Physics Institute could house SESAME, and the synchrotron could be readied for \$10 million less and two years sooner than elsewhere, Asaturian claims. In addition, Armenia has 350 or so scientists, engineers, and machinists who could work on the synchrotron—a team of them is helping dismantle BESSY I.

Americans of Armenian descent are lobbying the US government to support siting SESAME in Armenia. And Jirair Hovnanian, a businessman who is heading up the US campaign, has written to UNESCO Director General Koichiro Matsuura, requesting that he revisit the SESAME decision and make a "fair and impartial recommendation." Money for the project could be raised in Armenian diaspora communities, Asaturian and Hovnanian say. At press time, though, the Armenian campaign had yielded no results.

Additional money must still be raised for SESAME. Estimates start at about \$65 million for moving, rebuilding, and upgrading BESSY I, constructing associated labs, and operating the facility for five years.

Planners hope to raise funds from SESAME member countries as well as from other sources, including Europe, Japan, and the US. "The various problems have to be solved one after the other," says SESAME interim chair and former CERN director Herwig Schopper. "In order to be able to discuss the funding and approach possible sponsors, the site decision had to be taken first."

TONI FEDER

Physics Enrollment Leveling Off, Make-up Changing

In 1998, the number of physics bachelor's degrees conferred in the US (3821) was down 20% compared to five years earlier, a period over which the total number of bachelor's degrees conferred annually remained flat. The decline in physics degree production may soon level off, however, according to a recent report by the American Institute of Physics.

The steepest declines in the numbers of bachelor's degrees awarded were seen in departments with graduate physics programs, falling 39% and 24% since 1992 for master's- and PhD-granting departments, respec-

tively, compared to a 10% drop at departments where the bachelor's was the highest degree available.

The number of first-year students in US graduate physics programs remained level in fall 1998; however, the proportion of US citizens among incoming students continued to slide, and in 1998–99 they were outnumbered by noncitizens.

A total of 1323 physics PhDs were conferred in 1998, down slightly from the previous year. And, based on enrollment data, the AIP report predicts a continued decline in US physics PhD production over the next few years.

Women continue to be underrepresented in physics at all degree levels: In 1998 they comprised 19% of bachelor's recipients and 13% of PhD recipients. Their numbers are stronger in astronomy, with 33% of bachelor's degrees and 19% of PhDs going to women in 1998.

These and other data can be found in the latest annual *Enrollments and Degrees* report, available free of charge from AIP, Education and Employment Statistics Division, 1 Physics Ellipse, College Park, MD 20740; e-mail stats@aip.org; Web <http://www.aip.org/statistics/trends/undtrends.htm> ■



Web Watch

<http://www.ucsusa.org/arms/arms-home.html>
<http://www.fas.org/>

Two science-based advocacy groups offer a wealth of on-line material about arms control. Founded at MIT in 1969, the Union of Concerned Scientists has, as one of its current focus areas, the so-called National Missile Defense project. The Federation of American Scientists began life in 1945 as the Federation of Atomic Scientists, which was founded by veterans of the Manhattan Project. Its frequently updated Web site recently featured satellite images of North Korea's Nodong missile test facility.



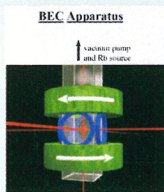
<http://www.spoof.gsfc.nasa.gov/earthmag/demagint.htm>

That Earth itself is a magnet was first realized 400 years ago by the English scientist William Gilbert, who sought to explain why compass needles point north. To commemorate that *coup de recherche*, David Stern of NASA's Goddard Space Flight Center has compiled *The Great Magnet, The Earth*, an extensive site about Gilbert's life and work.



<http://www.colorado.edu/physics/2000/cover.html>

The self-professed aim of Physics 2000, an educational Web site from the University of Colorado at Boulder, is "to make physics more accessible to students and people of all ages and to counter its current negative image." The interactive site contains, among many other things, a series of animations that describe the principles and practice of Bose-Einstein condensation.



To suggest topics or sites for Web Watch, please contact ptwww@aip.org by e-mail.

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