Undergraduates Assemble Neutron Detector

Spreading the construction of a detector across several institutions brings project visibility to participants.

"The undergraduates come running." So says Ruth Howes about student participation in the Modular Neutron Array, or MoNA, a detector built in large part by undergraduate physics majors. Howes, chair of the physics department at Marquette University in Milwaukee, Wisconsin, says it is unusual and significant that students can work on MoNA without leaving their home institutions. The detector was installed last summer at the National Superconducting Cyclotron Laboratory (NSCL) at Michigan State University in East Lansing.

With MoNA, says MSU's Michael Thoennessen, the project's leader, "we can address one of the most interesting questions in heavy ion physics: For a given proton number, what's the heaviest isotope you can make?" For oxygen, this limit—called the dripline for isotopes that persist for milliseconds—is ^{24}O; with one more neutron, ^{25}O lives only 10^{-21} seconds. An experiment planned for MoNA, Thoennessen adds, "is to take a beam of fluorine-26, which we can make here at the lab, and send it to a thin target, typically beryllium, to strip a proton. Then ^{26}F becomes ^{25}O, which decays immediately into ^{24}O." From the ejected neutron's time-of-flight and position on the detector, "we can get the neutron's energy and can reconstruct to show that ^{25}O was created, how long it lived, and what its decay energy was," says Thoennessen.

The facilities offering the biggest competition for MoNA, he adds, are GSI in Darmstadt, Germany, RIKEN in Tokyo, and GANIL in France.

Ranking right up with the project's scientific potential is student involvement, which helped drum up funding. Recalls Jim Brown, a physicist at Wabash College in Crawfordsville, Indiana, "At a users' meeting, I popped off with, 'Nothing looks too difficult to assemble. We could get undergraduates.' My idea was that it would involve my students—it would give my guys something to do that would be good. Michael Thoennessen called a couple of months later, and said yes." NSF funded the project with more than $900 000, split among the 10 campuses that built MoNA.

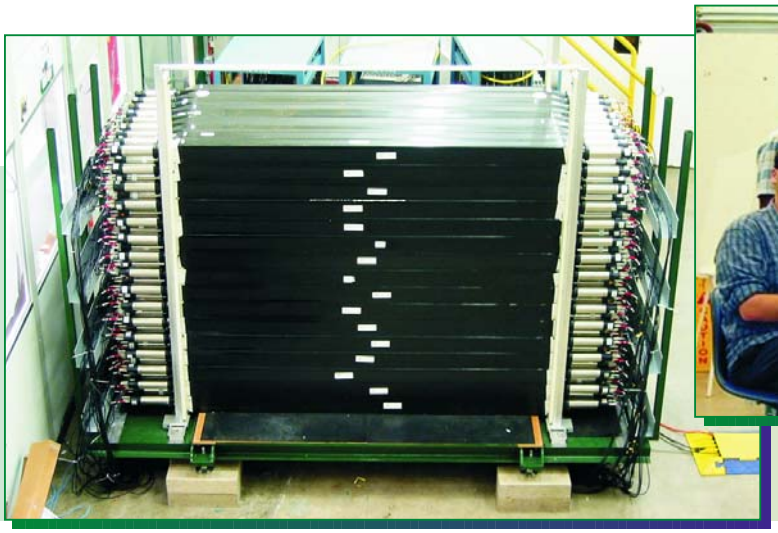
Nontraditional students

The detector consists of 144 two-meter-long plastic scintillator bars arranged in 9 vertical layers of 16. Photons created when incident neutrons interact with the scintillator are recorded by photomultipliers at the ends of the bars. MoNA is sensitive to neutron energies from 50 to 250 MeV.

Perhaps the most novel aspect of the construction process was that students could work on MoNA from their home institutions. To be sure, some did go to NSCL through NSF's Research Experience for Undergraduates program. But others signed on directly through their physics departments. "Increasingly, undergraduate physics departments are seeing nontraditional students," says Howes. "One of my undergraduates had been a funeral director. He was 30 and had a steady girlfriend. Another had worked in industry and had a wife. They appreciate being involved in real, publishable research, but they can't leave home the way 20-year-olds can, for the whole summer."

A local presence on college campuses brings other benefits, Howes says. "Pieces of hardware were delivered to undergraduate institutions. That meant we had labs with equipment. This is far more interesting to a casual passerby than a work station." As a result, she adds, it is easier to attract students and to obtain the internal grants and fellowships that "you depend on when you are at a small college." MoNA members, in addition to MSU, Marquette, and Wabash, are Central Michigan University in Mt. Pleasant; Concordia College in Moorhead, Minnesota; Florida State University in Tallahassee; Hope College in Holland, Michigan; Indiana University at South Bend; Western Michigan University in Kalamazoo; and Westmont College in Santa Barbara, California.

Phil Voss, who began working on MoNA as a junior at Central Michigan University, describes a stint at MSU: "We had two hours of lectures every morning. We calibrated [the detector], did some dirty work, painted a couple



THOMAS BAUMANN/MSU

The Modular Neutron Array (left) was assembled by undergraduates (above) at Concordia College and nine other institutions.

of steel bars that slow down neutrons. I stayed an extra week, I enjoyed it so much." Uchenna Onwuemene, who also worked on MoNA as an undergraduate, adds, "We learned about nuclear physics. We saw the cyclotron and learned the part the detector would play. We saw the big picture."

Suitcase alternatives

At NSF, the MoNA collaboration is considered a big success, says Brad Keister, the foundation's program director for nuclear and theoretical physics. "It's an important part of experimental physics to build the things you measure with. And I don't know anyone who is excited about 'suitcase physics.' In this case, at least part of the construction took place at the home institutions." At the inauguration of the upgraded NSCL in 2001, he adds, "Bob Eisenstein [then NSF's assistant director for mathematical and physical sciences] walked up to a poster [about MoNA] and said, 'That's what NSF is about.' It's difficult for big science in big institutions to partner with undergraduate institutions—especially several of them at once. To the credit of Michigan State, they figured out how to make it work." The first data, a calibration run using helium-7, were taken last summer.

Now that the detector is in use, MoNA organizers want undergraduate involvement to continue. "We are preparing a new proposal for NSF," says Thoennessen. "We'd like to have [students] analyze data, and to come here to Michigan for workshops."

Toni Feder

Missing Magazines Highlight Staff Distrust of Los Alamos Management

After an *annus horribilis* at Los Alamos, the atmosphere at the lab is still uneasy.

As the University of California (UC) finishes the last seven months of its current contract to manage the Department of Energy's Los Alamos National Laboratory, controversy and change have become the two constants for the weapons lab's staff. Over the past several years, the lab has been under assault by critics in the administration, Congress, and DOE for a litany of perceived breaches in security, safety, and accounting. The last director was forced to resign, and the current director, G. Peter Nanos, is at odds with many on his staff over his recent shutdown of the lab and his charges that the scientists created a "cowboy culture" at the facility.

The result of all the turmoil, according to many scientists and managers, is low morale and serious worry about what happens if UC loses its management contract. In the absence of hard facts, rumors abound about what a change in management would mean for individual benefits, pensions, and job stability. "People want certainty, and what LANL has at the moment is a lot of uncertainty," says James Fallin, the lab's director of public affairs.

The rumor mill went into overdrive when many LANL employees didn't receive their December 2004 issue of PHYSICS TODAY. That issue contained an Opinion piece (on page 60) in which LANL physicist Brad Holian compared the lab's safety record to those of other DOE labs. According to a survey conducted by PHYSICS TODAY, 59% of the lab's 414 subscribers didn't get that issue. In February, the nondelivery rate was 2.6%.

"Almost everybody has assumed that [the reason behind the missing issue] is something malicious, but a couple of years ago they would have thought it was simply a problem with the mailroom," says Holian. "I'm not very much into the conspiracy theory business," he adds. LANL is investigating the disappearance of the magazines and has implemented a new tracking process to better ensure that magazines and journals are properly delivered, says Fallin. "There never has been, nor would there ever be, any attempt to keep those kinds of publications away from employees," he says, "and quite frankly, we're scratching our heads over what happened."

Trying times

LANL recently returned to full operations following a six-month shutdown ordered by Nanos after two classified disks were reported missing and a student suffered a serious eye injury while working at the lab (see PHYSICS TODAY, November 2004, page 31). More than a dozen employees, including managers, were suspended or fired. The shutdown delayed work on major contracts and, according to the lab's own estimates, cost between $127 million and $500 million.

On 28 January, the National Nuclear Security Administration (NNSA), the DOE arm that oversees the nuclear weapons labs, announced that "the allegedly missing disks never existed and no compromise of classified material has occurred." As a result of the NNSA findings, UC was fined $5.1 million from its 2004 $8.7 million management fee. "The major weaknesses in controlling classified material revealed by this incident are absolutely unacceptable," NNSA Administrator Linton Brooks said in a statement.

"We got walloped," UC spokesman Chris Harrington says of the fine. "This is a very aggressive action by the NNSA. Unfortunately, we deserved it. . . . We have taken the necessary actions and steps to ensure that the proper policies and procedures are now in place . . . so that this doesn't occur in the future. And if there are going to be lapses and problems, then [people will expect] that there are going to be consequences."

Nanos, who has been LANL director for about two years, upset some employees in a series of all-hands meetings, commonly watched on videocast. "The director's words and actions have created a tremendous amount of stress, anxiety, distrust, and frankly, embarrassment for us," says David Hanson, a theoretical physicist at LANL.

In a 19 January all-hands meeting, Nanos complained about the December 2004 issue of PHYSICS TODAY. Holian's Opinion piece states that LANL's safety record for serious accidents is better than any other nuclear weapons lab's (see page 10 of this issue), whereas Nanos had said previously that it was worse than average. According to Hanson, the director made it quite clear that he did not agree with Holian's conclusions and implied that the article contained errors, which he did not specifically identify.

But now, says Fallin, "Nanos wants to take the discussion away from numbers, away from comparison with other institutions, and bring it all back home to where employees themselves see that they need to take responsibility for their own safety and that of their colleagues. Nanos does not want to have to telephone another family about a serious injury caused by carelessness at the lab." In the January meeting, Nanos said that new safety and security procedures will