signal to background

Science meets architecture; changing China; Energy Secretary at Fermilab; outreach in Bangalore; artistic Super-K detector; Illinois Accelerator Day; Pakistan's magnet feet; letters.

Photos: Gregory Loew

Science meets architecture

A step away from the cars scuttling down the streets of Delhi, precisely arranged on a tame green lawn, is what looks like a giant's playground.

Twin cylinders squat at the far end. A pole stands at the center of each, matching the windowed cylinders' radii and heights. Their shadows fall across the floor's slender wedges, where minutes and degrees mark the lunar calendar.

Nearby, twin bowls carved in marble host a celestial map. A giant sundial, cradled in a quadrant, soars above it all.

This is Delhi's Jantar Mantar, one of four remaining observatories in towns across northern India, and a site visited by physicists who were in India for an International Linear Collider Global Design Effort meeting.

The buildings date to the 1720s, when Jai Singh II ruled Amber, India. Singh commissioned the brick and marble observatories to measure time, create astronomical tables, and predict the movements of celestial bodies—which also meant predicting eclipses.

The advent of small brass instruments made this massive masonry obsolete before the first brick was laid. Today, it offers a glimpse of India's early efforts to bridge science and architecture.

Krista Zala

Physicists witness a changing China

China gave the year a haunting label: "Curse of 1976." The Premier of the Peoples Republic, Zhou Enlai, died in early January. Chinese Red Army founder and elder statesmen Zhu De died in early July. Chairman Mao Zedong died in September, prompting the bloody power grab by The Gang of Four. And on July 28, an earthquake estimated at magnitude 8.0 struck the industrial city of Tangshan, about 95 miles from Beijing, followed by a magnitude 7.1 aftershock. The official death toll was more than 240,000; unofficial estimates surpassed 600,000 dead and more than 750,000 injured.

This was the scarred and battered China that met SLAC director W.H.K. "Pief" Panofsky on his first visit in late summer of 1976—just four years after the historic visit of US President Richard Nixon. Panofsky made his journey by invitation of Chang Wu-yen, to discuss possibilities for China embarking on a high-energy physics program. "I assumed that my trip would be canceled," Panofsky says, "but Chang prevailed that it should go forward despite the fact that many buildings in Beijing had been condemned as unsafe, and people were living in the streets in tents erected by the army."

Panofsky saw a people determined to move on. "Regular life was disrupted by the earthquake," he recalls, "but I was impressed by the flood of bicycles, by the general resourcefulness of people 'to cope,' and by the insistence of some of the Chinese scientists to go forward in pursuing HEP." Through Chang, Panofsky met with scientists and government officials to consider their approach. "We discussed alternatives," he says. "At that time, the Chinese had planned to build a proton machine near the Ming tombs [about 30 miles from Beijing]. As a result of my raising questions as to this approach, Fang Yi, the Chinese Science Minister, visited the US, including Fermilab. This resulted finally in the Chinese decision to build the [Beijing Electron Positron Collider]."

Thus, Panofsky was an active participant in HEP collaboration between the two countries even before the official PRC-US Committee was formed in 1979 by President Jimmy Carter and Premier Deng Xiaoping. Panofsky credits SLAC and Fermilab, especially Fermilab Director Robert Wilson, with boosting China in its initial high-energy physics efforts. He recalls: "Bob Wilson, after extensive soul searching on the subject, agreed that it would be best for China to build an electron-positron colliding beam machine as an initial entry into HEP."

Panofsky has been a member of the PRC-US Committee since its inception. Among many other colleagues, he was joined in 1986 by Berkeley Lab Physics Division director Pier Oddone, who is now the director of Fermilab. Through their visits over the ensuing decades, they have seen changes that they find amazing even while watching them happen. "There has been a tremendous transformation," Oddone says. "The streets were once filled with bicycles, and now they are filled with cars. The economy has grown 10 percent a year for 20 years."

Asked what has changed the most, Panofsky says: "My answer is: almost everything. There is vast migration of people from the countryside to the cities, the ruthless tearing down of old buildings in the cities to make room for high rises to accommodate the influx, the displacement of bicycle traffic by automobiles, and the dramatic rate of construction of roads to accommodate that traffic. But mainly, people talk much more freely."

Chinese colleagues apparently speak freely and respectfully of Panofsky, conferring on him the title, "Lao Pan." Panofsky explains: "'Lao Pan' means something like 'Good Old Pan' or 'The Elder Pan.' 'Lao' is a title without American English equivalent, denoting both a form of address, such as 'Mr.' and also one who is something of a respected patriarch."

Mike Perricone

Pier Oddone (top photo) exchanges greetings with Premier Deng Xiaoping while visiting China in 1988 with the PRC-US Committee.

Pief Panofsky (bottom photo, right) confers with Peoples Republic Science Minister Fang Yi in this image from the IHEP-Beijing website commemorating the 25th anniversary of the PRC-US Committee.

Photos courtesy of IHEP-Beijing

Photo: Reidar Hahn, Fermilab

Secretary of Energy Samuel Bodman tours Fermilab.

Bodman on Fermilab

A portion of US Energy Secretary Samuel Bodman's remarks during his visit to Fermilab on April 7, 2006:

"Successful futures are built on past successes, and in this respect, you have every reason to be optimistic and confident about your future. The performance of the Tevatron, the most powerful particle accelerator in the world, has been truly successful, and I want you to know that that is noticed and that it is appreciated. You are successfully employing technologies, such as electron cooling, that have never before been used at this energy and scale, to obtain record luminosity. You are consistently raising the bar to levels that allow the observation of those elusive states that define the meaning of mass, or to create supersymmetric particles for the first time since they were produced by the big bang. The Large Hadron Collider at CERN depends on your work. The science there will stand on the shoulders of Fermilab's achievements and experience… Fermilab is currently the most important high-energy physics laboratory in the world. And the future of high-energy physics research in the United States depends on this laboratory remaining robust.

I fully support the possibility of bringing the International Linear Collider to this lab. There are a great many difficult steps that will be needed for this to occur. This audience understands better than I just what those steps are and how difficult they will be. But it is a goal worth fighting for. This may turn out to be the most profound new science that we will be seeing in our lifetime."

e-Lab outreach in Bangalore

Armed with tin foil, GPS units, and sheets of black paper, two Fermilab educators headed to Bangalore to help high-school and college teachers set up a detector at a local planetarium. Indian students will join a study of cosmic rays. "The goal is to set up a research community that involves teachers and students," says Marge Bardeen (photo below, back row, left), director of Fermilab's Education Office, and co-facilitator of the two-day Bangalore workshop. "We set up the detector, and taught teachers how their students can conduct investigations online."

Using a website called an e-Lab, students can upload and analyze cosmic-ray data, showcase their research, and communicate with US students doing similar studies. In the e-Lab, students ask questions about cosmic rays and use the shared, online data to answer their questions. Co-facilitator Bob Peterson, also of Fermilab's Education Office, says part of the excitement is in figuring out what to ask. "There isn't one big cosmic-ray question that the students are trying to answer," he says. "One student asked me how snow affects cosmic rays, for example, and wound up creating a research project to find out."

Though cosmic ray detectors are scattered throughout US high schools, and about 170 are hooked up to the e-Lab now, the Bangalore visit made the collaboration international. "Our goal for this trip was to enable students in India to join the collaboration with the American students who are already logged in," says Peterson, adding that the Bangalore workshop participants were excited about bringing their classrooms online. "They were so smart and knowledgeable in high-energy physics, but also so open to new ideas," he says. "They said 'this changes the way we teach,' but they were excited to try it."

Siri Steiner

Photo: Fermilab Education Office

Art meets science at Super-K detector

At first glance, it seems to be another example of soulless high technology—its very name, photomultiplier tube, is devoid of poetry. Shaped like a miniature spacecraft, glowing with a mysterious golden luster, it seems to be of extraterrestrial origin.

Yet it represents the quintessence of Japanese craftsmanship. Made by Hamamatsu Photonics, each tube is handblown by a craftsman to a precision that no manufacturing technique can achieve. About 13,000 of these handcrafted electronic marvels line the walls, floor and ceiling of the mammoth Super-Kamiokande (Super-K) detector facility.

"It is like the work of the glass blowers in Venice," says Jeff Wilkes of the University of Washington, spokesman for the contingent of US scientists collaborating with their Japanese counterparts at Super-K. "But it is on a much larger scale, with tremendous attention to quality and detail."

Located in an old mine one kilometer below ground level, Super-K is one of the world's answers to the elusive neutrino, a chargeless, nearly massless particle so elusive that it can pass through a thousand miles of lead. Super-K's detector is a giant cylinder of ultra-pure water, surrounded by thousands of photomultiplier tubes (photo below). Neutrinos moving through the water with the speed of light emit an extremely faint blue glow that the tubes collect and amplify.

Commissioned in 1996, the Super-K detector enabled pioneering work on cosmic-ray physics, research of dark matter, and experimental inspection of Grand Unification Theories. Then in November, 2001, disaster struck. A change in pressure, probably from a crack, caused a photomultiplier tube to implode, starting a chain reaction. In minutes, about 6000 more had burst.

After several years of tireless effort, Super-K has been fully restored and will be recommissioned in June. The photomultipliers are now in plastic shielding to prevent a repeat of the 2001 accident. The scientists have taken advantage of the restoration effort to rearrange and add more tubes for improved neutrino detection, Wilkes says.

Chandra Shekhar

A special day in Illinois

Valentine's Day. Thanksgiving Day. Secretary's Day.

The United States celebrates and honors lots of events and people. In April, the residents of Illinois added another occasion to their list. Recognizing the importance of accelerator technology and the significant role that Fermilab and Argonne National Laboratory—both located in Illinois—play in the field, Governor Rod Blagojevich proclaimed April 21, 2006 as "Particle Accelerator Day" in Illinois.

"Illinois has been recognized as an international leader in accelerator technology thanks to these laboratories," said Jack Lavin (right, bottom photo), director of the Illinois Department of Commerce and Economic Opportunity, who read the proclamation at an event that also saw the signing of a Memorandum of Understanding by Fermilab director Pier Oddone (center, bottom photo) and Argonne director Rob Rosner.

Speaker of the US House of Representatives Dennis Hastert, who did not attend the event, sent congratulations from Washington, DC. "Fermilab and Argonne are two of the premier research institutions in the world," he said. "You don't have to understand every detail of what happens at these laboratories to know that great ideas come from them. With this new agreement, the position of our nation, and our state, can only be strengthened at the forefront of scientific research. I'm excited to think about the great discoveries to come from these two world-leading labs as they work together even more closely in the years ahead."

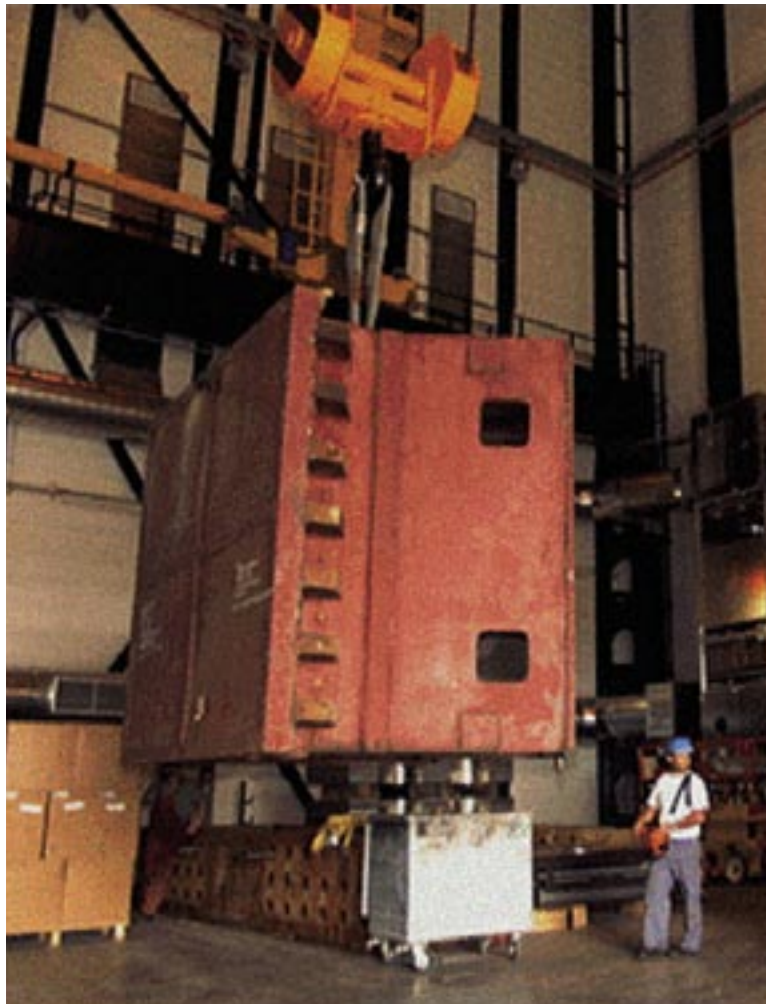
Kurt Riesselmann

Photo: Kamioka Observatory, ICRR (Institute for Cosmic Ray Research), The University of Tokyo

Photo: Reidar Hahn, Fermilab

30-ton foot

Pakistan does not have a long history of domestic particle physics experiments, but the country is nevertheless finding ways to contribute to international efforts. After signing an agreement in 1997 with CERN, the European particle physics laboratory, the Pakistani Atomic Energy Commission's company, Scientific and Engineering Services, constructed a set of large steel feet that support the 12,500 tons of magnet in the CMS detector for the Large Hadron Collider. Each foot alone weighs 30 tons. The feet were constructed in Taxila, Pakistan, and then traveled by truck, ship, and train to the Large Hadron Collider in Geneva.
David Harris



Photos: CERN

Letters

Ziploc

I just perused the April issue of *symmetry* and had to laugh about the Ziploc purse. I visited CERN for the first time a few months ago and was rummaging around the house trying to find something to store my coins in with the knowledge that I would have to keep three different currencies in order.

Ta da...a Ziploc!

I felt rather foolish at first, pulling out my baggie in the lunch line, but it worked great. I thought I was the only world traveler that had to resort to Ziplocs to keep my money straight but finding out that it's a physics culture thing really makes me feel like I have arrived…I truly am a high-energy physicist!

Thanks for the laugh.

Linda Bagby, Fermilab-DZero/CMS

Other significant uncited papers

Using Nobel laureate Abdus Salam as an example, Mart (*symmetry*, February 2006) informed readers that papers of symposium proceedings received no citation count and fortunately, the Nobel committee dug out the paper in a proceeding and recognized the originality as well as priority of Salam's work. I would like to offer another example on the significance of a paper that appeared in a symposium proceedings: Koichi Tanaka (2002 Nobel in Chemistry). Fortunately again, the Nobel committee sought out this paper to signify Tanaka's pioneer work.

The significance of a paper is occasionally not determined by the journal's name and associated reputation where the paper was printed. For example, in the obituary of Edward B. Lewis (1995 Nobel in Physiology or Medicine), Matthew P. Scott and Peter A. Lawrence wrote, "For those who suspect that the present emphasis on publication is overdone, Lewis provides a superb role model. He published rarely and did not seem to care where. Some of his papers came out in such obscure journals that they were exchanged, like samizdat, as faded Xerox copies." (*Nature* **431**, 143, 2004).

Canadian stem cell scientists Ernest A. McCulloch and James E. Till (2005 Albert Lasker Award for Basic Medical Research) published their breakthrough paper in a journal, which was not and is not as famous as *Nature* or *Science*.

Lastly, it would be unbelievable for present day researchers that the great American physicist Willard Gibbs published his important papers in a local journal *Transactions of the Connecticut Academy of Arts and Sciences*, which had limited circulation and was little read. It was Wilhelm Ostwald who translated Gibbs's paper into German to make his ideas gaining more recognition in Europe.

Min-Liang Wong, Department of Veterinary Medicine,
National Chung-Hsing University, Taiwan

Full citations to papers online at www.symmetrymagazine.org

A balanced life

It was very funny to read the cover-story of the March issue, when Ruth Howes mentions the feeling she got from fellow physicists: "It was about who could work hardest and who could be the tiredest"—this is indeed widespread in the physics community.

Competition is strong and physics is not an easy subject, but I admire physicists who are doing a good job, yet organize their work such that it doesn't prevent other projects in their life from happening. Physicists need to be intelligent, creative, and curious, so they should be interested in many other things in life.

I am sure that physics benefits from work atmospheres which are not perceived as one having to suffer or to sacrifice "everything" for the privilege of being a physicist. Elizabeth Freeman's career choice is certainly a very interesting, and certainly too rare, example of this.

Ursula Bassler, IN2P3, France

Letters can be submitted via letters@symmetrymagazine.org