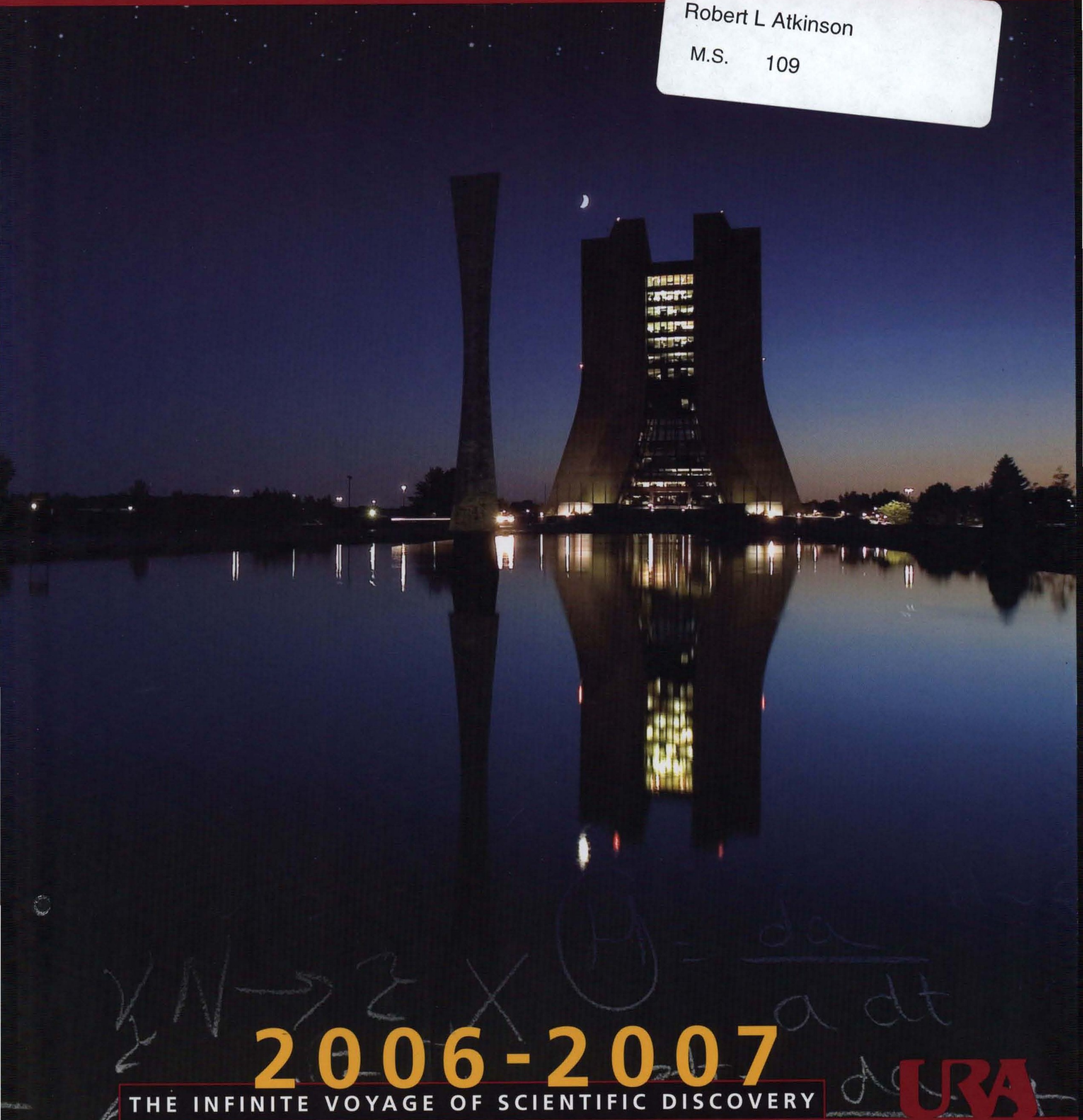
Universities Research Association, Inc.
ANNUAL REPORT



2006-2007
THE INFINITE VOYAGE OF SCIENTIFIC DISCOVERY

URA: Serving Universities and the Nation through Science

URA is "an entity in and by means of which universities and other research organizations may cooperate with one another, with the Government of the United States, and with other organizations, toward the support and use of laboratories, machines, and other research facilities, and toward the development of knowledge in the physical and biological sciences."

It was created "...for research, development and education in the physical and biological sciences, including all aspects of the field of high-energy physics, nuclear energy, and their engineering and other applications; and to educate and train technical, research and student personnel in said sciences."

In this aerial view of Fermilab, the main campus 16-story Wilson Hall (with Fermilab logo in parking area in front) stands on the Illinois prairie adjacent to the 4-mile Tevatron accelerator ring (left). The blue Central Utility Building is seen in the cooling pond surrounded by the smaller circular ring that houses the Booster accelerator. The Anti-Proton Source and Main Injector are seen in the distant background.

MESSAGE FROM THE URA PRESIDENT

The year 2006 was a notable year of transition in the history of URA and our 90 member universities, as well as for Fermilab, our flagship enterprise. In keeping with a new DOE policy that required all DOE national laboratory contracts to be subjected to competition, DOE in the spring of 2006 issued a Request for Proposals for the new Fermilab management and operation contract to begin January 1, 2007. With that in mind, in the fall of 2005 the Trustees of URA undertook a major reassessment of the management structure that might best serve a Fermilab future which includes 1) the pending shutdown of the Tevatron when the Large Hadron Collider (LHC) begins physics experiments at CERN in Europe, and 2) the ability thereafter to attract to Fermilab the proposed follow-on International Linear Collider (ILC).

As a consequence, the URA Trustees proposed, and the Council of Presidents at its annual meeting in February 2006 approved, a new partnership between URA and the University of Chicago (UChicago), in order to best prepare for a future at Fermilab which we all hope will include an ILC sited in northern Illinois. Accordingly, URA and the UChicago formed a new company in equal ownership, *Fermi Research Alliance, LLC* (FRA), for the purpose of submitting a proposal for the management and operation of Fermilab. EG&G, Inc. later joined the proposal as a named subcontractor. In August of 2006 the FRA team submitted its written proposal, and in September our team made oral presentations before the DOE selection panel.

On November 1, DOE announced the selection of FRA as the new Fermilab contractor. The URA-UChicago proposal received one of the highest scores ever awarded in a competitive DOE laboratory contract solicitation. FRA officially became the Fermilab contractor on January 1, 2007. Director Pier Oddone now also holds the title of President of FRA, LLC. The new FRA Board of Directors supersedes the former Fermilab Board of Overseers. Of its 24 members, half are appointed by UChicago and half by URA. At this writing, the FRA Board has had two meetings under the Chairmanship of University of Chicago President, Bob Zimmer.

Now beginning his third year as Fermilab Director, Pier Oddone presides over a Tevatron that continued to set new performance records throughout 2006 and into 2007; a world-leading program in neutrino physics; and a burgeoning agenda in experimental particle astrophysics—all as he and Fermilab, now working closely with Argonne National Laboratory, begin to lay the groundwork to host the proposed ILC, an electron-positron collider that would be the next major energy-frontier accelerator after the LHC.

In the meantime, Fermilab will remain the world leader at the high energy frontier of particle physics for most of this decade, and the Laboratory is already reaping outstanding physics returns from its second multi-year discovery campaign, "Collider Run II." Indeed, in 2007 the Tevatron has delivered more than twice as much integrated "luminosity" (number of proton-antiproton collisions) to the CDF and DZero experiments as in 2006. Fermilab's scientific and management talent also continues to lead U.S. participation in the LHC, in preparation for the expected 2008 startup. And Dr. Barry Barish of Caltech works from his office at Fermilab, and around the world, as leader of the Global Design Effort (GDE) to research and plan for the ILC. Early in 2007, the GDE reported its initial cost estimate for the ILC.

In its experimental hall deep underground, the *Neutrinos from the Main Injector* (NUMI) facility at Fermilab is also rapidly accumulating data, along with its sibling long-baseline MINOS detector at the former Soudan iron mine in northern Minnesota. Early in 2007, the *MiniBooNE* experiment completed gathering data and its "box" was opened to reveal its much-anticipated results. With plans for the new "NOvA" experiment in northern Minnesota, Fermilab is rapidly becoming the world center for accelerator-based neutrino physics. The Soudan mine also hosts the laboratory leading the search for enigmatic Cold Dark Matter in the universe. This and other undertakings in the realm of astrophysics and cosmology constitute a major new theme for Fermilab and its recently formed Institute for Particle Astrophysics.

The *Sloan Digital Sky Survey* collaboration continues to produce spectacular data of truly cosmic significance—data which have produced the largest number of most-cited astronomy publications of any ground or space-based observatory. In Mendoza Province Argentina, construction is essentially complete on the 17-nation *Pierre Auger Cosmic Ray Observatory*. Events already recorded by Auger comprise the world's largest data-set on ultra-high-energy cosmic rays, approaching 10^{20} eV—some 100 million times greater than the energy produced by Fermilab's Tevatron. The Auger Collaboration recently published its first findings based on those data. Under the outstanding leadership of Project Manager Paul Mantsch of Fermilab, Auger is on track (and under budget) for completion by the end of 2007, even as plans are being laid for subsequent construction of the complementary northern hemisphere array, to be sited in southeastern Colorado.

In the midst of these scientific successes, Fermilab continues to carry out its vitally important educational mission by producing the best of America's next generation of scientists and leaders. In 2006, work carried out at

Fermilab Director, Pier Oddone, seated left, and Dennis Wilson, U.S. Department of Energy Office of Science procurement advisor, shake hands at Fermilab after signing a 5-year, $1.6 billion contract with Fermi Research Alliance, LLC to manage the high-energy physics laboratory. Behind them are, from left, University of Chicago President Robert Zimmer, DOE Undersecretary for Science Raymond Orbach, then U.S. House Speaker Dennis Hastert and URA President Fred Bernthal.

Fermilab again resulted in the award of well over 100 Ph.D. degrees. Each year URA highlights this important measure of research productivity and vitality at Fermilab by awarding the annual URA Outstanding Ph.D. Thesis Prize. Similarly, URA sponsors Fermilab's annual Alvin Tollestrup Award for Outstanding Postdoctoral Research.

The 2006 Annual Meeting of the URA Council of Presidents (our "shareholders") was held in early February, with David Baltimore, then President of California Institute of Technology, presiding and concluding his year as Council Chair. Similarly, in late January 2007, Susan Hockfield, President of Massachusetts Institute of Technology presided after chairing the Council during the key Fermilab transition year of 2006. As always at these meetings, URA's corporate business was combined with the now traditional Policy Forum, which featured addresses by John Marburger, former Chairman of the URA Board of Trustees and now Science Advisor to President Bush; Senator Lamar Alexander, then Chair of the Senate Subcommittee on Energy; Congressman Bart Gordon, new Chair of the House Committee on Science; DOE Secretary Sam Bodman; DOE Under Secretary for Science Ray Orbach; and NSF Director Arden Bement. Some 70 URA member universities were again represented at both the 2006 and 2007 meetings.

URA has always enjoyed the generous voluntary service of numerous distinguished individuals, who provide leadership and oversight on our Board of Trustees, on the Fermilab Board of Overseers, and now the new FRA Board. We are especially grateful to: Joe B. Wyatt, Chancellor Emeritus of Vanderbilt University, and Chair of our Board of Trustees, for his long and diligent service; Robert Galvin, former Chairman and CEO of Motorola, for his wise counsel to URA as Vice-Chair of the Trustees; Emanuel Fthenakis, former Chairman and CEO of Fairchild Industries, who continues to lend his considerable experience and expertise as Chair of our Audit Committee; and Don Hartill, Professor of Physics at Cornell University for his years of exemplary service as Chair of the Fermilab Board of Overseers.

This is just a sampling of the extraordinary talent that assembles voluntarily from around the country and the world to assist URA and our funding agencies in their undertakings, reaffirming the benefits that derive from the URA partnership between Fermilab and our member research universities. This paradigm of university-government-laboratory partnership has been frequently emulated at other agencies, to the considerable benefit of the nation's research enterprise.

As we write new chapters in the history of URA's scientific endeavors, our vision remains grounded in the original URA Articles of Incorporation, key excerpts of which appear on the inside cover of this report. In keeping with that charter, URA remains ready to respond to other appropriate opportunities to serve the U.S. and international research community. We look forward to another exciting year of service to our university community and to the American people, as we continue the infinite voyage of scientific discovery.

MEMBER UNIVERSITIES

ALABAMA
University of Alabama-Tuscaloosa

ARIZONA
Arizona State University
University of Arizona

CALIFORNIA
California Institute of Technology
University of California-Berkeley
University of California-Davis
University of California-Irvine
University of California-Los Angeles
University of California-Riverside
University of California-San Diego
University of California-Santa Barbara
Stanford University

COLORADO
University of Colorado-Boulder

CONNECTICUT
Yale University

FLORIDA
Florida State University
University of Florida

HAWAII
University of Hawaii-Manoa

ILLINOIS
University of Chicago
Illinois Institute of Technology
University of Illinois at Chicago
University of Illinois
at Urbana-Champaign
Northern Illinois University
Northwestern University

INDIANA
Indiana University
University of Notre Dame
Purdue University

IOWA
Iowa State University
University of Iowa

KANSAS
Kansas State University

LOUISIANA
Louisiana State University
Tulane University

MARYLAND
Johns Hopkins University
University of Maryland-College Park

MASSACHUSETTS
Boston University
Harvard University
Massachusetts Institute of Technology
University of Massachusetts-Amherst
Northeastern University
Tufts University

MICHIGAN
Michigan State University
University of Michigan
Wayne State University

MINNESOTA
University of Minnesota

MISSOURI
Washington University in St. Louis

NEBRASKA
University of Nebraska-Lincoln

NEW JERSEY
Princeton University
Rutgers University

NEW MEXICO
New Mexico State University
University of New Mexico

NEW YORK
Columbia University
Cornell University
University of Rochester
Rockefeller University
State University of New York-Buffalo
State University of New York-Stony Brook
Syracuse University

NORTH CAROLINA
Duke University
University of North Carolina-Chapel Hill

OHIO
Case Western Reserve University
Ohio State University

OKLAHOMA
University of Oklahoma

OREGON
University of Oregon

PENNSYLVANIA
Carnegie Mellon University
Pennsylvania State University
University of Pennsylvania
University of Pittsburgh

RHODE ISLAND
Brown University

SOUTH CAROLINA
University of South Carolina

TENNESSEE
University of Tennessee-Knoxville
Vanderbilt University

TEXAS
University of Houston
University of North Texas
Rice University
Southern Methodist University
Texas A&M University
Texas Tech University
University of Texas-Arlington
University of Texas-Austin
University of Texas-Dallas

UTAH
University of Utah

VIRGINIA
Virginia Polytechnic Institute
University of Virginia
College of William and Mary

WASHINGTON
University of Washington

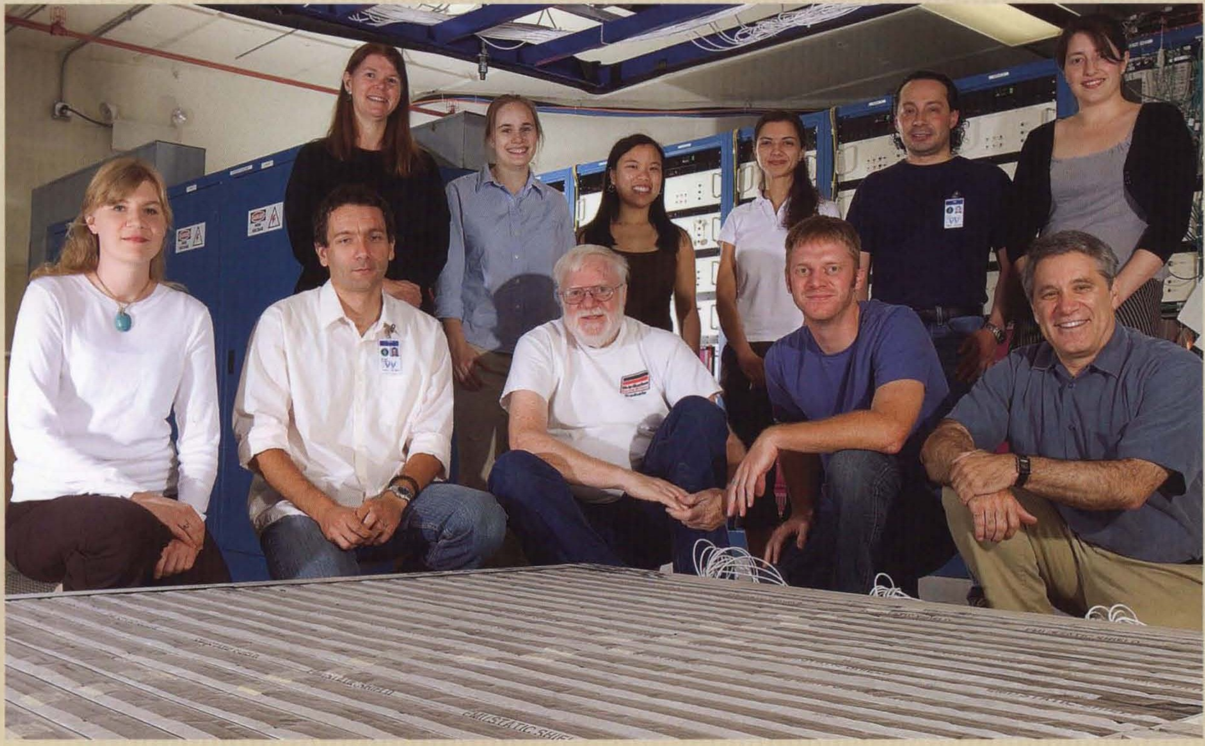
WISCONSIN
University of Wisconsin-Madison

CANADA
McGill University
University of Toronto

ITALY
University of Pisa

JAPAN
Waseda University

Fermilab users from around the world work with the Laboratory's employees to advance the frontiers of particle physics

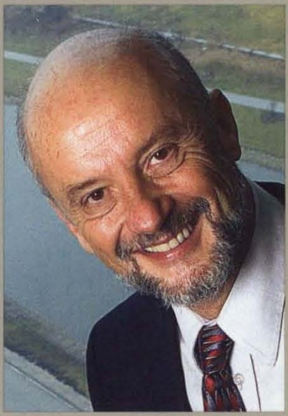


FERMILAB

OVERVIEW

Fermi National Accelerator Laboratory, 30 miles west of Chicago, is a U.S. Department of Energy national laboratory with the primary mission to provide the facilities and resources necessary for advancing the understanding of the fundamental nature of matter and energy, and to provide leadership and resources for qualified experimenters to conduct basic research at the leading edge of high-energy physics and related disciplines.

Fermilab is the home of the Tevatron, the world's highest-energy particle accelerator. Particle beams circle through a ring of magnets four miles in circumference to generate collisions that produce experimental conditions equivalent to those that existed in the first quadrillionth of a second after the birth of the universe. Large detectors record and analyze these high-energy particle collisions to unveil the forces and particles that have governed the evolution of the universe since the Big Bang.



Fermilab Director Piermaria Oddone

Fermilab also has the world's most powerful proton beam for creating neutrinos, ghost-like particles that can cross through the entire Earth without leaving a trace. The huge number of neutrinos produced at Fermilab allows scientists to conduct experiments that explore the role these particles have played in the formation of the universe. The detectors for both collider and neutrino experiments are built and operated by large teams of visiting scientists and Laboratory staff.

The Center for Particle Astrophysics at Fermilab includes groups investigating cosmic rays, supernovae, dark matter, dark energy and other phenomena. Together with the collider and neutrino experiments, these research projects place Fermilab at the frontier of global particle physics and particle astrophysics research.

Fermilab currently provides research facilities for some 2,500 particle physicists and their students, from 259 institutions in 37 states (plus the Commonwealth of Puerto Rico) and 31 foreign countries. The U.S. scientists' research is usually supported by DOE and the National Science Foundation, and in some cases by university funds.

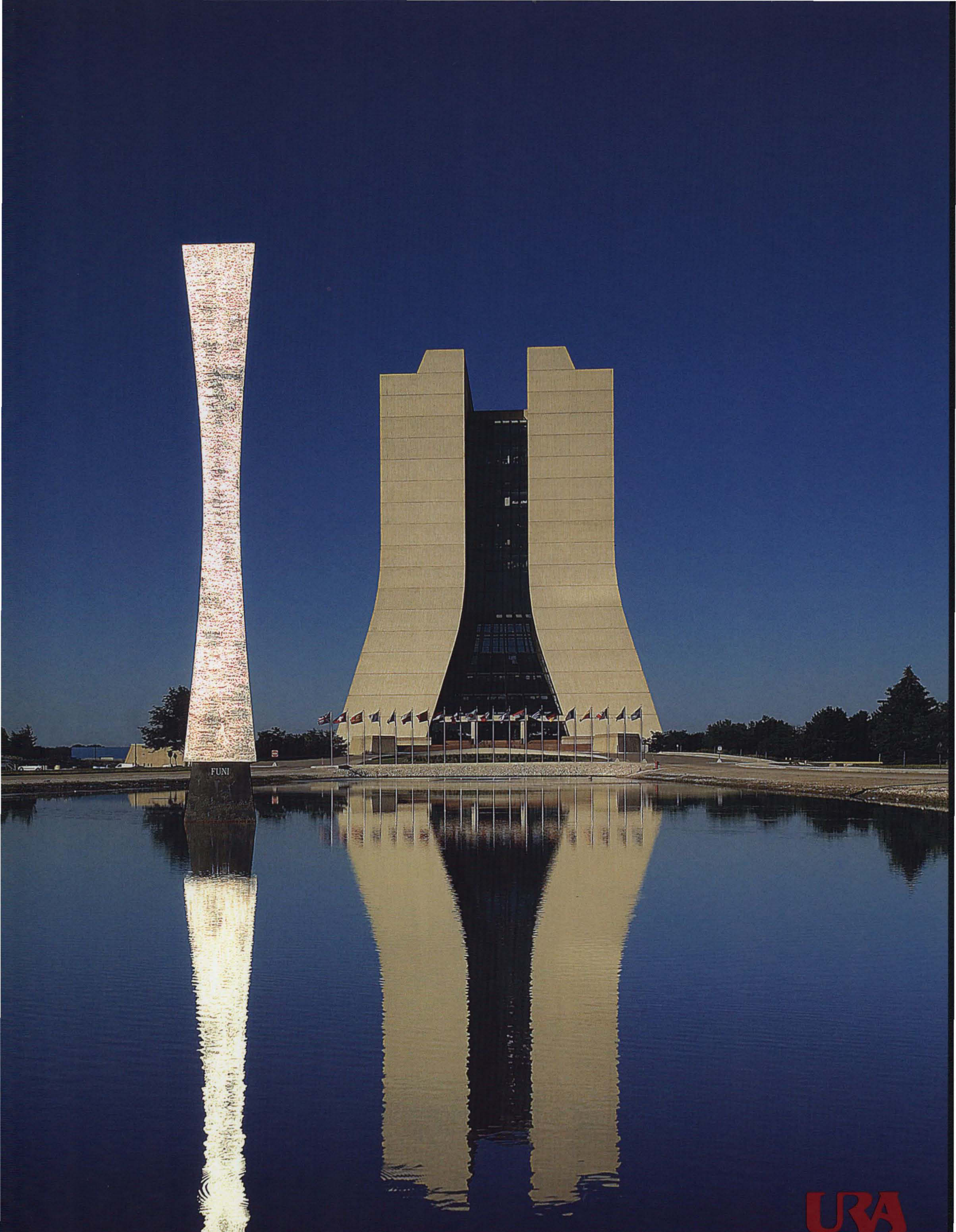
EVOLUTION OF THE LABORATORY

Today, the Fermilab accelerator complex consists of a chain of five machines that accelerate particles in sequence to increasing energy. Fermilab began operations in the early 1970s with a single beam of protons directed at fixed-target detectors. The Laboratory has upgraded its capabilities over the years to advance the exploration of the fundamental building blocks of matter. The first major upgrade was the development of the Tevatron, the world's first superconducting synchrotron, with beam energies of approximately one TeV or one trillion electron volts. It operated for the first time in 1983, and the leaders of its design and construction team received the National Medal of Technology in 1989.

Another vital upgrade enabled the Tevatron to become a collider, accelerating antiprotons as well as protons to TeV energies, in beams traveling in opposite directions, to produce collisions at selected interaction regions. The first proton-antiproton collisions were achieved in 1985, and now two 5,000-ton detectors, CDF and DZero, track and record the subatomic particles that emerge from proton-antiproton collisions. The collaborations that use these detectors announced in March 1995 the discovery of the top quark, a fundamental particle with an electric charge two-thirds that of the electron, and a mass nearly equal to that of one atom of gold. In late 1997, the Laboratory ended Tevatron Collider Run I in order to make major improvements to the Fermilab accelerator complex and the two big collider detectors for Run II. Meanwhile, the last run of the Tevatron fixed-target program was completed in early 2000, the same year one of the collaborations announced the discovery of the predicted, but hitherto unobserved, tau neutrino, thereby completing the discovery of the members of all the three families of elementary particles.

Fermilab's Wilson Hall is a landmark for both the local neighborhood and the high-energy physics community

The stately 16-story Robert Rathbun Wilson Hall rises above the surrounding Illinois countryside. Inspired by a Gothic cathedral in Beauvais, France, its twin towers are joined by crossovers beginning at the seventh floor. The distinctive texture of the outer walls was created by using forms with staggered boards when the concrete was poured. Headquarters for the laboratory's administrative staff, Wilson Hall also offers the breathtaking expanse of one of the world's largest atriums, which soars to the very height of the structure and contributes to the sense of open space.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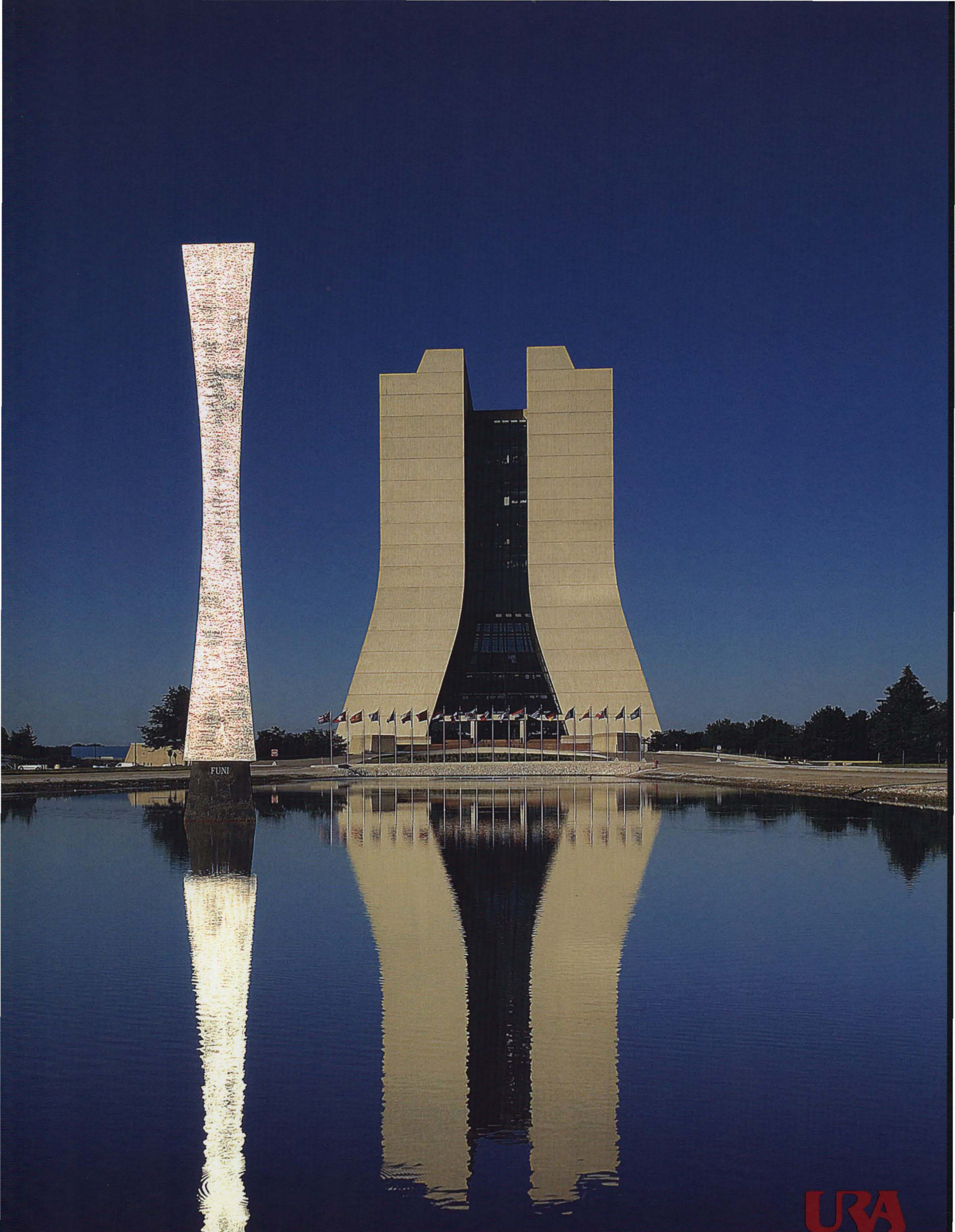
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Major improvements in the accelerator complex have led to an increase of the collision energy and to a much higher collision rate

Major improvements in the accelerator complex since the end of Run I have led to an increase of the Tevatron collision energy to nearly 2 TeV and to a much higher collision rate. The two-mile Main Injector, completed in 1999, has increased the rate of antiproton production for Run II. The Recycler, a storage ring located in the Main Injector tunnel that began operation in 2005, has eliminated a bottleneck in the accelerator chain and allows for large bunches of antiprotons to be injected into the Tevatron collider. The Recycler's successful operation involves reducing the size of the antiproton beams. The smaller and denser the antiproton beams, the larger the collision rate with the proton beams. Increasing the density of the beam is achieved via cooling, and one way to cool the beam is to bathe it in "cold" electrons.

Fermilab Deputy Director Young-Kee Kim reviews points of a presentation during the All Hands Meeting held in Ramsey Auditorium. Her overall goals include: "To keep the lab a great place and a safe place to work, a great place for science, and a great place for the public that supports us."

TODAY'S RESEARCH PROGRAM

Fermilab's two collider detectors were substantially overhauled for the new, higher-event-rate environment of Collider Run II, and there has been extraordinary improvement in the performance of the accelerator complex to achieve the Run II goals by 2009. All of the accelerator improvements for Collider Run II combined could provide proton-antiproton collision data up to sixty times that of the entire Collider Run I, and thereby increase the potential for discoveries, from finding the Higgs particle to detecting extra dimensions of space.

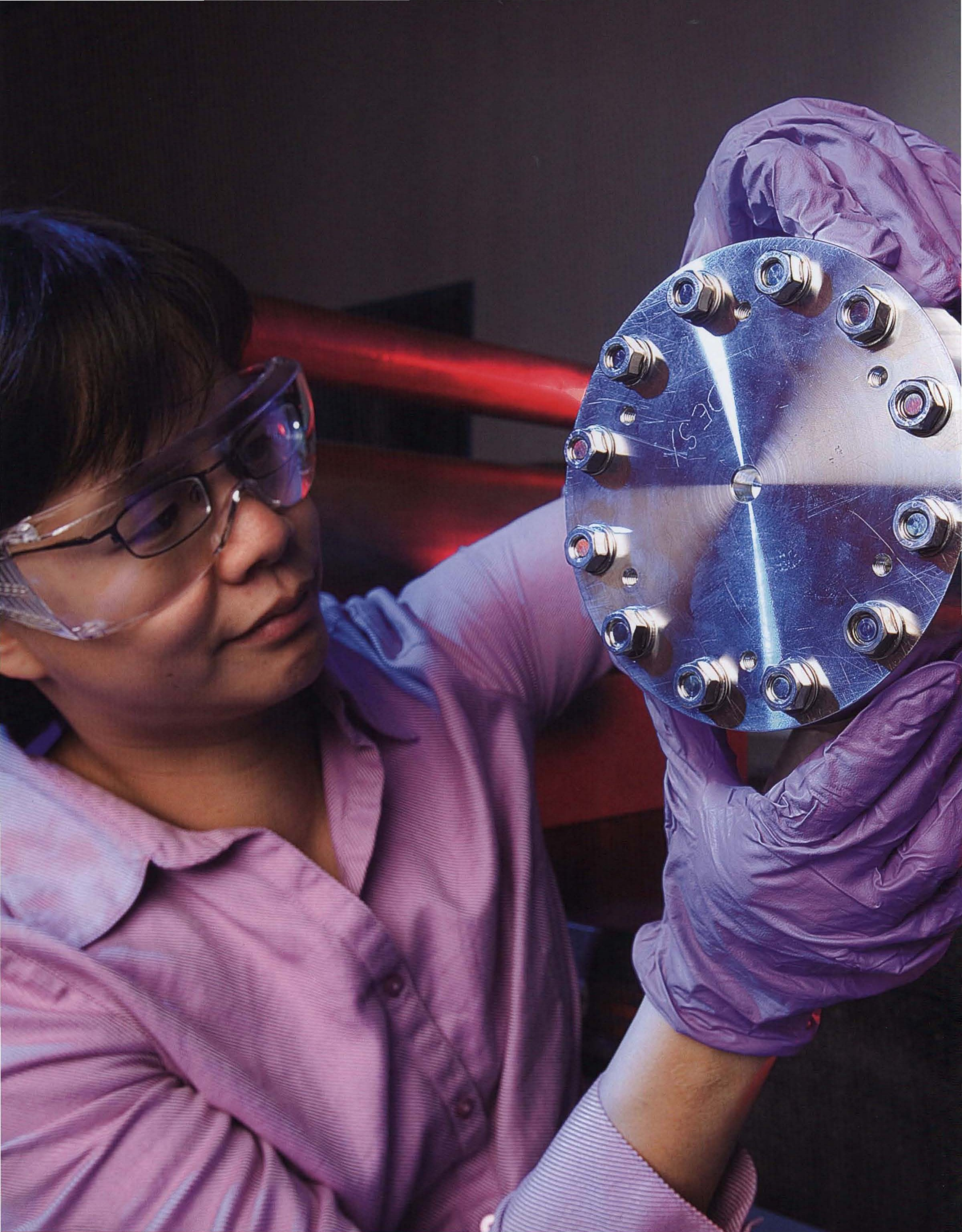
The Laboratory's current fixed-target program includes two forefront neutrino experiments: MINOS, which receives 120 GeV protons from the Main Injector; and MiniBooNE, which receives 8 GeV protons from the Booster, the proton injector accelerator for the Main Injector. Both experiments have published important new results about neutrino oscillations and the possible existence of a fourth type of neutrino. A third major neutrino experiment involving the Main Injector, called NOvA, has received initial approval for construction from DOE. Two smaller neutrino experiments, SciBooNE and MINERVA, are now in preparation.

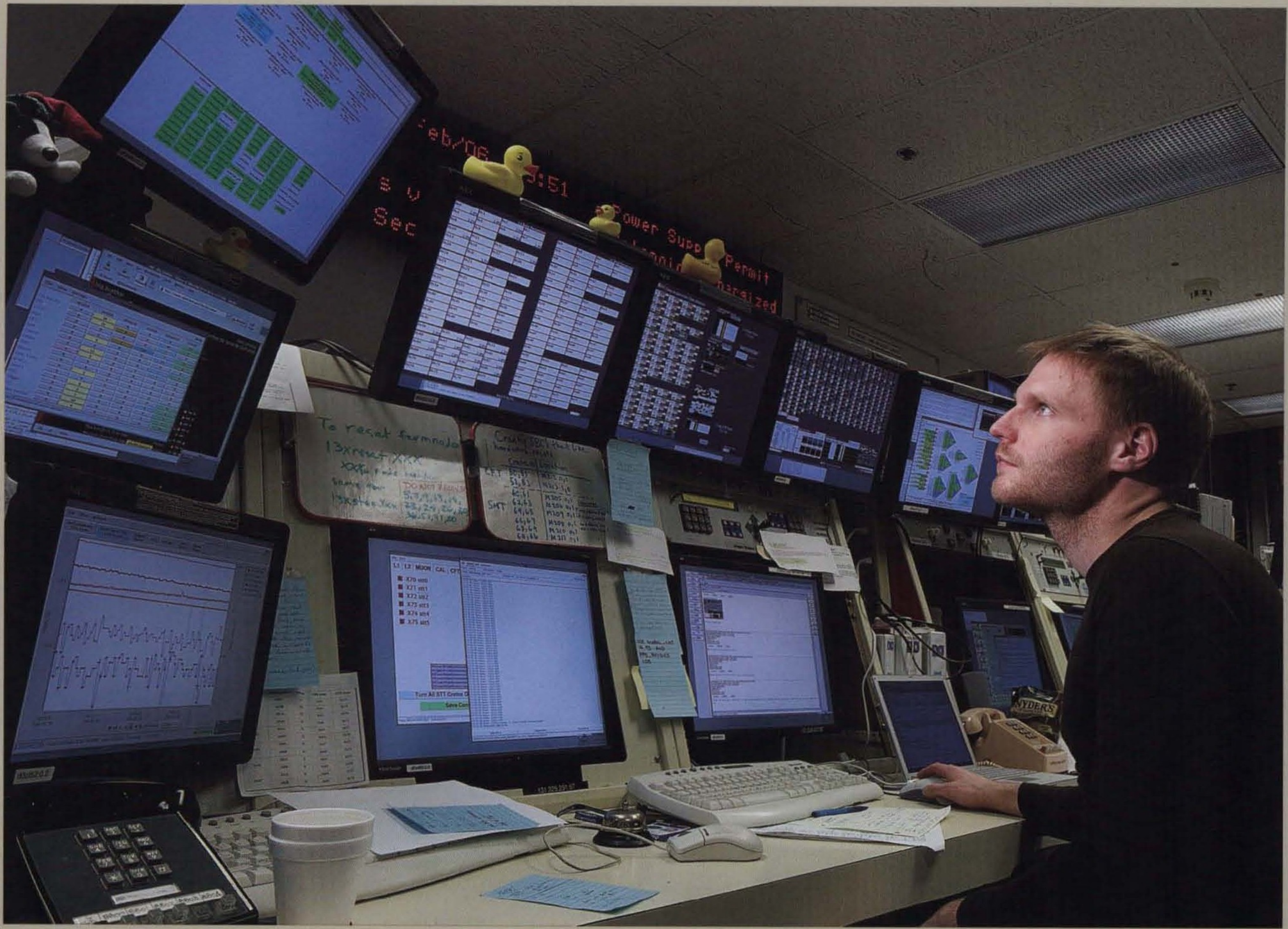
Fermilab plays a key role in several non-accelerator projects at the forefront of research in astrophysics: the Cryogenic Dark Matter Search; the Pierre Auger (Cosmic Ray) Observatory Project; and the Sloan Digital Sky Survey. The Laboratory is also in collaborations for two proposed projects: the Super Nova Acceleration Probe (SNAP) and the Dark Energy Survey.

R&D continues on future accelerator facilities, with the focus on the proposed International Linear Collider (ILC), and on a phased approach to increasing proton beam intensity for extending the reach of the neutrino physics program. Both efforts would rely on superconducting acceleration structures. In an international collaboration, Fermilab is building the R&D facilities necessary to develop and test key ILC components, and the Laboratory is preparing for a potential U.S. bid to host the ILC in Illinois.

The Tevatron has set several peak luminosity rec during 2006. The Main Control Room initiates processes that lead to data product


Tevatron Mode :)



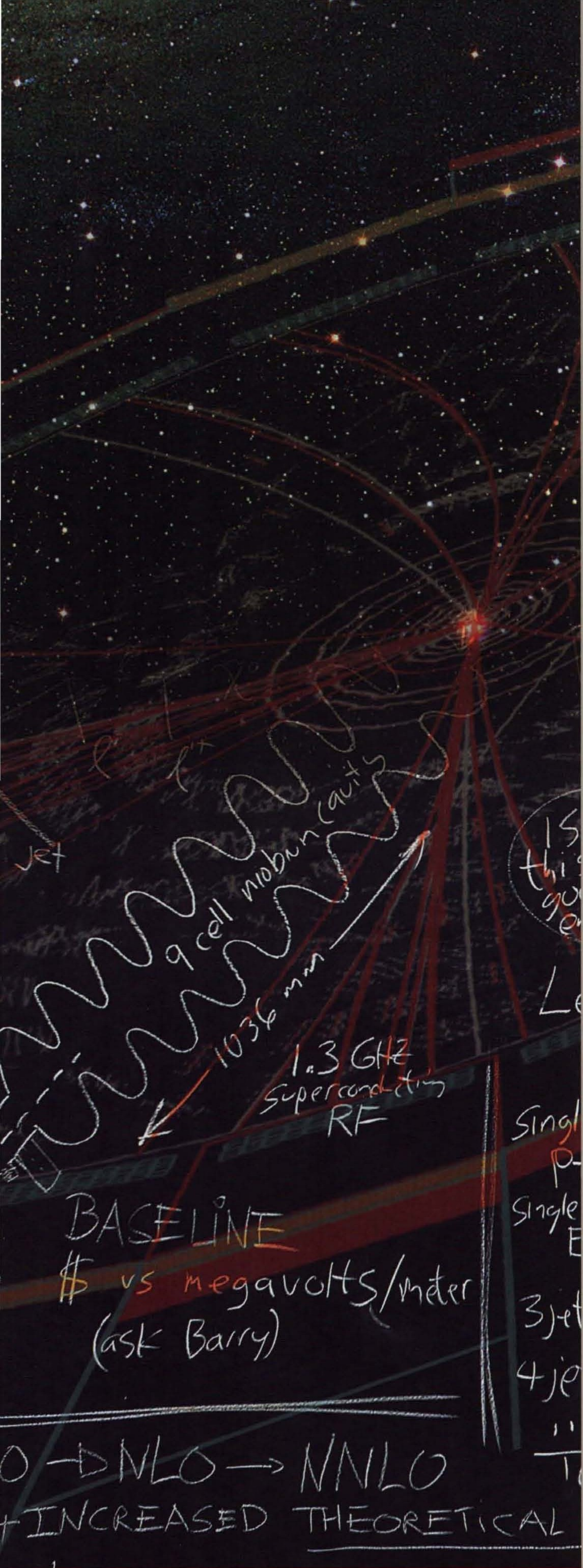


Collecting data during an evening shift at the DZero Control Room. The increased dataset, higher collider energy and improved detector capabilities are enabling both collaborations to explore physics beyond the Standard Model.

In addition, the Laboratory is the center of U.S. activity in preparing for the scientific program at the Large Hadron Collider (LHC), now nearing the end of construction at CERN, the European Laboratory for Particle Physics in Geneva, Switzerland. The LHC, which will collide particles at seven times the energy of the Tevatron, is currently scheduled to be commissioned in 2008, and at that time, the high-energy frontier in particle physics will shift to Europe. The LHC Physics Center at Fermilab provides U.S. physicists with a remote operations center for the LHC accelerator as well as the CMS experiment, computing resources for physics analysis, and access to experts in hadron collider physics.

With Collider Run II well underway, the CDF and DZero detectors are both taking data with high efficiency, R&D continues on future accelerator facilities, with the focus on the proposed International Linear Collider (ILC)

lab scientist Mayling Wong inspects a 1.3 GHz Type I cavity, component for the proposed International Linear Collider Fermilab is building the R&D facilities necessary to develop est key ILC components, and the Laboratory is preparing potential U.S. bid to host the ILC in Illinois.

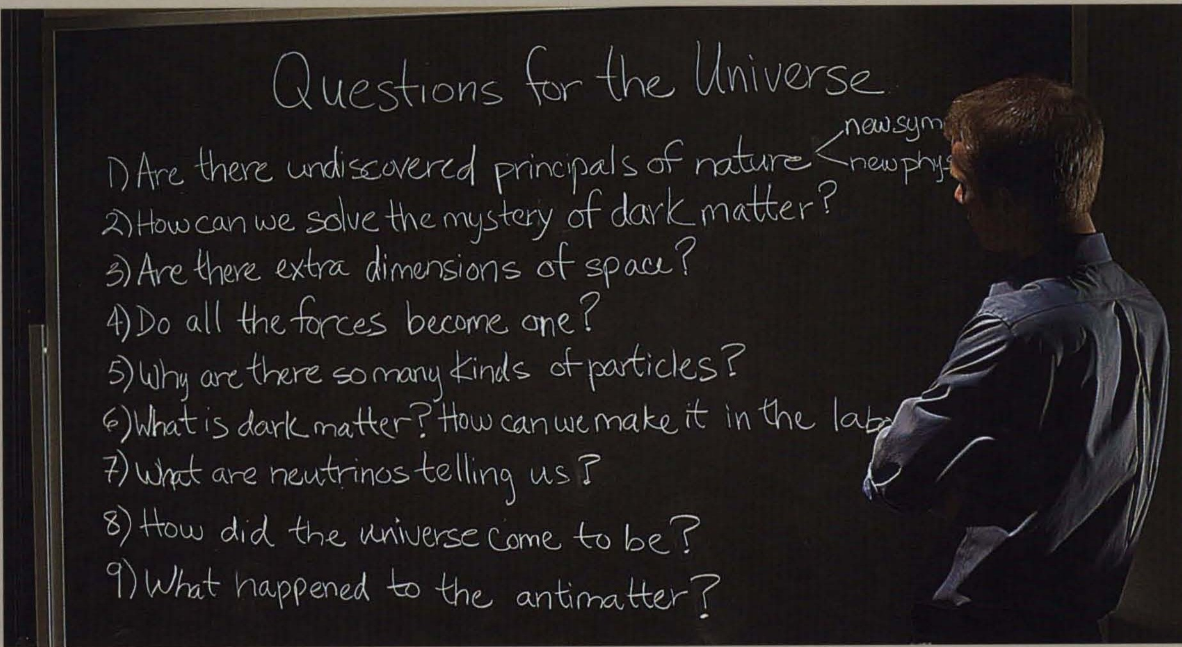


The Frontiers of Particle Physics, Astrophysics and Cosmology

The advances in scientists' understanding of the physical universe through progress in the interrelated fields of particle physics, astrophysics and cosmology over the past few decades have been remarkable. Of the 18 fundamental subatomic particles that have been observed thus far, three have been discovered at Fermilab: the bottom quark in 1977, the top quark in 1995, and the tau neutrino in 2000. Yet these 18 particles make up less than five percent of the entire mass and energy of the universe. Experiments have shown that the total matter-energy content of the universe must include invisible dark matter that holds the universe together, and a mysterious dark energy that pushes the universe apart. The prospects for new fundamental discoveries in the next decade are as great as at any time in the history of these fields. New experiments and observations will be able to answer profound questions, some of which are related to discoveries within the last few years, and others which have been central to these fields for decades. In its report entitled "Quantum Universe, The Revolution in 21st Century Particle Physics," a Department of Energy/National Science Foundation advisory committee formulated the following nine interrelated questions that define the research agenda ahead.

1. Are there undiscovered principles of nature: new symmetries, new physical laws?

The fundamental particles discovered so far reflect the underlying symmetries that make up the known physical laws of nature. Yet the quantum ideas that so successfully describe the familiar forms of matter in our environment fail when applied at the cosmic scale of the universe. Solving the problem requires the appearance of new forces and new particles signaling the discovery of new symmetries. The theory of "supersymmetry" predicts that for every known particle there also exits a "superpartner" particle. The experimental discovery of supersymmetry is an immediate challenge in particle physics.



2. How can we solve the mystery of dark energy?

Two independent discoveries imply the presence of a new form of energy that accounts for over two-thirds of the energy content of the universe. This dark energy that permeates empty space and accelerates the expansion of the universe must have a quantum explanation. Dark energy might be related to the so-called Higgs field, a force that fills space and gives particles their mass. The discovery of supersymmetry would provide crucial evidence for this possible connection.

3. Are there extra dimensions of space?

In trying to understand the quantum nature of gravity, physicists have developed "string theory," which implies the existence of supersymmetry and predicts seven undiscovered dimensions of space that give rise to much of the apparent complexity of particle physics. The discovery of these extra dimensions would change our understanding of the birth and evolution of the universe and reshape our concept of gravity.

4. Do all of the forces in nature become one?

At the most fundamental level, all forces and particles in the universe might be manifestations of a single grand unified force, as envisioned by Albert Einstein. We already know that remarkably similar mathematical laws and principles describe all the known forces except gravity. A grand unified force would relate all of the elementary particles and predict new ways that one kind of particle can transform into another.

5. Why are there so many kinds of elementary particles?

There are three families of particles with dramatically different masses. Patterns and variations in the families of these particles suggest undiscovered principles that tie together the "quarks" and "leptons" of the "Standard Model" of particle physics. Detailed studies of quarks and leptons at accelerator experiments will provide the clearest insight into these principles.

6. What is dark matter, and how can we make it in the laboratory?

Most of the matter in the universe is unknown dark matter, probably heavy particles produced at the very beginning of the universe, in the "Big Bang." The leading candidates for dark matter are as yet unobserved particles whose existence is predicted by theories that go beyond the Standard Model. In particular, the theory of supersymmetry predicts new families of particles interacting very weakly with ordinary matter.

7. What are neutrinos telling us?

Among the particles that make up the Standard Model, neutrinos are the most mysterious. Neutrinos are both ubiquitous and elusive, interacting so weakly with other particles that they travel through the universe almost unimpeded by matter. Detailed studies of the neutrino's tiny mass relative to the other particles, and how they change from one type to another as they travel may lead to the discovery of new phenomena.

8. How did the universe come to be?

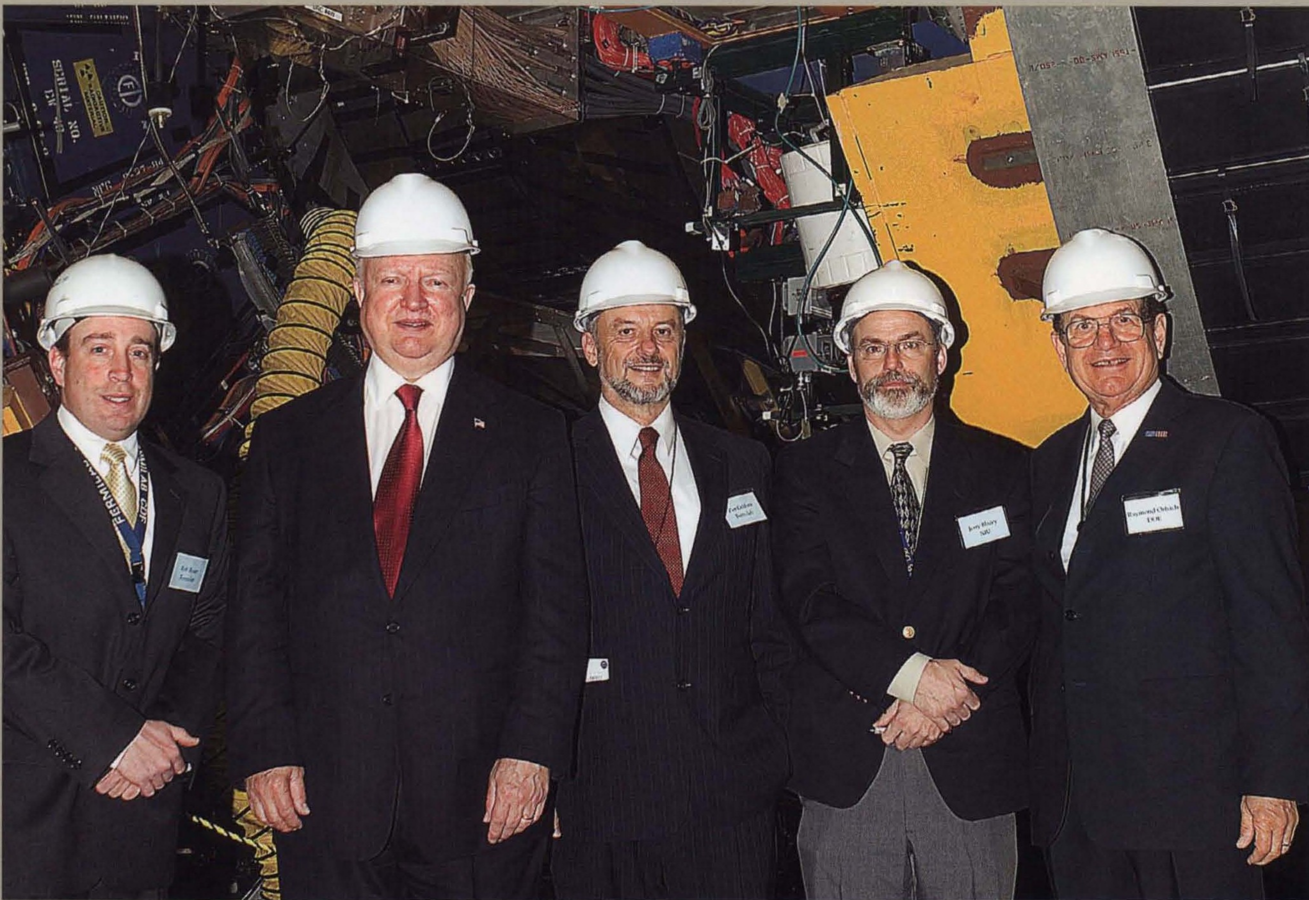
According to modern theories of cosmic evolution, the universe began with a singular explosion (the Big Bang), followed by an extremely rapid burst of expansion, termed "inflation." To understand inflation requires breakthroughs in our understanding of physics, of quantum gravity, and of an ultimate unified theory. Following inflation, the universe passed through a series of transitions to allow the formation of stars, galaxies, and life on earth. Although the physical conditions during inflation are too high in energy to reproduce on earth, some of the conditions of the later cosmic transitions could be recreated for study in high-energy accelerator experiments.

9. What happened to the antimatter?

Experiments show that for every fundamental particle there exists an antiparticle, a particle that has identical mass and other properties, but has still other properties which are reversed, such as electrical charge. When a particle and an antiparticle interact, they annihilate each other, producing lighter particles and the release of energy in the form of massless photons. Current cosmological theories imply that the big bang and its immediate aftermath almost certainly produced particles and antiparticles in equal numbers. However, observations to date indicate that the universe is composed almost entirely of matter. A tiny imbalance between the particles and antiparticles must have developed early in the universe, or else most of them would have annihilated leaving only photons and neutrinos. Subtle asymmetries between matter and antimatter, some of which have been observed in the laboratory, must be responsible for this fortuitous imbalance.

The Fermilab program is addressing all nine of these important issues with new and proposed experiments. Over the next few years, the Tevatron collider remains at the center of the search for new physics at the highest energy available at any accelerator facility. For example, discovery of the predicted, but as yet unobserved, Higgs boson would lead to an understanding of what determines the masses of the elementary particles. Fermilab has also developed a world-leading neutrino program that will contribute essential information on the puzzling question of neutrino masses and oscillations. The Fermilab particle astrophysics program is exploring the questions of dark matter, dark energy, and mysterious high energy phenomena in the universe. Fermilab is actively engaged in planning and R&D for the future accelerators and experiments needed to provide answers to the above questions.

The SciBar Booster Neutrino Experiment (SciBooNE), Fermilab's newest experiment, celebrated with this groundbreaking ceremony in Sepetember, 2006. Fermilab Director Pier Oddone (far right) along with Deputy Director Young-Kee Kim (seated) expect the experiment to be collecting real physics data by March 2007 due to its quick start progress and small size. As another sign of U.S. and Japan collaboration, the already built and ready to go three-part detector arrived at Fermilab from Japan to sit in the beam's direct path, 100 meters from the MiniBooNE target hall.



Left to right: CDF cospokesperson Rob Roser, U.S. Secretary of Energy Samuel W. Bodman, Fermilab Director Pier Oddone, DZero cospokesperson Jerry Blazey, and DOE Under Secretary for Science Ray Orbach tour portions of the lab before the Secretary conducted an all hands meeting with lab personnel and later met with the press. The most important assets though, as the Secretary emphasized in his speech, are not the accelerators and detectors, but the people who contribute in many different ways to the success of this laboratory.

Programs and Activities, including Recent Highlights

SCIENTIFIC STRATEGY

With the formation of Fermi Research Alliance, LLC (FRA), an organization jointly owned by URA and the University of Chicago and dedicated to the management of Fermilab, Laboratory Director Pier Oddone and his senior management team strengthened Fermilab's Scientific Strategy. The strategy focuses on the following primary scientific fronts.

Energy frontier: Run II of the Tevatron represents the leading edge in high-energy physics and will continue to be at the research frontier at least through 2009, overlapping with the startup of the LHC at CERN in 2008. Fermilab's strong role in the CMS experiment at the LHC will ensure continuing access to the energy frontier during the next decade. In parallel, the Laboratory is making a significant investment in R&D towards the long-term goal of hosting the proposed ILC.

Neutrino physics: MINOS, MiniBooNE, SciBooNE and MINERVA are the current and near-term experiments in this field, to be followed by NOvA, which is soon to start construction. A campaign to increase the neutrino flux created by Fermilab accelerators by a factor of three is part of this program.

Particle astrophysics: This program includes current and future experiments to study dark energy (SDSS-II, DES and JDEM), current and future searches for dark matter (CDMS, CDMS-25, COUPP) and the observation of ultra-high-energy cosmic rays (Pierre Auger).

DOE Fermi Site Office Manager Joanna Livengood (center) presents the National Safety Council Occupational Excellence Achievement Award to Fermilab Director Pier Odonne and Bill Griffing (left), head of Fermilab's Environment, Safety and Health office.

DEVELOPMENT OF A ROADMAP FOR THE FUTURE

In 2007, Fermilab Director Pier Oddone established a Steering Group to propose a roadmap for the future of the Fermilab accelerator-based particle physics program. The Steering Group, chaired by Deputy Director Young-Kee Kim has developed the roadmap based on the recommendations in the 2006 report of the National Academies' Committee on Elementary Particle Physics in the 21st Century (EPP2010), and on the current recommendations of the Particle Physics Program Project Priorities (P5) subpanel of the DOE/NSF High Energy Physics Advisory Panel. The Steering Group has considered the Fermilab-based facilities in the context of the global particle physics program. Specifically, the group has developed a strategic roadmap that: supports the international R&D and engineering design for as early a start of the ILC as possible and supports the development of Fermilab as a potential host site for the ILC; develops options for an accelerator-based high energy physics program in the event the start of the ILC construction is slower than the technically-limited schedule; and includes the steps necessary to explore higher energy colliders that might follow the ILC or be needed should the results from LHC point toward a higher energy than that planned for the ILC. The roadmap will provide valuable input for the Laboratory's recently initiated workforce planning effort.

SAFETY

Fermilab has an ambitious and effective program to continuously improve safety in the workplace. The Laboratory's major benchmark accident rates have been reduced by a factor of about eight over the last nine years, and have been among the lowest in the DOE laboratory system. In 2006, Fermilab received the National Safety Council's Occupational Excellence Achievement Award for the third consecutive year. To meet DOE's increasingly stringent safety performance metrics, Dr. Oddone established in March 2006 a Director's Panel on Injury Reduction. The Laboratory is in the process of implementing the Panel's recommendations.

COLLIDER EXPERIMENTS

In 2006, the Tevatron Collider set new performance records, and provided world-class data to the CDF and DZero experiments. During the past year, the Collider collaborations made several key discoveries and important measurements. CDF and DZero have the potential to make major discoveries, such as the Higgs boson; the lightest supersymmetric particles; and extra dimensions of space predicted by string theories. Such discoveries have required an aggressive program of upgrades to the accelerator complex and the collider detectors over the past several years.

The luminosity improvements of the accelerator complex over the past several years—a measure of the proton-antiproton collision rate—have been the key to providing the 1,400 physicists who make up the CDF and DZero collaborations with an ever-increasing number of collisions—the foundation of discoveries. All CDF and DZero upgrades were completed in 2006, and both detectors have been taking data with high efficiency. The detector collaborations continue to report new measurements, refining our understanding of the Standard Model of particles and forces as well as setting constraints on new phenomena beyond the Standard Model. Some of these measurements provide the world's best limits on new phenomena. Among the important results coming from the CDF and DZero experiments in the past year are: the discovery of rare matter-antimatter oscillations at ultrahigh frequency (3 trillion oscillations per second); discovery of two rare types of particles that are exotic relatives of the common proton and neutron; and the first evidence of single top quarks produced in a rare subatomic process involving the weak nuclear force.

In early 2007, the CDF collaboration announced the world's most precise measurement of the W boson mass, the carrier of the weak nuclear force and a key parameter of the Standard Model. The new W mass value leads

ermilab has also developed a world-leading neutrino rogram that will contribute essential information on he puzzling question of neutrino masses and oscillations

to an estimate for the yet-undiscovered Higgs boson that is lighter than previously predicted, in principle making observation of this elusive particle more likely by the experiments at the Tevatron Collider.

Through 2006, the Collider collaborations submitted for publication some 80 papers and made 500 conference presentations on Run II research results. About 150 students have submitted Ph.D. theses from Run II thus far, and about 250 others are currently working towards their degrees. The Tevatron collider program will represent the world's top research program at the energy frontier until the LHC detectors begin taking physics-quality data later this decade. Each additional year of running time extends the Tevatron Collider's discovery reach for the Higgs boson, and for physics beyond the standard model.

NEUTRINO EXPERIMENTS

Scientists have discovered three different types, or "flavors," of neutrinos: electron neutrinos, muon neutrinos, and tau neutrinos. The particles play an important role in stellar processes, such as the creation of energy in stars as well as supernova explosions. Experimental results obtained over the last decade have shown that the evasive neutrinos switch back and forth among their three different flavors (neutrino oscillations) while traveling through space and matter, suggesting that these particles have mass. Two current Fermilab experiments explore in detail the phenomenon of neutrino mass through neutrino oscillations. The results of these experiments concerning the properties of neutrinos, in conjunction with others around the world, could be profound because of the abundance of neutrinos in the universe. (Each cubic centimeter of the universe contains more than 100 neutrinos!)

The MiniBooNE experiment uses a proton beam from Fermilab's 8 GeV Booster to produce a neutrino beam. The MiniBooNE collaboration has been searching for the change of muon neutrinos to electron neutrinos in order to provide a definitive answer to questions raised by evidence for such neutrino oscillations observed by the LSND experiment at Los Alamos National Laboratory. A confirmation of the LSND result would suggest the existence of a fourth type of neutrino and would throw serious doubt on the present structure of the Standard Model of particles and forces. In April 2007, the MiniBooNE collaboration reported its eagerly-awaited first results, which rule out the interpretation of the LSND signal as a simple two-neutrino oscillation effect (equal for neutrinos and antineutrinos). MiniBooNE has been running with antineutrinos for the past year, but the collaboration is also continuing its analysis of the earlier neutrino data at low energy that did not match expectations.

In the NuMI (Neutrinos at the Main Injector) project, with its associated experiment called Main Injector Neutrino Oscillation Search (MINOS), Fermilab uses a 120 GeV proton beam from the Main Injector to create a high intensity beam of muon neutrinos aimed first at the

One of the two 'horns' of the NuMI beam line that focus the beam of particles for the MINOS neutrino experiment at Fermilab. The NuMI horn focuses short-lived particles called pions, which are generated when protons hit a target and decay to neutrinos (among other particles). The focusing is achieved using intense magnetic fields generated by 200,000-ampere pulses of electric current. (Photo credit Peter Ginter)

The LHC will provide a unique and affordable opportunity for U.S. scientists to continue to work at the energy frontier

"near" MINOS detector located at the Laboratory, and continuing straight through the earth to the "far" MINOS detector located deep underground at the Soudan Underground Laboratory, in a former iron mine in northern Minnesota. Civil construction of NuMI, which included challenging underground excavation activities, began in 1999, both on the Fermilab site and at Soudan. The NuMI project received an Outstanding Civil Engineering Achievement Merit Award in 2006 from the American Society of Civil Engineers. By the end of 2005 the MINOS experiment reached an important milestone of 10^{20} protons on target for the production of neutrinos, a new world record for long baseline experiments.

The MINOS experiment has confirmed neutrino oscillations as muon neutrinos travel the 730 kilometers from Fermilab to Minnesota. In 2006, the MINOS collaboration reported the "disappearance" of about half of the muon neutrinos sent to the far detector. MINOS confirmed that the number of "disappeared" muon neutrinos is consistent with the neutrino oscillation effect. The mass difference between the two oscillating neutrino states corresponds to an amount that is about one ten millionth of the mass of an electron. At present, MINOS provides the world's best accelerator-based measurements for the neutrino mass difference and oscillation parameters. With Fermilab's projected proton intensity improvements and planned running schedule, MINOS expects to reach its design goal of even more precise neutrino measurements. First results from a search for electron neutrino appearance are expected in the next year.

In 2007, Fermilab plans to start the NOνA project, a large neutrino detector that would be located about 810 kilometers from the Laboratory in Minnesota, on the surface and off-axis to the NuMI beam. NOνA will provide the most sensitive search for muon neutrino to electron neutrino oscillations and a unique capability to resolve the mass hierarchy among the three different types of neutrinos known to exist.

The Laboratory installed the SciBooNE experiment in a newly constructed enclosure near the Booster neutrino beam target. SciBooNE will measure various cross sections for low-energy neutrinos that are important for the T2K experiment in Japan, as well as for MiniBooNE. The MINERVA collaboration is making good progress for a small experiment to be located on-site in the NuMI beamline upstream from the MINOS near detector. MINERVA will measure neutrino cross sections with unprecedented precision at higher energies. Fermilab's plans to increase proton intensity for the production of neutrinos would extend the physics benefits significantly for each of these experiments.

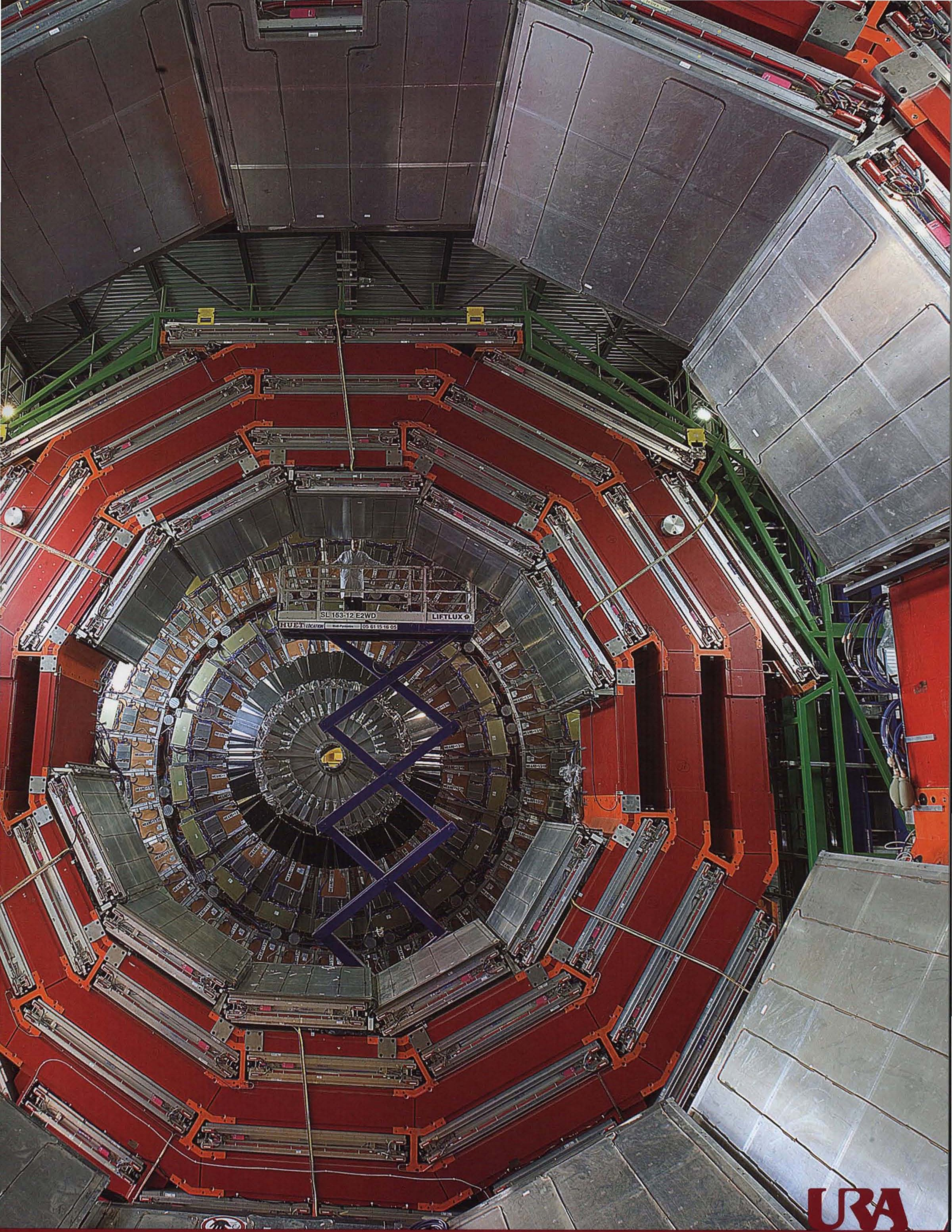
LARGE HADRON COLLIDER ACTIVITIES

As Collider Run II continues at Fermilab, the Laboratory also has a significant role in the collider that will soon overtake the Tevatron at the energy frontier. Through DOE and NSF, the United States has invested $531 million over eight years in the LHC accelerator at CERN and the two major LHC detectors. The U.S. is one of several non-CERN-member states, including Canada, Japan, India and Russia, contributing to the LHC.

When the LHC begins producing physics-quality data sometime in 2008, it will reach a beam energy seven times the energy of Fermilab's Tevatron. The LHC will provide a unique and affordable opportunity for U.S. scientists to continue to work at the energy frontier, and it will allow Fermilab to participate in the development of technologies for building the accelerators that will someday surpass the LHC's capabilities.

In the U.S. contribution to construction of the LHC accelerator, Fermilab led a collaboration that included Fermilab and the Brookhaven and Lawrence Berkeley National Laboratories. Most of the R&D for the advanced superconducting quadrupole magnets for the LHC's interaction regions has been done at Fermilab, and most of the fabrication of these quadrupoles took place at Fermilab. In March 2007, a support structure for one of these magnet assemblies failed a pressure test in the LHC tunnel at CERN, and the subsequent investigation revealed an engineering design flaw that required repairs on all nine such magnet assemblies delivered to CERN. Fermilab has collaborated closely with CERN to

The giant Compact Muon Solenoid (CMS) detector takes shape at CERN. The U.S. CMS collaboration designed the $44-million hadron calorimeter, which will measure the energy of particles produced in collisions at the center of the detector. The U.S. CMS is a collaboration of U.S. scientists participating in the CMS experiment at the Large Hadron Collider (LHC) at CERN in Geneva, Switzerland. Fermilab is host laboratory for the physics research phase of U.S. CMS, and is the major U.S. regional computing center for CMS.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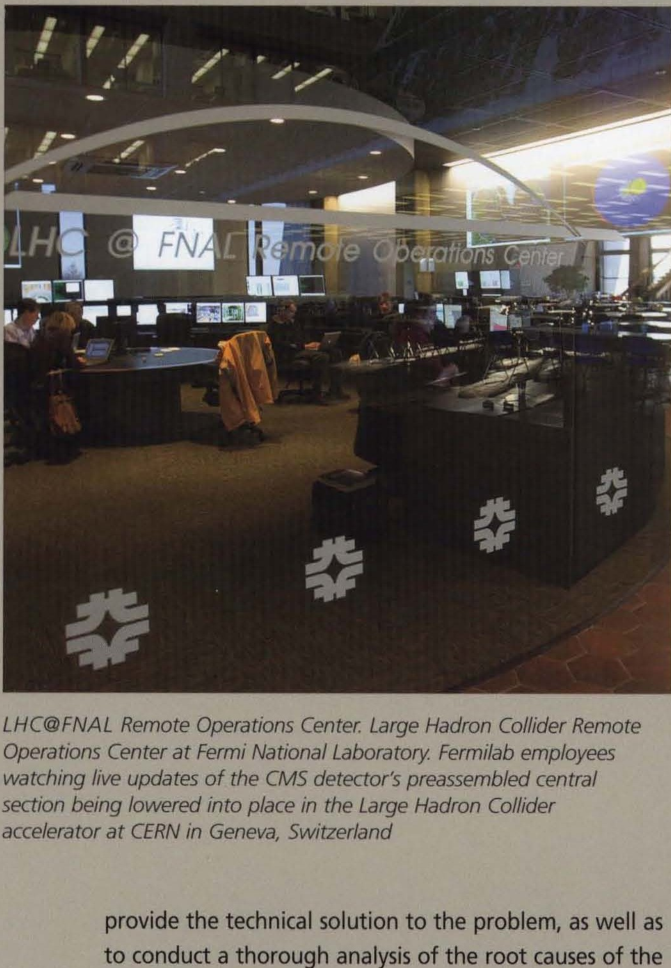
As the largest U.S. laboratory for particle physics, Fermilab would provide a strong base on which to build new facilities



LHC@FNAL Remote Operations Center. Large Hadron Collider Remote Operations Center at Fermi National Laboratory. Fermilab employees watching live updates of the CMS detector's preassembled central section being lowered into place in the Large Hadron Collider accelerator at CERN in Geneva, Switzerland

provide the technical solution to the problem, as well as to conduct a thorough analysis of the root causes of the design flaw. A redesigned support structure was installed in one magnet assembly, and a subsequent pressure test was successful. The new support structure will be incorporated in each of the remaining magnet assemblies before their installation.

With its construction responsibilities for the LHC accelerator now essentially completed, Fermilab is actively participating in the commissioning phase. To help commission the LHC and to carry out R&D to enhance LHC performance, Fermilab has been appointed the host laboratory for the U.S. LHC Accelerator Research Program (LARP), which was launched in February 2004. The main areas of LARP activities are accelerator physics (experiments and simulation), long-term magnet design and production for the LHC interaction region upgrade, and instrumentation and diagnostics.

DOE and NSF also asked Fermilab to oversee project management for the U.S. contribution to the international CMS detector, one of the LHC's two major detectors. Fermilab serves as one of the collaborating institutions in U.S. CMS and is its host laboratory. In July 2006 the U.S. CMS collaboration joined their CMS colleagues from around the world in announcing that the completed giant detector had been sealed and switched on for a series of tests using cosmic ray particles. During 2007 CMS is being installed, section by section, into its underground cavern at the LHC in preparation for commissioning activities.

Fermilab has also been chosen to be the major U.S. regional computing center for CMS, one of the few such centers around the world. Preparations are underway for Fermilab's role as host laboratory for the physics research phase of U.S. CMS once the LHC begins operations. Fermilab has established the LHC Physics Center (LPC) on the 11th floor of Wilson Hall to provide a research home for physicists from many institutions working on CMS physics analysis, and the LHC@FNAL remote operations center on the ground level of Wilson Hall to serve both LARP and LPC.

THE INTERNATIONAL LINEAR COLLIDER

While scientists await new discoveries at the high-energy frontier from Collider Run II at Fermilab, and later in the decade from the LHC at CERN, they must also plan how to advance the field in the future. For this it is necessary to perform R&D for the next generation of major accelerator facilities. Fermilab is the natural site for such a facility in the United States. As the largest U.S. laboratory for particle physics, Fermilab would provide a strong base of talent and infrastructure on which to build new facilities both on and near the present site.

There is a consensus in the worldwide particle physics community that the next large accelerator facility should be the International Linear Collider (ILC). The ILC would create high-energy (500-1000 GeV) particle collisions between electrons and positrons, their antimatter counterparts. Together with the LHC, the ILC would provide a tool for scientists to address many of the 21st century questions about the fundamental nature of matter, energy, space and time, including dark matter, dark energy, and extra dimensions. From its inception, the ILC would be designed, funded, managed, and operated as an international scientific laboratory.

With the endorsement of the International Committee for Future Accelerators (ICFA) in 2004, the particle physics community has chosen an accelerator technology for the ILC, opening the way for the world community to unite and concentrate resources on the design of a linear collider using superconducting radiofrequency (RF) technology for the accelerating structures of the ILC. In 2005, ICFA established the international Global Design Effort (GDE). An international group of about 50 people forms the GDE team for the ILC, headed by Barry Barish, professor of physics at California Institute of Technology and former director of the LIGO laboratory, a major NSF-funded observatory for the detection of gravity waves. The GDE team sets the strategy and priorities for the work of hundreds of scientists and engineers at universities and laboratories around the world. Fermilab is hosting members of the GDE team and supports the ILC Website and communications. In February 2007, the GDE published a draft ILC Reference Design Report. This multi-volume document provides the first detailed technical snapshot, defining in detail the technical parameters and components that make up each section of the 31-kilometer long accelerator. The reference design will guide the development of the worldwide R&D program, motivate international industrial studies and serve as the basis for the final engineering design needed to make an official project proposal later this decade. As part of the Reference Design Report, the GDE also produced a preliminary estimate for the cost of the ILC. Fermilab played a significant role in developing the reference design, and the Laboratory's contributions will continue to grow during the engineering phase of the project.

In collaboration with other laboratories, Fermilab is in the process of building the necessary infrastructure to fabricate, process, treat and test superconducting RF cavities for ILC R&D. The Vertical Test Stand and Horizontal Test Stand will be used to qualify cavities for ILC R&D. In the Cryomodule Assembly Facility, scientists will prepare qualified cavities and string them together in a clean room environment. These strings of cavities then become fully assembled cryomodules. Fermilab is currently in the process of constructing the ILC Test Area, where scientists will test a series of cryomodules with an electron beam. In addition, Fermilab plans to develop a facility for chemically processing and treating superconducting cavities. Once the entire infrastructure is complete, Fermilab will have a full-service superconducting RF facility, where scientists from around the world will be able to process, assemble and test cavities and cryomodules from start to finish. Working with other laboratories, universities and industry, Fermilab is progressing in the development of the electron source for a superconducting linac; the design of a damping ring to "cool" the motion of electrons and positrons, so the beams can be tightly focused; and the development of simulation tools to study beam transport from the damping ring to the interaction point. Fermilab is pursuing a world-class program of ILC detector R&D activities that are integrated with the broader U.S. program. The Laboratory has established the only hadron test beam facility in the U.S. that is capable of adequately supporting ILC detector development.

In 2005, DOE Office of Science officials stated that if the U.S. were chosen by the international community to host the ILC, the collider would be sited near Fermilab. In response, Fermilab has initiated site studies for a proposed ILC for which Fermilab would be the host laboratory. In his role as Fermilab Director, Pier Oddone is a member of both the International Linear Collider Steering Committee (ILCSC) under ICFA, and the regional Linear Collider Group of the Americas (formerly the U.S. Linear Collider Steering Group)

Barry Barish, Director of the ILC Global Design Effort, on tour of R&D areas at Fermilab inspecting a superconducting RF structure for potential use in the International Linear Collider.

During the Fermilab Annual Users Meeting, Robin Staffin, DOE Associate Director for High Energy Physics, seconded the conclusions of Harold Shapiro, chair of the EPP2010 panel. "We're entering a period of great promise and scientific potential."

ACCELERATOR R&D FOR NEUTRINO PHYSICS AND FOR THE NEXT GENERATION OF COLLIDERS

Very intense neutrino sources are required for the next generation of neutrino experiments. Current accelerator sources at Fermilab produce beams of neutrinos by smashing high-energy protons into stationary targets. To increase the intensity of the proton beam—and hence the resulting neutrino beam—Fermilab is working on possible upgrades to the existing accelerator complex to provide beam power of 1 megawatt (MW). The Laboratory is planning for R&D for a high-intensity neutrino source, a multi-MW superconducting RF linac as a new injector into the Main Injector, replacing Fermilab's aging Linac and Booster accelerators. The neutrino source would use the same superconducting accelerating technology as the ILC, providing a synergistic overlap.

Muons, the short-lived and heavier relatives of electrons, can be used to produce much more intense beams of neutrinos. There is international interest in muon storage ring facilities as a base for a multi-TeV muon collider for the post-ILC era, as well as for a neutrino factory to explore symmetry violation phenomena. However, muon beams are large and diffuse, and they currently are too big to "fit" into an accelerator. Fermilab is home to the MuCool collaboration, which has been formed to pursue the development of ionization cooling technologies for a high luminosity muon collider. MuCool is part of the larger Neutrino Factory and Muon Collider Collaboration, which includes particle and accelerator physicists from U.S., Japanese and European laboratories and universities. With the goal of creating compact muon beams, MuCool physicists will soon be testing accelerating capabilities of new RF cavities, developed by groups at Lawrence Berkeley National Laboratory and Thomas Jefferson National Accelerator Facility. The initial ionization cooling experiment will be at the Rutherford Accelerator Laboratory in the U.K., with a follow-on experiment proposed at Fermilab.

Fermilab is also collaborating with several regional universities that have initiated accelerator R&D efforts, including Illinois Institute of Technology, Northern Illinois University, Northwestern University, University of Chicago and University of Illinois at Urbana-Champaign. The Northern Illinois Center for Accelerator and Detector Development (NICADD) began operations in 2002 at Northern Illinois University's DeKalb campus. NICADD projects envisioned for collaboration with Fermilab include creation of a particle detector research facility, establishment of a separate facility for development of the next generation of linear colliders, and joint operation the 15 MeV Photoinjector, a laser-driven, electron beam research facility at Fermilab. Seven participating institutions are using the facility, with its superconducting RF technology, for experiments on plasma and laser acceleration techniques, and for several investigations that could have an impact on linear collider design considerations. Fermilab is designing a program based on merging the Photoinjector with the ILC R&D program.

In early 2007, Fermilab established the Accelerator Physics Center to coordinate and conduct accelerator R&D activities aimed at the next generation of accelerator facilities, to provide physics support for existing operational programs, and to increase the Laboratory's involvement in the education of accelerator scientists and engineers.

The Fermilab particle astrophysics program is exploring the questions of dark matter, dark energy, and mysterious high energy phenomena in the universe

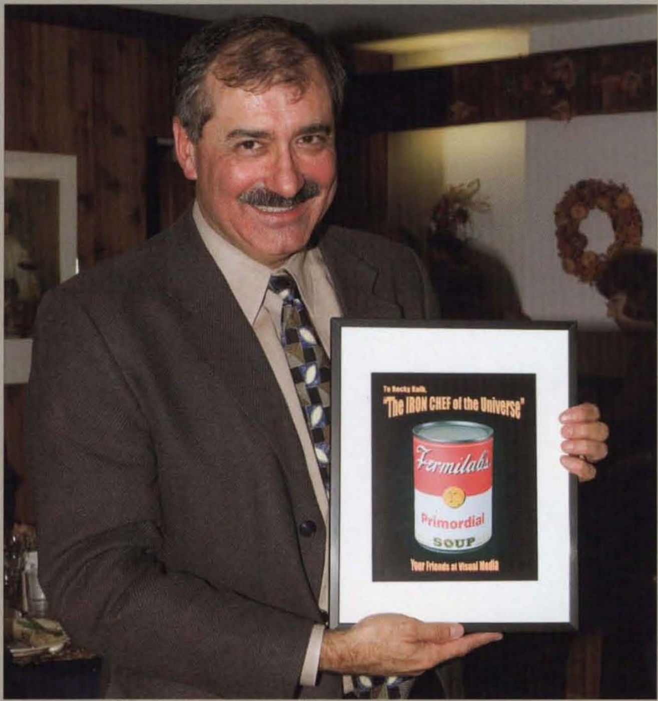
Messier 31 or M31, better known as the Andromeda galaxy, is our nearest spiral neighbor. Visible to the naked eye on a clear moonless night, M31 appears nearly three degrees wide in our sky—that's six times the width of the full moon! Because of M31's large angular size, this picture was created by stitching together data from multiple SDSS images. A new dwarf spheroidal galaxy was recently discovered in M31 using SDSS photometry data and follow-up observations. This puts the count at 10 known satellite galaxies contained within M31.

ASTROPHYSICS

Fermilab's astrophysics program addresses fundamental scientific issues in the intersecting domains of particle physics and cosmology, the study of the origin and structure of the physical universe. The Fermilab Particle Astrophysics Center on the 6th and 7th floors of Wilson Hall was established in November 2004, unifying the Laboratory's existing and proposed experimental and theoretical astrophysics activities. All of the proposals for extending the validity of the Standard Model of particle interactions predict new particles. If these particles are stable, then large numbers of them will have survived the moment of creation and will still be present. Should that be the case, they could make up a significant fraction of the mass of the universe.

Searches for such particles of "cold dark matter" are underway. Fermilab is a member of the collaboration of fourteen institutions in the Cryogenic Dark Matter Search (CDMS). These collaborators have developed very sensitive detectors that can detect the recoils of germanium or silicon nuclei if they collide with one of these massive particles. Fermilab has had the project management responsibility for the current CDMS II, located in the same Soudan Underground Laboratory that also houses the far MINOS detector. Fermilab is playing a key role in the project management, electronics, data acquisition, computing, and cryogenics systems for CDMS II, which is at present one of the most sensitive dark matter searches in the world. The critical cryogenic system is now in operation, and in 2006 all five detector "towers" were taking data at Soudan. Fermilab scientists are also involved in R&D work for the SuperCDMS, a phased enlargement of CDMS culminating in a detector system with roughly 1,000 times the sensitivity of the current one, to be located at SNOLAB, the underground laboratory in Sudbury, Ontario. Fermilab is participating in the Chicagoland Observatory for Underground Particle Physics (COUPP) collaboration. The COUPP detector, located underground in the MINOS near detector hall at Fermilab, is demonstrating the advantages of a heavy liquid, room temperature bubble chamber for the direct detection of dark matter particles hitting nuclei.

Fermilab has also been engaged in the international Sloan Digital Sky Survey (SDSS) collaboration that aims to find out how matter, both dark and luminous, is distributed. SDSS has mapped in detail one-quarter of the entire sky, determining the positions, absolute brightnesses, and red shifts of nearly 200 million celestial objects, including more than a million galaxies and two hundred thousand quasars. The SDSS collaboration built and utilized a 2.5-meter telescope and the associated instruments at Apache Point, New Mexico. Among Fermilab's many contributions to this project has been the construction of the data acquisition system and the software and hardware to process the expected 10 to 20 terabytes of data that were accumulated during the roughly five-year duration of the survey.



Retiring from his position as Director of Fermilab's Particle Astrophysics Center, Edward "Rocky" Kolb became Chairman of the Department of Astronomy and Astrophysics at the University of Chicago. Since the University of Chicago has a long-standing relationship with Fermilab, "Rocky will continue to have an office at Fermilab and is expected to be seen frequently," said colleague Scott Dodelson. Displaying a gift from Fermilab's Visual Media Services, appealing to his sense of humor, this poster shows a Primordial Soup can acknowledging Rocky as the Iron Chef of the Universe.

In July 2004, SDSS scientists announced that their extensive investigation of the distribution of material in the largest, most detailed map of the universe strongly confirms that 70% of the universe is composed of dark energy. In January 2005, a group of SDSS scientists announced results on the clustering of nearby galaxies, with important implications for the geometry of the universe. A follow-on survey, SDSS-II, with funding from the Alfred P. Sloan Foundation, NSF, and DOE, will be completed in July 2008. The SDSS-II collaboration has grown to include 23 member institutions around the world. SDSS-II has three components. The first, called LEGACY, will complete the SDSS survey of the extragalactic universe, obtaining images and distances of nearly a million galaxies and quasars over a continuous swath of sky in the Northern Hemisphere. The second part of SDSS-II, the Sloan Extension for Galactic Understanding and Exploration (SEGUE), is mapping the structure and stellar makeup of the Milky Way Galaxy, and gathering data on how the Milky Way formed and evolved. Identifying the oldest stars will help scientists understand how the elements of the periodic table were formed inside of stars. The third component of SDSS-II includes an intensive study of supernovae, sweeping the sky to find these remnants of gigantic explosions from dying stars. Scientists can precisely measure the distances of distant supernovae, using them to map the rate of expansion of the universe, a direct measurement of the effects of dark energy on the geometry of the universe as a whole. In 2006, for the third consecutive year, the SDSS program had the largest fraction of the most cited astronomy papers of any ground or spaced-based observatory.

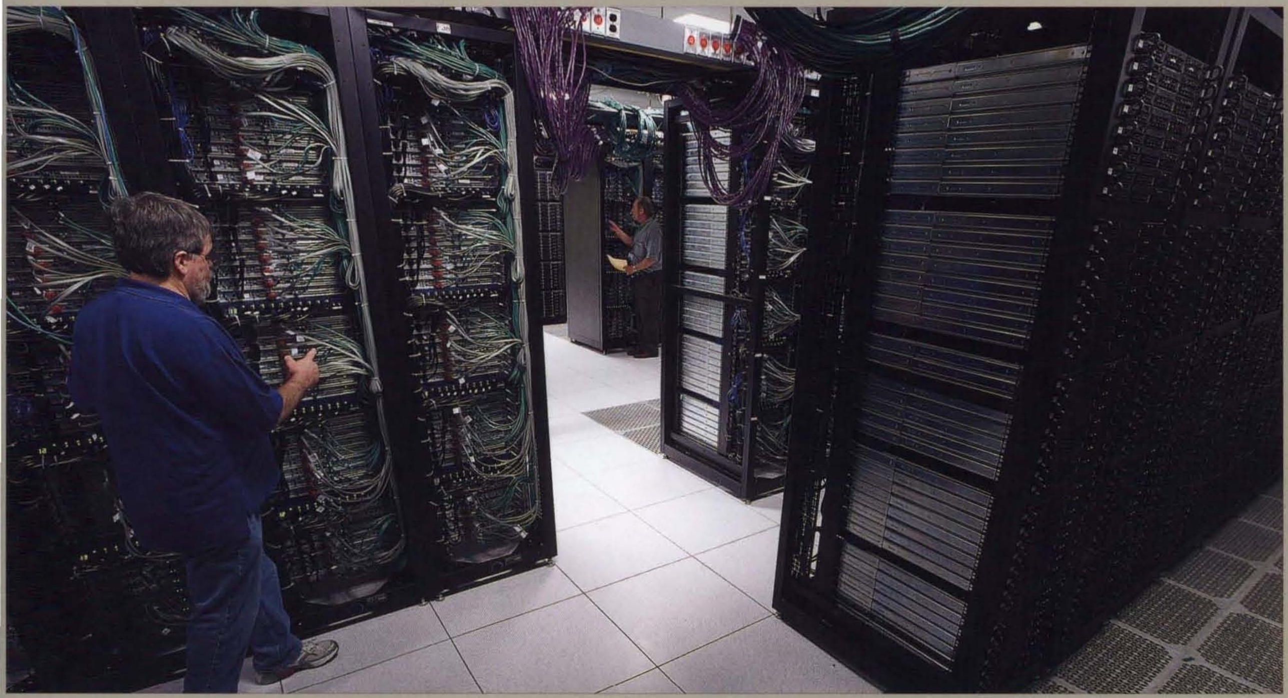
Looking beyond SDSS, scientists in Fermilab's Experimental Astrophysics Group are playing a leading role in the Dark Energy Survey (DES), which will use four independent methods to study the nature of dark energy. The DES collaboration will conduct a five-year survey, beginning as early as 2009, using a new wide-field camera to be built for the existing 4-meter telescope at the Cerro Tololo Inter-American Observatory in Chile. Fermilab scientists are leading the construction of the camera and optics. In the longer term, the Experimental Astrophysics Group is positioned to make significant contributions to the Super Nova Acceleration Probe (SNAP) satellite experiment, a proposal for the NASA-DOE Joint Dark Energy Mission, would detect and monitor several thousand "Type Ia" supernovae to determine the properties of dark energy.

As a member of an international collaboration of about 300 scientists from 17 countries, Fermilab is playing a major role in the Pierre Auger Observatory Project, which is exploring the properties and mysterious origins of very-high-energy cosmic rays. *(See Separate Section on Pierre Auger Observatory Project.)*

COMPUTING

Fermilab is at the forefront of the development and use of ultra-fast data processing and data transfer technology for its diverse scientific user community. Run II at Fermilab has over a thousand participating physicists around the world. The upcoming LHC experiments at CERN involve collaborations larger than their predecessors, with more widely distributed analysis work. The data collected from experiments are becoming orders of magnitude more voluminous; petabytes (millions of gigabytes) per year are expected. To satisfy these and other emerging IT needs in the scientific, industrial, governmental and commercial arenas, grid computing has been conceived as an expansion of distributed computing. The term "grid" arose in the late 1990s to describe a computing infrastructure that allows dynamic, distributed collaborations to share resources. Grid computing involves the distribution of computing resources among geographically separated sites (creating a "grid" of resources), all of which are con-

The Laboratory's Computing Division is actively participating in the development and deployment of grid technology for high energy physics research



Dave Ritchie and Jack MacNerland at Wide Band's Grid Computing Center. In 1998 Fermilab began to employ clusters or "Farms" of low cost commodity PC's for Monte Carlo and experiment data reconstruction computing. Today the lab is using mostly commodity PC's, which provides lower cost computing through the purchase of approximately 1,000 units per year.

figured with specialized software for routing jobs, authenticating users, monitoring resources, and so on.

Fermilab is actively participating in the development and deployment of grid technology for high energy physics research. The Laboratory's Computing Division is involved in a variety of grid projects, some involving CDF and DZero Run II data handling and other current research projects at Fermilab, others looking forward to and preparing for physics that will be coming from the LHC at CERN in a few years. These grid projects are collaborations of scientific and computer professionals from a number of participating laboratories, universities and other organizations throughout the U.S., Europe and Asia. Fermilab is among the first users of DOE's UltraScience Net, a new network for high-speed and high-capacity science applications.

In 2006, DOE and NSF provided a five-year, $30 million award to the Open Science Grid Consortium (OSG), in which Fermilab plays a leading role. Scientists from many fields use the OSG infrastructure. In particular, the members of the international ATLAS and CMS detector collaborations at the LHC will rely on OSG to participate fully in these experiments.

PUBLICATIONS

During 2006, the various collaborations of experimenters and theorists at Fermilab produced about 170 publications and made some 320 conference presentations. The results included the most precise measurement of the top quark mass, observation of quantum oscillations between particles containing bottom quarks and their antiparticles, and new limits on the size of extra dimensions and the mass of new particles proposed by theoretical models such as supersymmetry. In addition, during 2006-07 some 88 Ph.D. candidates completed theses based on accelerator-based research they carried out at Fermilab, and another 31 completed theses based on the Laboratory's astrophysics activities. These students go on to promising careers in particle physics, in related fields such as astronomy, computer sciences, and engineering, as well as careers in industry and commerce.

The Leon M. Lederman Science Education Center, drew attendance in 2006 of over 26,000 students

2006 Summer Internships in Science and Technology Students (SIST) with Nobel laureate Leon Lederman. Fermilab has sponsored the SIST program for 35 years. SIST has the distinction of being the oldest operating program of its type in the U.S. and has served as a model for other laboratories and private industry.

EDUCATION, TRAINING AND FELLOWSHIP PROGRAMS

Fermilab's history of achievement in science education and teacher training programs is a tribute to physicists' love of learning and to students' responsiveness to real-world situations. Spearheaded by Fermilab Director Emeritus and Nobel laureate Leon Lederman, the education program gives special emphasis throughout to strengthening science education for under-represented groups.

The Fermilab Education Office and its Leon M. Lederman Science Education Center, dedicated in 1992, drew attendance in 2006 of over 26,000 students and 2,400 teachers in K-12 education programs. The Laboratory offers some 30 programs: teacher enhancement workshops and institutes, opportunities for research participation, development and distribution of instructional materials, a collection of teachers' resources, Laboratory tours, special events, class field trips, and science shows. The Education Office is a leader in QuarkNet, the DOE- and NSF-funded program that reaches 500 high school teachers across the country, bringing the world of particle physics to their students. In 2006, the Center's education webserver received nearly 16 million hits. Currently, 50 percent of the Center's funding, including QuarkNet, is provided by Fermilab, and 50 percent comes from other federal, state and private sources.

The Internships for Physics Majors (IPM) summer program is aimed at outstanding college physics students who desire an opportunity to experience a working scientific environment. The IPM program is open to students in the U.S. and abroad. Students also participate in the IPM program through DOE's Science Undergraduate Laboratory Internship program, which is open to all science undergraduates. TARGET is a program for academically talented high school students who are members of minority groups and who have expressed an interest in science. TARGET students come to the Laboratory each morning in the summer to work with an advisor and then attend three classes every afternoon at nearby Naperville High School. The Summer Internships in Science and Technology (SIST) program provides summer internships at Fermilab in physics, engineering and computer science to an average of 20 undergraduate students per year from minority groups traditionally underrepresented in the fields of science and engineering. Fermilab has sponsored the SIST program for 35 years. SIST has the distinction of being the oldest operating program of its type in the U.S. and has served as a model for other laboratories and private industry.

Fermilab sponsors the Lederman, Peoples and Wilson postdoctoral fellowships at the Laboratory, and participates in a Joint University-Fermilab Doctoral Program in Accelerator Physics. In 2005, Fermilab initiated the John Bardeen Engineering Fellowship to bring to the Laboratory each year one or two of the most talented masters or doctoral recipients in engineering. In collaboration with other laboratories and U.S. universities, Fermilab serves as home of the U.S. Particle Accelerator School. The Laboratory also supports university faculty members in residence at the Laboratory through a guest scientist program.

In 2007, the Laboratory established an International Fellows Program for Ph.D. students, post-doctoral researchers, and senior researchers from non-U.S. institutions. Initially, these fellowships will be available to physicists who are interested in working on the Tevatron collider experiments, and to scientists and engineers who are interested in developing accelerator and detector technology and test facilities for the ILC. In future years, the program could extend to other areas of activity at the Laboratory.

URA sponsors two annual awards at the Laboratory. The Fermilab/URA Graduate Thesis Award honors the outstanding doctoral thesis written on research conducted at Fermilab or in collaboration with Fermilab scientists. The Tollestrup Award for Postdoctoral Research honors outstanding work conducted by a postdoctoral researcher at Fermilab or in collaboration with Fermilab scientists. URA also supports the awards for outstanding poster presentations at the annual New Perspectives Conference, organized each year by Fermilab's Graduate Student Association on behalf of young scientists at the undergraduate, graduate, and postdoctoral levels.

URA has also provided financial support for graduate courses at Fermilab. Graduate students often have difficulty taking classes at their home institutions because they spend so much time at Fermilab participating in experiments. In 2005, Fermilab's Theoretical Physics Department began an academic lecture series aimed at graduate students and young postdocs.

ENVIRONMENTAL AND CONSERVATION ACTIVITIES

In addition to its research mission in high-energy physics, Fermilab has been designated a National Environmental Research Park by DOE. The Laboratory diligently oversees restoration and preservation of the site's ecosystems. Over the years, the Laboratory has restored more than a thousand acres of the native tallgrass prairie that once covered the Fermilab site. The prairie is actively managed, including annual prairie burns to help maintain the system's natural cycles. In 1998, Fermilab became a member of Chicago Wilderness, a consortium of more than one hundred public and private landholders in the Chicago area committed to careful and responsible management of the remaining habitat in the region.

Fermilab is a leader in implementing energy conservation, recycling and waste reduction programs, and has won a number of awards over the past few years. The Laboratory continued to make progress in minimizing waste prior to generation and in reducing pollution, and in 2006 received several awards for efforts in managing

Volunteers enjoying Earth Day / Arbor Day 2006 planting approximately 70 trees and shrubs on a beautiful day in April. The Ecological Land Management Committee, or E.L.M. Committee, who oversees the land use and land management activities at Fermilab, sponsors the annual event with help from Fermilab's Roads and Grounds Section. The committee is made up of volunteers that cover many different areas of environmental and ecological expertise.

Fermilab is a leader in implementing energy conservation, recycling and waste reduction programs excess electronic equipment. Specifically, Fermilab won DOE's *Pollution Prevention Star Award* and DOE's *Best-in-Class Award* for its efforts toward electronics management. Upon receiving the *Best-in-Class Award*, the Laboratory was notified of also being in the running for the *White House Closing of the Circle Award*. Additionally, the DOE participated in and won the *Federal Electronics Reuse and Recycling Challenge* sponsored by the U.S. Environmental Protection Agency, and Fermilab was recognized as being a major contributor to DOE receiving that distinction.

In 2007, following a rigorous external audit, Fermilab received formal recognition for its environmental management and protection practices from the International Organization of Standards (ISO), an international body of technical standards for various industries. The so-called *ISO 14001 standard* provides a framework for environmental impact measurement and management into an Environmental Management System (EMS). In order to receive ISO 14001 recognition, an organization is required to demonstrate a commitment to compliance with environmental laws and other requirements, pollution prevention and continual improvement. The external audit capped an intense effort by Fermilab's environmental protection staff and Laboratory management that began with a prior review of Fermilab's EMS in October 2006. The audit team was very complimentary of many of Fermilab's practices, including the open policy Fermilab exhibits towards its neighbors, and the many preventive actions that are incorporated into the Laboratory's work planning.

TECHNOLOGY TRANSFER

While Fermilab is dedicated to basic physics research, the Laboratory is eager to share its science, technology and know-how by working cooperatively with U.S. industry to encourage economic development. Fermilab has unique capabilities in designing and operating accelerators, managing very large cryogenic systems, developing and operating fast electronics, creating hardware architectures and software for massively parallel computing systems and operating industrial-scale applications of superconducting technology. Sometimes advances in these technologies at the Laboratory have applications beyond high-energy physics research, and Fermilab can transfer new technology to industry to foster economic development. Fermilab's Directorate-level Office of Research and Technology Applications (ORTA) facilitates the transfer of technologies developed at the Laboratory.

ACCELERATORS IN MEDICINE

Between 1976 and 1985, the National Cancer Institute funded clinical trials at Fermilab to explore the effectiveness of fast neutrons versus photon therapy in the management of radio-resistant tumors. Since then, working with hospitals in the Fermilab region, more than 3,100 patients with cancer have received treatment at Fermilab's Neutron Therapy Facility (NTF). About 25 percent of these patients reside outside Illinois, including individuals from Canada, Greece, Haiti, Mexico, Pakistan, and the Philippines. From 1995 to 2003, the NTF was operated under contract with Provena Saint Joseph Hospital of Elgin, Illinois. In December 2004, Northern Illinois University announced the formation of the NIU Institute for Neutron Therapy at Fermilab, partnering with the Laboratory to continue the NTF program of providing such therapy to patients and to conduct extensive research on this treatment.

Beyond the borders of Illinois, the NTF has served as a model for more recently built neutron therapy facilities in Michigan, South Africa, and France. Fermilab also built a 250 MeV proton accelerator for the hospital of Loma Linda University Medical Center in California, which began treating patients in October 1990.

Medical Physicist and Technical Director Arlene Lennox preparing treatment plans at the Northern Illinois University Institute for Neutron Therapy, NIUINT at Fermilab.

More than 3,100 patients with cancer have received treatment at Fermilab's Neutron Therapy Facility

Fermilab sponsors cultural and other activities to which the public is invited

WGN-TV's chief meteorologist Tom Skilling has hosted the Severe Weather Seminar at Fermilab every year for 25 years. Skilling and other guest speakers describe recent developments in severe weather warnings and give new perspective on past weather events. People attend from the local community and also Iowa, Ohio, Michigan, Wisconsin and Indiana—as many as 2,500 people come to the event. The Seminar is held in Fermilab's Ramsey Auditorium with two presentations open to the public.

COMMUNITY PROGRAMS

Fermilab's role as a key element of the Illinois High Technology Corridor is complemented by its sponsorship of cultural activities to which the public is invited. Laboratory staff members volunteer in supporting an arts series, physics colloquia, films and an art gallery. Fermilab also conducts public tours for visitors and briefings for local citizens on Laboratory initiatives. With the cooperation of DOE security officials, the Laboratory has been pleased to be able to continue most of its public events and guided tours in the wake of post-9/11 security concerns at Federal facilities. In January 2005, the Fermilab implemented a new site security plan, which places principal security attention to a number of Property Protection Areas. For the remainder of the site, the Laboratory provides open access during normal business hours. As a result of the new security program, Fermilab maintains the strong connection with the surrounding communities that it has historically enjoyed.

In March 2004, the Laboratory formed the Fermilab Community Task Force on Public Participation to develop a set of mutual expectations for how Fermilab will interact with the community on issues that affect them both. The 20-member Task Force consists of individuals with diverse interests from the surrounding communities. The Laboratory asked the Task Force to provide recommendations on how the Laboratory and the community should work together on issues of mutual interest and concern. The Task Force submitted its final recommendations to Laboratory management in December 2004. Fermilab is using these recommendations to develop a comprehensive policy for public participation, incorporating community desires and concerns to the maximum extent possible. The Fermilab Community Task Force currently meets on an occasional basis as issues arise.

Fermilab maintains strong governmental, associate laboratory and community relationships

Argonne National Laboratory Director Robert Rosner (left), Fermilab Director Pier Oddone and Illinois Department of Commerce and Economic Opportunity (IDCEO) Director Jack Lavin (right), show signed Memorandum of Understanding Proclamation recognizing the partnership of the two laboratories. Fermilab and Argonne with their complementary strengths, their deep knowledge of accelerators, and their commitment to scientific and operational excellence can provide a strong scientific center to host the future International Linear Collider in Northern Illinois. The laboratories also feel fortunate for the absolute outstanding support received from the State of Illinois government.

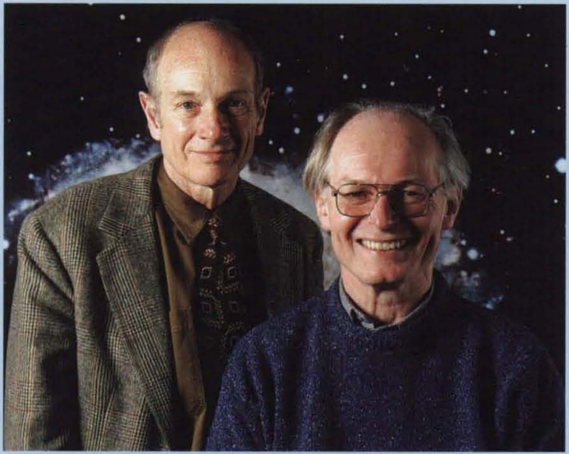
In early 2007, the Laboratory established the twenty-four member ILC Citizens' Task Force, which provides guidance and advice to Fermilab to ensure that community concerns and ideas are included in all public aspects of ILC planning and design. Several members of the Community Task Force also serve as members of the ILC Citizen's Task Force.

LABORATORY DIRECTORS

On July 1, 2005, Piermaria Oddone became Fermilab's fifth director. Dr. Oddone comes to Fermilab from Lawrence Berkeley National Laboratory, where he was Deputy Director for the previous fifteen years. Dr. Oddone succeeds Michael Witherell, who served as director from 1999 to 2005. Dr. Witherell has returned to the University of California at Santa Barbara, where he now serves as Vice Chancellor for Research. John Peoples, Jr. led the Laboratory from 1989 to 1999. Dr. Peoples is currently a senior scientist in Fermilab's Experimental Astrophysics Program, where he served from 1999 to 2003 as Director of the Sloan Digital Sky Survey. Leon M. Lederman, a 1988 Nobel laureate, directed the Laboratory from 1979 to 1989 and is a member of the URA Board of Trustees. Dr. Lederman is currently Resident Scholar at the Illinois Mathematics and Science Academy; his contributions to science education are known worldwide. Fermilab's founding director, the late Robert R. Wilson, served from 1968 to 1978, and subsequently served as a member of URA's Fermilab Board of Overseers. Dr. Wilson provided enduring guidance for the aesthetics of buildings and grounds, including sculpture that he created.

For further information about Fermilab, visit the Laboratory's website at http://www.fnal.gov

PIERRE AUGER OBSERVATORY PROJECT



"These highest-energy cosmic rays are messengers from the extreme universe. They represent a great opportunity for discoveries," said Nobel Prize winner James Cronin (left), of the University of Chicago, who conceived the Auger experiment together with Alan Watson of the University of Leeds (UK). Alan Watson and Giorgio Matthiae of the University of Rome (Italy) are the current project spokespersons, and Jim Cronin is spokesperson emeritus.

Cosmic rays are high-energy charged particles from space that constantly bombard the Earth from all directions. The majority of the particles are protons—the nuclei of hydrogen atoms—but some are much heavier, ranging up to the nuclei of uranium atoms. A small fraction of cosmic rays are the most energetic particles ever observed in nature. Direct measurement requires locating detectors above most of the Earth's atmosphere, using high-altitude balloons and orbiting satellites, which necessarily imposes limits on the weight of instrumentation required for the highest energy cosmic rays. Nearly 70 years ago, French physicist Pierre Auger discovered that cosmic rays can also be detected indirectly on the surface of the Earth by observing the showers of secondary particles they produce when colliding with atmospheric molecules. Named in his honor, the Pierre Auger Observatory is a broad-based international effort to solve the mystery of the origins of the extremely rare ultra-high-energy cosmic rays showering the earth at energies above 10^{19} electron volts (eV), or about 10 million times greater than the energy of the protons accelerated by Fermilab's Tevatron. These highest-energy cosmic rays can be considered messengers from the extreme universe, and thus they represent great opportunity for discoveries. Tracking these particles back to their source will help explain how nature creates the conditions to accelerate them to such high energies.

The especially interesting cosmic rays, which have energies of over 10^{20} eV (equivalent to the kinetic energy of a tennis ball traveling at 60 miles per hour, but packed into a single proton), have an estimated arrival rate of less than 1 per square kilometer per century! They are important because they are expected to be only slightly deflected by galactic and intergalactic magnetic fields. To record a large number of these ultra-high energy cosmic rays events requires a very large observing area, roughly the size of the state of Rhode Island. The Pierre Auger Observatory is completing construction of an array of 1,600 surface detectors spaced about 1.5 kilometers apart and spread over 3000 square kilometers in Argentina's Mendoza Province, just east of the Andes Mountains. For more accurate measurement of cosmic ray events, the Observatory is the first to use a hybrid approach: a surface detector array to record the showers of particles produced when cosmic rays strike the earth's surface, supplemented with fluorescence detectors to record the atmospheric flares produced by particle showers, visible on dark clear nights. Each surface detector, consisting of a tank filled with 3000 gallons of ultra-pure de-ionized water and associated electronic equipment, can record the electromagnetic shock waves produced by cosmic ray shower particles traveling through the water. Surrounding the array are four fluorescent detector

The Pierre Auger Observatory is studying showers of particles produced when cosmic rays strike the earth's atmosphere. Some 1,600 surface detectors are being deployed for the Southern engineering array on the pampa, near Malargüe, Argentina, that will record cosmic rays events as they occur. Technicians installing electronics on one of the surface detectors, with the Andes Mountains shown to the west of the detector array.

the earth's atmosphere. As of mid-2007, the southern hemisphere Observatory was about 80% completed, with all of the fluorescence telescopes and 1300 surface detectors in operation. The Auger data collected since January 2004 are about three times that of the AGASA surface array in Japan and about twice that of the HiRes fluorescence detectors in the U.S.

In 2007, the Auger collaboration began a public release of one percent of the cosmic-ray events recorded by the southern hemisphere Observatory. New cosmic-ray data—about 70 events per day—are posted on the Auger website on a daily basis. The one-percent release is part of the worldwide Pierre Auger education and outreach program. It will allow teachers to expose students to real scientific data and the breathtaking processes that take place in the cosmos, where charged particles are hurled toward Earth. Data are provided both as graphical displays and in tabular form. For each cosmic-ray air shower, the Auger displays show the energy and direction of the incoming cosmic-ray particle.

Within the scientific community, there is great interest in the mysterious origin of the ultra-high energy cosmic rays that the Observatory is analyzing. Theorists have developed a number of exotic theories for such origin, including the collapse of hypothetical objects, called "topological defects," left over from the Big Bang.

To get a complete view of the heavens as seen from the earth, the Auger collaboration has established a design for a northern hemisphere partner of the southern hemisphere Observatory, to be based in southeastern Colorado. With observatories in both hemispheres, the Auger collaboration will have the opportunity to view cosmic rays across the entire sky visible from earth. If cosmic rays are found to arrive from specific directions, the Auger Observatories will be able to identify and study possible cosmic ray sources all over the sky with equal sensitivity. If discrete sources are not found, the full-sky coverage provided by the two sites will be essential for determining whether cosmic ray arrival directions are characterized by subtle large-scale patterns in the universe, or whether they are completely arbitrary.

Mirrors of the Light Detection and Ranging (Lidar) system used for the atmospheric monitoring. Using Lidar systems, located near each fluorescence eye, the quality of air is monitored during the nights of fluorescence detector data taking. Also near the center of the array there are two central laser facilities, used to fire laser shots into the sky at night to calibrate the response of the nitrogen fluorescence detectors.

In a grant to URA on behalf of the U.S. Project participants under Dr. Cronin's continuing leadership, the National Science Foundation and the Department of Energy are providing some $10 million toward the U.S. share for the construction of the southern hemisphere Observatory. URA serves as the sponsoring organization for the U.S. participants, and as such oversees those activities currently funded by the U.S., such as component R&D and production. In addition, DOE and NSF have designated URA to be the agent on behalf of the U.S. on the Project's international oversight board, which has been chaired by URA President Fred Bernthal from 2004 to 2007.

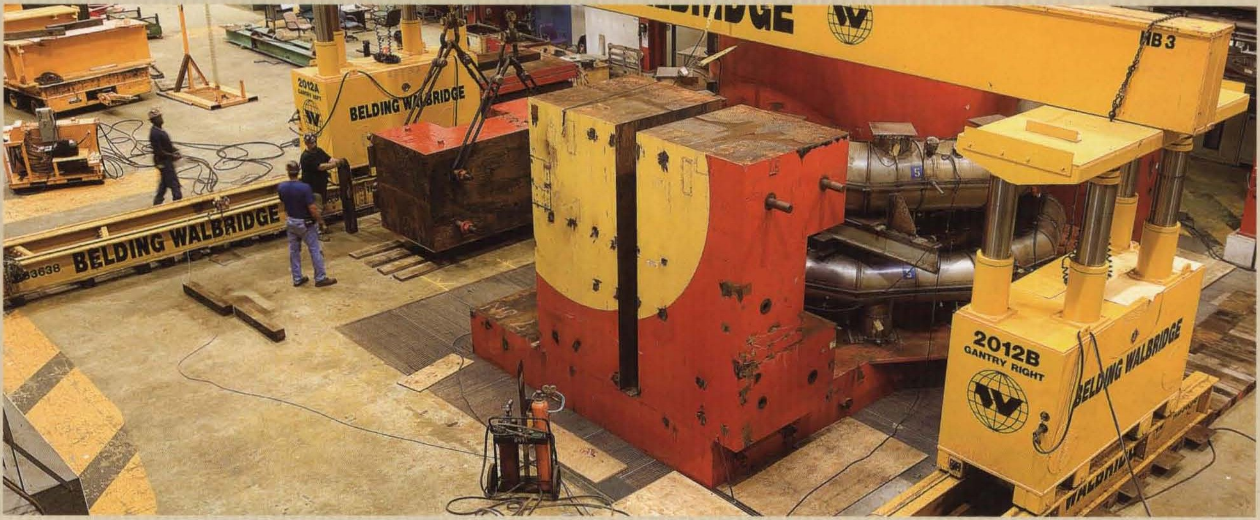
For further information about the Pierre Auger Observatory, visit its website at http://www.auger.org

FUTURE URA ENTERPRISES

URA has a broad charter for the management of research and educational activities in the natural sciences. The Corporation is always exploring potential new management responsibilities that would be of value to the university research community.

As part of this planning, URA will consider bids on management contracts for selected national research centers and facilities that serve a broad base of national and international users.

HISTORY 1965-2007



Workers begin removing the Chicago Cyclotron magnet from the New Muon building at Fermilab. The giant magnet was originally part of the Chicago Cyclotron, made famous when Enrico Fermi and his colleagues at the University of Chicago used it to show that particles called "pions" are largely responsible for the force that holds protons together in the nucleus of an atom. Over the magnet's two-decade-long career at Fermilab, it was used in a least six experiments and became special to a lot of people, because it spans most of the history of accelerator-based physics. With the magnet now removed, the building has been converted into a test beam facility for the ILC.

The creation of URA marked a milestone in government-university cooperation for the management of Federal laboratories. Until 1965, individual universities and regional consortia had built and operated facilities under Federal sponsorship. It was the unique character of particle physics research—which often involved collaborations among scientists from many institutions—that created the need to establish a representative, truly national management organization. The Federal government consulted with the National Academy of Sciences on how to accomplish this goal. The President of the Academy then convened the presidents of the U.S. universities engaged in particle physics, to consider management options for national facilities. Following that meeting, 25 attendees agreed to form a consortium leading to the incorporation of URA.

This concept of fully national, and now increasingly international, cooperative efforts between the Federal government and research universities was developed to address the needs of many fields of science. For four decades, from 1967 through 2006, URA was the sole contractor to the Department of Energy (DOE) and its predecessor agencies for the design, construction, management, and operation of Fermilab. URA's success in building and operating Fermilab led to its selection as management and operating (M&O) contractor for the nation's next major particle accelerator, the SSC. After the project was canceled in 1993, URA managers and staff assisted with the termination activities, which were essentially concluded by the end of 1996, on schedule and under budget.

In accordance with its new policy of periodically holding formal competitions for the award of all of its laboratory M&O contracts, DOE held a competition for the Fermilab contract in 2006. As part of the strategic approach for bidding on the new Fermilab contract, URA teamed with one of its member universities, the University of Chicago (UChicago), to form Fermi Research Alliance, LLC (FRA), a jointly-owned non-profit company. FRA combines URA's broad geographical representation in the university community and forty years of experience in managing Fermilab, with UChicago's institutional strength and diversity, prominence in the local region, and sixty years of experience in managing Argonne National Laboratory. The URA-UChicago team garnered one of the highest scores ever awarded in a DOE laboratory contract competition, and DOE awarded the Fermilab contract to FRA, effective January 1, 2007.

Jane Scheyer Wilson, 89, widow of Fermilab's founding director Robert R. Wilson, died February 14, 2006, in Ithaca, New York. Robert and Jane Wilson are shown in a 1978 photo above.

Currently, the Fermilab program and its associated scientific and technological enterprises, and participation in the Pierre Auger Observatory Project represent the core of URA's activities. As appropriate opportunities arise, the corporation will consider submitting proposals to the Federal government, or elsewhere, for the management and operation of other facilities and programs in science and engineering.

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William A. Schmidt
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Fermilab

Piermaria Oddone
Director

Young-Kee Kim
Deputy Director

Laboratory Staff: 2,000

Pierre Auger Observatory Project

James W. Cronin
(University of Chicago)
U.S. Principal Investigator

CORPORATE STRUCTURE

MEMBERSHIP AND GOVERNANCE

As a non-profit corporation, URA is governed by a Council of Presidents of its 90 member universities. The Council is analogous to the shareholders of a public corporation. A Board of Trustees, elected by the Council, has the fiduciary responsibilities for the corporation and deals with corporate policy and planning issues. The Trustees appoint a board of overseers for each major URA-managed enterprise. URA overseers typically have the scientific and/or administrative expertise and experience applicable to the specific enterprise. The headquarters office of URA in Washington, D.C. coordinates the activities of the Council and boards, and is responsible for oversight and governance of Fermilab and for corporate relations with the federal government, industry, academe, and the general public.

URA member universities are divided among seven geographic regions within the United States to ensure that URA's governing boards reflect the organization's national character. URA has expanded these regions to include its several international members. The Council of Presidents elects one Trustee from each of the seven regions; each Regional Trustee is president or equivalent chief executive officer of a member institution in the region. There are up to ten At-Large Trustees. A board of overseers typically has a similar structure, with seven regional members and a designated number of at-large members.

URA board members over the years have included chief executive officers of major industrial corporations, corporate vice-presidents, university presidents and vice-presidents. Boards have also included winners of major science prizes, including Nobel laureates, as well as directors of other major research laboratories. Regional group secretaries, who are faculty members at URA member universities, help to identify candidates for election as regional members on the boards of overseers.

URA was the sole management and operating (M&O) contractor for Fermilab through 2006, and URA's oversight body for Fermilab was the eighteen-member Fermilab Board of Overseers. The Fermilab Director was selected by the URA Board of Trustees with the approval of DOE. In 2007, URA joined with the University of Chicago to form Fermi Research Alliance, LLC (FRA), the jointly-owned nonprofit company that now holds the Fermilab M&O contract. Accordingly, direct oversight of Fermilab has been assumed by a new twenty-four member FRA Board of Directors. Under URA's formal agreement with the University of Chicago, half of the FRA Directors are appointed by URA and half are appointed by the University. The University President serves as the Chair of the FRA Board, and the URA President serves as the Board's Vice Chair. Representatives of Fermilab's other major neighboring universities (Illinois Institute of Technology, Northern Illinois University, Northwestern University, and the University of Illinois) have permanent seats on the FRA Board. URA has appointed nine incumbent members of its 2006 Fermilab Board of Overseers, including all seven Regional Overseers, to the FRA Board.

Daily Fermilab operations are coordinated directly between Laboratory management and the DOE Fermi Site Office or DOE headquarters. The total number of FRA employees at Fermilab is currently about 2,000. The Fermilab Director is the President of FRA.

ASSESSMENTS

In lieu of annual dues, URA historically has assessed its member universities only as special needs arise. From the formation of the corporation in 1965 through 2006, such assessments totaled $30,000 per member. Newly elected members were assessed the amount of the most recent prior assessment. In response to a requirement in DOE's request for proposals (RFP) for the new Fermilab M&O contract that commenced on January 1, 2007, URA, the University of Chicago and the four local Illinois universities agreed to support new initiatives at the Laboratory. The University will contribute its share of the fee earned under the contract, approximately $400,000 per year, to underwrite University faculty participation at Fermilab and other Laboratory programs. Similarly, URA will support a variety of activities at Fermilab which would specifically be reserved for faculty and staff from URA member universities, and which would be of mutual benefit to the universities and to the Laboratory. To fund this initiative, the URA Trustees authorized the introduction of a five-year, limited-term assessment of $5,000 per year from each of URA's member universities, over the five-year term of the new Fermilab contract.

URA HEADQUARTERS OFFICE

Corporate officers include leaders of the URA governing bodies (Council of Presidents and Board of Trustees) and executive officers at URA headquarters in Washington, D.C. (President, Vice President/Secretary, Chief Financial Officer/Treasurer, and General Counsel). The URA Secretary, CFO, and General Counsel currently also serve in the corresponding positions in FRA.

URA REGIONAL GROUP SECRETARIES

1 **Kam-Biu Luk,** University of California, Berkeley
2 **Kenneth J. Heller,** University of Minnesota
3 **Sally C. Seidel,** University of New Mexico
4 **Randal C. Ruchti,** University of Notre Dame
5 **Paul D. Sheldon,** Vanderbilt University
6 **Bruce A. Barnett,** Johns Hopkins University
7 **Michael Tuts,** Columbia University

URA BOARD OF TRUSTEES

REGIONAL TRUSTEES

REGION		Term Expires
1	Henry T. Yang Chancellor, University of California, Santa Barbara	2009
2	Mark S. Wrighton Chancellor, Washington University in St. Louis	2009
3	Sean O'Keefe Chancellor, Louisiana State University	2010
4	Lou Anna Simon President, Michigan State University	2008
5	Andrew A. Sorensen President, University of South Carolina	2008
6	Heather Munroe-Blum President, McGill University	2010
7	Shirley Strum Kenny President, State University of New York at Stony Brook	2009

TRUSTEES AT-LARGE

	Term Expires
Norman R. Augustine CEO (ret.), Lockheed Martin Corporation	2008
Steven C. Beering President Emeritus, Purdue University	2010
Emanuel J. Fthenakis CEO (ret.), Fairchild Industries	2010
Robert W. Galvin CEO (ret.), Motorola, Inc.	2008
Donald L. Hartill Professor, Cornell University Chair, Fermilab Board of Overseers (through December 2006)	ex officio
William H. Joyce CEO, NALCO Company	2009
Leon M. Lederman Professor, Illinois Institute of Technology, Director Emeritus, Fermilab	2010
Richard A. Meserve President, Carnegie Institution of Washington	2010
H. Guyford Stever President Emeritus (ret.), Carnegie Mellon University	Emeritus
Joe B. Wyatt Chancellor Emeritus, Vanderbilt University	2009

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Illinois Math & Science Academy

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Vanderbilt University

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Fairchild Industries (ret.)

Peter F. M. Koehler
University of Pittsburgh
Fermilab Board of Overseers (ex officio)
(through December 2006)

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Carnegie Institution of Washington

Andrew A. Sorensen
University of South Carolina

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Purdue University

Fred Bernthal
URA President

Robert W. Galvin
Motorola, Inc.

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Serving through December 2006 / Superceded by Board of Directors of Fermi Research Alliance, LLC, effective January 1, 2007

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REGION

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Professor, California Institute of Technology

2 Gregory Snow
Assoc. Professor,
University of Nebraska-Lincoln

3 Jack Ritchie
Professor, University of Texas at Austin

4 Heidi Schellman
Professor, Northwestern University

5 Thomas Weiler
Professor, Vanderbilt University

6 Sheldon Stone
Professor, Syracuse University

7 Frank Sciulli
Professor, Columbia University

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Professor, Johns Hopkins University

Mark Bregman
Chief Technology Officer,
Symantec Corporation

Ian Corbett
Head of Administration,
European Southern Observatory

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Professor,
University of California, Santa Cruz

Jerome Friedman
Professor,
Massachusetts Institute of Technology

Donald Hartill
Professor, Cornell University

Judd Haverfield
Vice President, Business Operations (ret.)
Weyerhaeuser Company

Peter Koehler
Professor, University of Pittsburgh

Alan Schriesheim
Director Emeritus,
Argonne National Laboratory

Allen Sessoms
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Jill Wittels
Vice President, Business Development,
L-3 Communications

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EXTERNAL COMMITTEES

URA VISITING COMMITTEE FOR FERMILAB SCIENTIFIC PROGRAMS (2006)

Term Expires

Fulvia Pilat, Chair 2007
Brookhaven National Laboratory

Alice Bean 2009
University of Kansas

Daniela Bortoletto 2006
Purdue University

Michael Dine 2009
University of California–Santa Cruz

Albrecht Karle 2007
University of Wisconsin–Madison

Matthias Neubert 2007
Cornell University

Natalie Roe 2008
Lawrence Berkeley National Laboratory

Nicholas Walker 2008
DESY Laboratory

From the Fermilab Board of Overseers

Donald Hartill 2006
Cornell University

Thomas Weiler 2006
Vanderbilt University

FERMILAB ACCELERATOR ADVISORY COMMITTEE

Term Expires

John Corlett, Chair 2007
Lawrence Berkeley National Laboratory

Swapan Chattopadhyay 2009
Cockcroft Institute

Gunther Geschonke 2009
CERN

Georg Hoffstaetter 2007
Cornell University

Kwang-Je Kim 2009
Argonne National Laboratory

Shin-ichi Kurokawa 2007
KEK Laboratory

Stephen Milton 2007
Argonne National Laboratory

Michiko Minty 2007
DESY Laboratory

FERMILAB ACCELERATOR ADVISORY COMMITTEE *(cont.)*

Term Expires

Hasan Padamsee 2009
Cornell University

Stephen Peggs 2007
Brookhaven National Laboratory

Tor Raubenheimer 2009
SLAC

Hans Weise 2009
DESY Laboratory

FERMILAB PHYSICS ADVISORY COMMITTEE

Term Expires

Daniel Marlow, Chair 2007
Princeton University

Hiroaki Aihara 2010
University of Tokyo

John Carlstrom 2011
University of Chicago

Sally Dawson 2010
Brookhaven National Laboratory

Sarah Eno 2009
University of Maryland

Fabiola Gianotti 2008
CERN

Rolf-Dieter Heuer 2009
DESY Laboratory

Steven Kahn 2008
SLAC

Boris Kayser 2008
Fermilab

François Le Diberder 2010
CNRS/IN2P3

Robert McKeown 2008
California Institute of Technology

Dong Su 2007
SLAC

Scott Willenbrock 2007
University of Illinois at Urbana–Champaign

Jeff Appel, Secretary
Fermilab

FINANCES

Universities Research Association, Inc.
SUMMARY OF REVENUES AND EXPENSES
Year Ended September 30, 2006

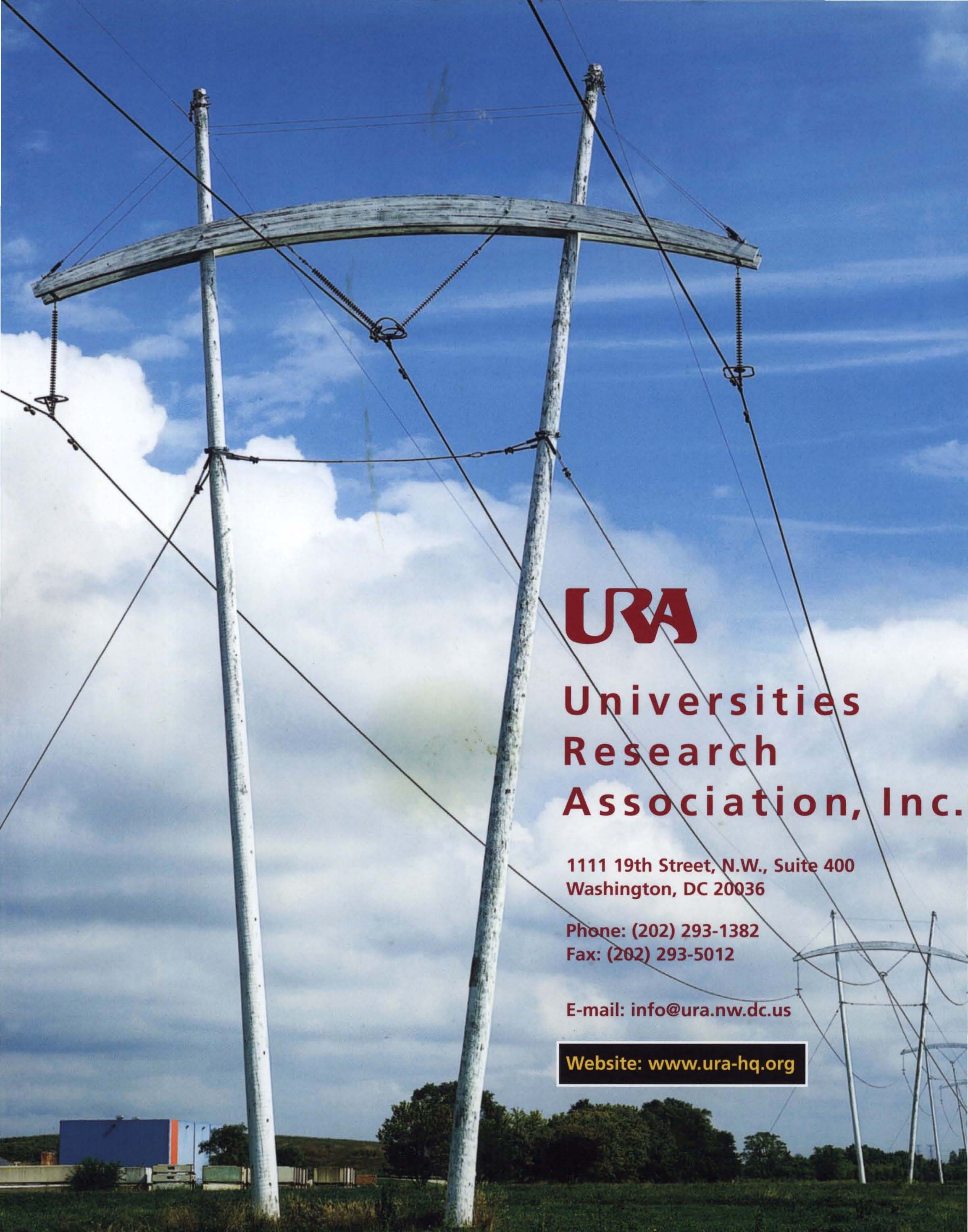
Total Revenue	$ 323,847,170

EXPENSES:

Salaries, wages and benefits	$ 184,326,840
Subcontracts and purchased services	54,624,197
Materials and supplies	23,455,888
Electric power	20,331,837
Travel, relocation and other employee allowances	7,323,143
Inventory usage	3,804,656
Fermi National Accelerator Laboratory and Pierre Auger Project support	559,316
Scholarships	103,950
Other *(includes proposal costs for Fermilab contract competition)*	2,243,818
Total Operating Expenses	$ 296,773,645
Cost of property, plant and equipment constructed for DOE	$ 29,069,387
Total Expenses	$ 325,843,032
Change in Net Assets	$<1,995,862>

The Feynman Computing Center, is a three-story semicircular structure of 74,000 square feet which houses the central computing facilities for the Laboratory. Many interior lights glow as work continues after hours from the building's north-facing glass facade here at sunset with the water fountain in the center outdoor court.

Back cover photo: The iconic pi-shaped power lines were designed by Founding Director Robert Wilson, over 30 years ago and had been constructed of wood. Due to deterioration, new poles made of steel, have been designed to be visually identical to the original poles. The replacement process, which took approximately two months, was recently completed.



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