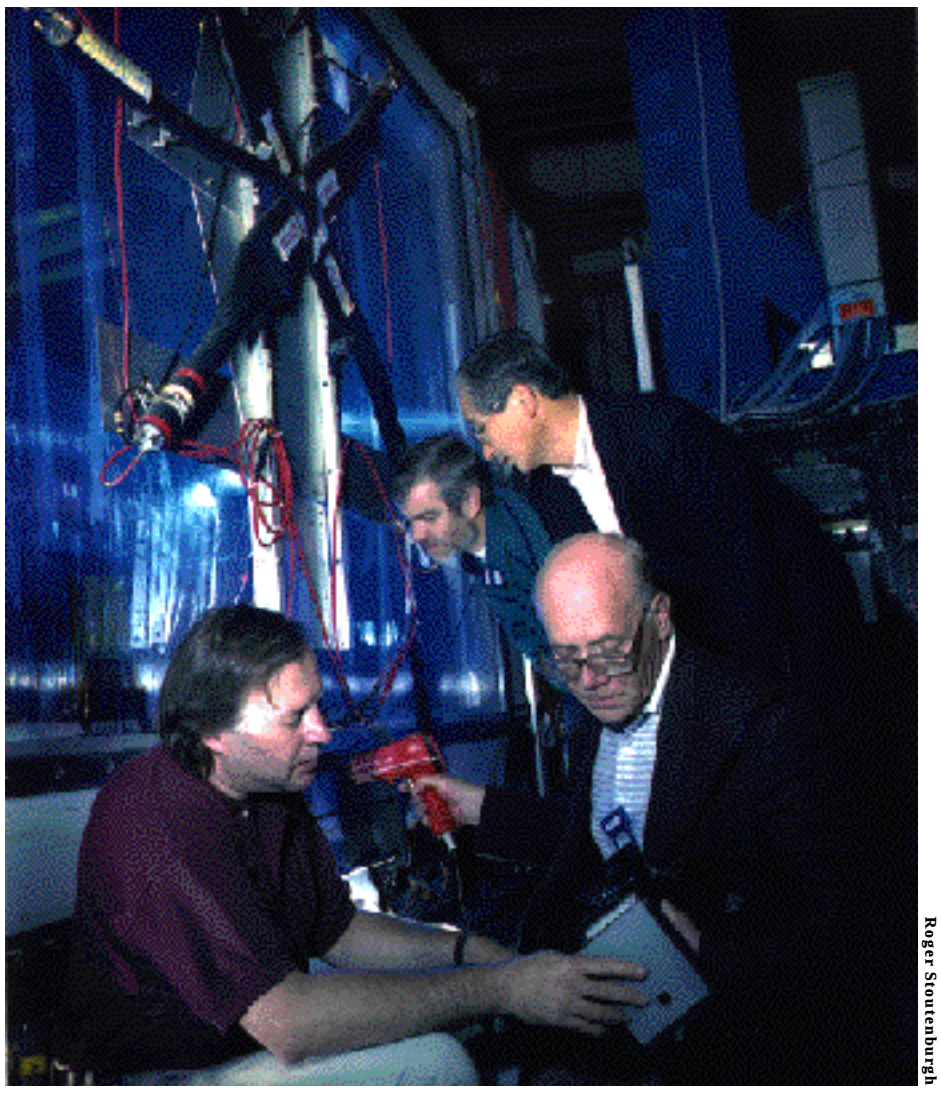
BROOKHAVEN BULLETIN
Vol. 51 - No. 37 September 19, 1997
BROOKHAVEN NATIONAL LABORATORY

Evidence of Exotic Meson Particle Discovered at AGS



Roger Stoutenburgh

At the Alternating Gradient Synchrotron, Experiment 852 researchers (from left, front, counterclockwise) Dennis Weygand, Hans Willutzki, Suh-Urk Chung and Robert Hackenburg are beside the multi-particle spectrometer with which the exotic meson was found.

Researchers at BNL's Alternating Gradient Synchrotron (AGS) accelerator have found evidence of a new and rare subatomic particle called an "exotic" meson.

This finding at AGS Experiment 852, described in the September 1 issue of *Physical Review Letters*, helps validate the standard model, the central theory of modern physics.

Also, the finding could improve understanding of how matter binds together at the relatively low energy level of 18 billion electron volts (GeV).

The E852 team of 51 scientists, graduate students and undergraduates includes researchers from: BNL, Northwestern University, Rensselaer Polytechnic Institute, the University of Massachusetts, Dartmouth College, and Russia's Institute for High Energy Physics and the Moscow State University.

The E852 collaboration also includes an Indiana University group, which did not sign the *Physical Review Letters* publication. "Instead of a short letter, the Indiana group wanted to write a longer paper, with all the technical and experimental details included," said Senior Physicist Suh-Urk Chung of BNL's Physics Department, an E852 cospokesman.

Funded by the U.S. Department of Energy (DOE) and the National Science Foundation, the E852 researchers uncovered an exotic meson with a mass of 1.4 GeV after years of selecting and analyzing data from products of billions of particle collisions made during the experiment's 1994 run.

The result was presented to participants of the Seventh International Conference on Hadron Spectroscopy, held at BNL August 25-30 (see story on page 2). At the conference, confirmation of the E852 result was reported by what is called the Crystal Barrel collaboration at CERN, the European particle physics laboratory.

"In some sense, we've discovered a new form of matter," said Chung. "This particle had been hypothesized [in the late 1970s], but it's never, never been pinned down.

"To find evidence of a particle that has never been detected before, one that's so important to our understanding of elementary particles, is hugely satisfying," Chung continued. "Just as satisfying is the fact that we found it at the AGS, the home to so many particle discoveries over the decades and, as our work also shows, a great machine for high-energy physics."

To do the experiment, E852 researchers aimed an 18-GeV beam of negatively charged pions from the AGS at a target of liquid hydrogen. The target was in a device called a multi-particle spectrometer (MPS), an instrument designed to detect many different types of particles at once.

(continued on page 2)

Bromley Calls Anti-HFBR Bill 'Unwise, Unwarranted'

In reaction to the bills introduced into the U.S. Congress by U.S. Senator Alfonse D'Amato and Representative Michael Forbes, D. Allan Bromley, who is the past President of the American Physical Society and the former Director of the Office of Science & Technology Policy under President George Bush, sent them a letter, excerpted below, on Thursday September 11, with copies to all members of the House and Senate energy & water development appropriations subcommittees.

Dear Senator D'Amato and Representative Forbes:

On behalf of more than 40,000 physicists throughout the United States, the Council of The American Physical Society last April adopted a statement on neutron scattering facilities. That statement, a copy of which I am enclosing, stresses the critical role that neutron science plays in a wide range of technologies across many fields. The statement also calls attention to the loss of American leadership in this area of research and the risks that our nation will face if the problem is not soon redressed.

I have learned recently that you and Representative Michael Forbes have submitted companion legislation that would permanently close Brookhaven's High Flux Beam Reactor, one of only four major neutron scattering facilities in our country. From a scientific standpoint, I believe that such action is unwise and unwarranted. For almost half a century, Brookhaven has been one of the gems in our nation's scientific enterprise, and the High Flux Beam Reactor has been an integral part of the laboratory's outstanding program. . . .

Sincerely, D. Allan Bromley

LIA Suports HFBR Review Process, Opposes D'Amato, Forbes Legislation

The Board of Directors of the Long Island Association (LIA), the region's largest business and civic organization, has unanimously passed a resolution urging that the U.S. Department of Energy be allowed to complete its process of evaluating the environmental, safety, health and community impact of BNL's High Flux Beam Reactor (HFBR) and then allowing Energy Secretary Federico Peña to make a determination as to whether the reactor should be restarted.

Hence the LIA's resolution opposes the legislation introduced into the U.S. Senate by Senator Alfonse D'Amato and into the House by U.S. Representative Michael Forbes, which attempts to shut down the reactor permanently without any evaluation through any process.

"The decision on the future of Brookhaven National Laboratory's reactor should be based on science, not politics," noted LIA President Matthew Crosson in a press release issued on Monday, September 15. "To flatly require that the reactor never be reopened, regardless of findings which might determine otherwise, is unnessary and unwise. It also may be damaging to Long Island's future economy. The facilities at the Laboratory, including the reactor, were core component's of Project Long Island's determination that Long Island's future will largely depend on high technology industries."

Crosson continued, "The LIA will urge both houses of Congress to oppose the legislation introduced by Senator D'Amato and Congressman Forbes. This issue is too important to Long Island and the country's future scientific endeavors to be determined by political considerations."

The LIA President concluded, "It is through research at [the HFBR] that we may be able to find cures for Lyme disease, cancer, arthritis and heart disease. Let's not be so abrupt in our decision to shut out these possibilities. Long Island deserves better than that."

Established in 1926 and now based in Commack, the LIA represents approximately half of Nassau and Suffolk's work force and aims to improve Long Island's business and working environment.

Interim Director Announces Five Changes Within BNL's Organization

On Tuesday, September 16, BNL's Interim Director Peter Bond announced that, effective that day, five changes had taken place within the Lab's interim organization.

First, at her request, Sue Davis stepped down as BNL's Associate Director for Reactor, Safety & Security, the position that she has held since 1992. Davis will remain within the Director's Office, as a senior advisor on environment, safety and health (ES&H).

Noted Bond, "I want to thank Sue for her heroic efforts over the past several years, which were extremely stressful and challenging times for the Laboratory."

He continued, "I am extremely pleased that Dr. Davis has agreed to serve as a senior advisor within the Director's Office [because] her experience and knowledge of the Laboratory's ES&H programs and related issues will be invaluable as we pursue a change in our culture and the development of new management systems and processes."

Bill Gunther, who since 1994 has been the Manager of the Office of Environmental Restoration (OER), has been named Interim Associate Director for Reactor, Safety & Security. Replacing Gunther as Interim OER Manager is Bob Howe, who until Tuesday was OER's Deputy Manager.

In addition, Dave Rorer, the Manager of the Reactor Division since 1995, is now that Division's Strategic Planning Manager. Becoming Interim Reactor Division Manager is Al Queirolo, who since 1995 had been that Division's Deputy Manager. The Reactor Division operates both BNL's High Flux Beam Reactor (HFBR) and the Brookhaven Medical Research Reactor.

"I want to thank Dave for his contributions to both the HFBR and the Laboratory during a particularly difficult time at the HFBR," commented Bond.

Hadron Spectroscopy '97: An Exotic Event

The annual International Conference on Hadron Spectroscopy has been key in the field since its inception, and the seventh such conference, held at BNL this year from August 25 to 30, proved to be exceptionally exciting.

As the 194 scientists from 19 countries who attended the conference learned, not only had a long-sought-after new particle, an exotic meson, finally been observed (see story on page 1), but also, using an entirely different approach, another experimental team had uncovered evidence supporting the discovery.

First, the evidence for an exotic meson with a mass of 1.4 billion electron volts (GeV) found at Experiment 852 at BNL's Alternating Gradient Synchrotron, was formally presented by E852 member Alexander Ostrovidov, Moscow State University, in his presentation of "Evidence of Exotic Meson Production in $\pi^- p$ Interactions," which was made at the conference's Tuesday, August 26, plenary session.

Then, in a parallel session that evening, when the conference participants broke up into small groups to discuss and report on specialized topics, E852 results were confirmed in preliminary findings presented in a talk by Wolfgang Duennweber, University of Münich, a member of the Crystal Barrel Collaboration at CERN, the European particle physics laboratory in Geneva, Switzerland.

Duennweber described how CERN physicists had used the Crystal Barrel detector to study the products created in antiproton-neutron collisions, and they also found evidence of an exotic meson with a 1.4-GeV mass.

Michael Herbert

Hadron '97 conference attendees pictured here include several coordinators and organizers from BNL's Physics Department: (front, from left) Sharon Smith, Fern Simes, Local Organizing Committee Chairman Hans Willutzki, Conference Chairman Suh-Urk Chung, Patricia Meehan and Florence O'Brien.

In addition, in his review of the conference that opened the final plenary session, on Saturday, August 30, Crystal Barrel collaborator Everhard Klempt of Bonn University reconfirmed and commented on the implications of the new particle.

Was the dramatic timing of this confirmation a coincidence? "Not really," said E852 co-spokesman Suh-Urk Chung, BNL Physics Department and Hadron Conference Chairman.

Chung related that last year, when he had attended LEAP-96, the 14th Biannual Conference on Low Energy Antiproton Physics held in Germany, he had given a review of E852's research, with preliminary results.

"The results I gave were preliminary, with no mass or width," said Chung. "But, because I was fairly sure that our results would prove positive, I urged those at the conference: Since we see the evidence, look at your data too."

It was after this talk, Chung said, that the Crystal Barrel researchers analyzed the antiproton-neutron data, in which they found confirmation of the new particle.

Conference attendee Ted Barnes, Oak Ridge National Laboratory and University of Tennessee, who gave the first plenary-session talk and is not affiliated with either the E852 or the Crystal Barrel collaborations, had commented earlier on the finding.

"This is a very important discovery," Barnes said. "Theorists have predicted the existence of exotic hybrid mesons, which contain both quarks and gluons, since the late 1970s, but E852 may have found the smoking gun for their existence. It's a benchmark that will set the mathematical scales for future experimentation and theoretical study."

Said Chung, "This could be the beginning of a new era in hadron spectroscopy, where multiquarks and gluons are accepted as constituents of hadrons. We have observed one kind of exotic meson, but there are also quarkless hadrons — glueballs — to look for, and we also want to search for them in our data."

Other experiments elsewhere, beside Crystal Barrel, have an excellent chance of finding candidates for the glueballs and other exotic mesons, Chung said. For example, two are the Institute for High Energy Physics/ Protvino in Russia and the COMPASS detector facility, expected to be ready for experiments in 1999 at CERN.

At BNL, Chung said, the search for exotic particles will go forward perhaps with an upgrade of the multiparticle spectrometer that has produced the new exotic meson and, also, at BNL's Relativistic Heavy Ion Collider, soon to be completed.

— Liz Seubert

Exotic Meson (cont'd.)

From the spectrometer's recordings of the billions of particles produced when the beam collided with the target, the experimenters selected reactions likely to yield possible exotic mesons, then analyzed these data using sophisticated statistical techniques.

"Before we could start on the experiment itself, we had to upgrade the MPS extensively," Chung said. "In fact, it took three years to prepare it for the first run."

The heart of the MPS is a 700-ton magnet that BNL acquired at no cost in the early 1970s from Argonne National Laboratory. A BNL team rebuilt the original round magnet and added multiple detectors so that, by 1975, the MPS had become a state-of-the-art device to detect protons, pions and kaons and their antimatter counterparts.

Chung explained that the recent $6-million upgrade, which the E852 team began in 1991, involved adding a detector to record photons. That detector, the work of the Russian team members, employs over 3,000 lead-glass elements, .

Also added around the target were: a four-layer cylindrical drift chamber to catch recoiling protons; a detector consisting of 198 blocks of thallium-doped cesium iodide, which shows slow-energy photons, known as "soft" photons; and a downstream end-cap array of lead-scintillation sandwich counters, which acts as a soft-photon veto.

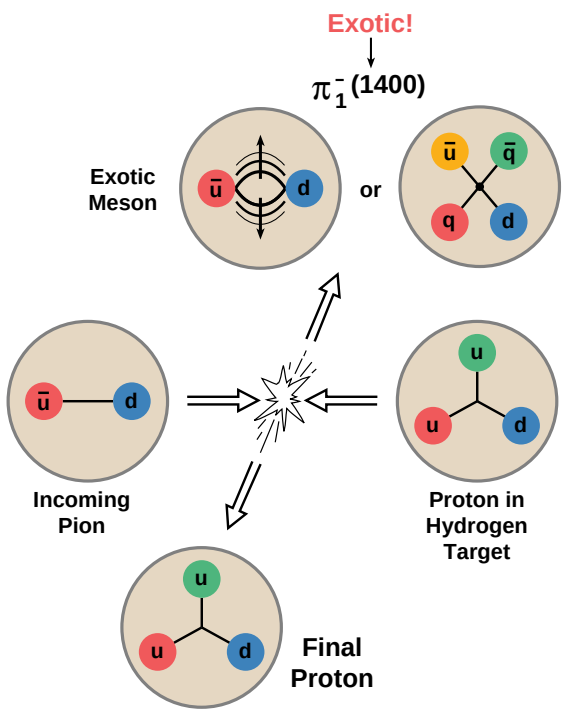
From the hundreds of millions of particles recorded by these extremely sensitive instruments, the MPS is programmed to select those that could be evidence of an exotic meson.

Meson = Quark + Antiquark

Theorized in 1935, the first meson particle was not observed until 1947.

Mesons and baryons, another kind of particle, belong to a branch of particles known as hadrons. Hadrons are known to be made up of different combinations of what are called quarks, which are believed to be fundamental or indivisible particles; antiquarks, which are the antimatter opposites of quarks; and gluons, which, like their name, hold quarks and/or antiquarks glued together. Six types of quark are known to exist: the up and the down, the strange and the charm, and the top and the bottom, each having its own antiquark.

Scientists know that baryons, which include the familiar protons and neutrons, are formed of three quarks, and that mesons contain a quark and an antiquark. The quarks in both baryons and mesons are held together by the binding force, known as the strong force, carried by the gluons.



An incoming pion (left), with both an up antiquark ($\bar{u}$) and a down quark (d), hits a proton in a hydrogen target. The gluons holding the quarks together in each particle can be pictured as strings. The particle collision leaves the proton essentially unchanged, but the pion is excited into the exotic meson state (π_1^-), including either a vibrating gluon string (top left) or an additional quark-antiquark ($q\bar{q}$, top right)

Stretched String

In one theoretical model of how a meson is structured, the gluon is pictured as a string stretched between the quark and the antiquark. The quark and the antiquark are thought to pull on opposite ends of the string as if they were contestants in a tug-of-war.

In usual mesons, the gluon string is stretched tight and steady in what is called its ground state. But theorists believe that mesons should also exist in other states in which the gluon string is oscillating, like a plucked violin string.

Some of these theoretical mesons are expected to have properties not found in usual mesons, so they are called "exotic." A meson could also have these exotic properties if it consisted of a pair of quarks and a pair of antiquarks, instead of just one quark and one antiquark.

Experimental Results

So, the MPS was looking for signals that a proton, made up of two up quarks and a down quark, and a pi-minus meson, made up of a down quark and an anti-up quark, had collided and formed a proton and a meson with extra properties that would qualify it as exotic.

Out of about 200 million possibilities that the MPS had first selected, the researchers found 47,200 events that could contain exotic meson candidates. Then, for two years, the team analyzed these events, ruling out any possible ambiguities.

"The properties of the new particle are such that it cannot consist of a quark and an antiquark held with a ground-state gluon string," said Chung.

He continued, "Theorists have hypothesized that the excited string itself can impart energy to the meson, adding to its mass and thus, changing its properties. But this needs further study. Our calculations showed that our finding must be either a quark and an antiquark with an oscillating string, or a four-quark system bound by a ground-state string."

One of the main reasons that this find is so interesting, Chung said, is that, although gluons have been detected as jets in high-energy experiments, this experiment may lead to information about gluons at the energy of the everyday world. "We are looking for information on the binding force at ordinary temperatures," he said.

Verify, Verify, Verify

Confident in their finding and supported by the results' having been reviewed by other physicists and confirmed at CERN, the E852 team is still actively verifying the discovery.

They are now gathering and examining data from 1995 and 1997, and they plan to use an independent detection method to verify their original exotic meson evidence. Plus, they also hope to search for more exotic mesons in 1998, when the next AGS run takes place.

"Once we establish the existence of these hybrid mesons, we must look for other such hybrids, to see how they are formed," said Chung. "This may shed more light on how gluons work."

— Liz Seubert and Kara Villamil

Give Blood Next Friday

There is still time to sign up to give blood during the extra blood drive that the Lab is holding this year on Friday, September 26, from 9:30 a.m. to 3 p.m. in the North and South Rooms of the Brookhaven Center.

Whether you gave during the summer drive on June 18 & 19 or not, if you are less than 76 years old, in good health and haven't given blood in the past 56 days, then sign up ASAP — the health of Long Island's blood supply depends upon those who give.

To make an appointment, contact BNL Blood Drive Chair Susan Foster, Ext. 2888, or e-mail foster2@bnl.gov with a note including your name, extension, and preferred date and time.

Yoga Practice

The BERA Indo-American Association is continuing its free Yoga practice sessions. Typically, a session will be comprised of breathing exercises, Sun salutation, Asanas or postures, and relaxation. The sessions will be organized by Smita Sathe in the Recreation Building in the apartment area, every Wednesday, 12:10 p.m.-12:50 p.m. Wear any loose outfit and bring a thick mat or a blanket.

If you are interested, call Sathe at Ext. 3924. Openings are limited by the space available.

Amateur Radio

The BERA Amateur Radio Club will next meet at noon on Thursday, September 25, in Room D, Berkner Hall. Membership fees are due at this time. All BERA members and licensed amateur-radio operators are invited to attend. For more information, call Chris Neuberger, Ext. 4160; or Nick Franco, Ext. 5467.

Pine Barrens Day

The First Annual Pine Barrens Discovery Day, sponsored by the Nature Conservance, will be held on Saturday, October 25, rain or shine. Come to learn about Long Island's Pine Barrens and stop by BNL's booth, which will display information on some of the Lab's environmental research.

The day will be filled with educational workshops, nature walks and presentations for the whole family. Special children's programs are available, as is limited child care. Registration by October 15 is required.

Events will take place from 8:30 a.m. to 5 p.m. at Suffolk County Community College's Eastern Campus, located on Speonk Riverhead Road, which is to the east of County Road 51 and just south of the Riverhead County Center.

The cost of attendance, $15 for adults and $10 for children 12 and under, includes Continental breakfast, box lunch and afternoon reception.

For more information or to receive a registration packet, call the Nature Conservancy, 329-3981, Ext. 23.

BROOKHAVEN BULLETIN

Published weekly
by the Public Affairs Office
for the employees of
BROOKHAVEN NATIONAL LABORATORY

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World Wide Web:
http://www.pubaf.bnl.gov/bulletin.html

The Brookhaven Bulletin is printed on paper containing at least 50 percent recycled materials, with 10 percent post-consumer waste. It can be recycled.

BNL's 5th Healthfest *– A Week Of Health, Fitness & Safety*

During BNL's 50th-anniversary celebration, Lab employees and retirees are again invited to participate in Healthfest — Brookhaven's fifth celebration of personal health, fitness and safety — which this year is scheduled for Monday, October 6, through Thursday, October 9.

The four-day festival has the following schedule of activities:

Monday, October 6

• **Pre-walk Stretch Clinic** - (rain or shine) 11:45 a.m. - 12:05 p.m., at the Science Education Center, Bldg. 438.
• **Employee 2-mile Fitness Walk** - (rain or shine) 12:10 - 1 p.m., start at the Science Education Center, Bldg. 438.

Tuesday, October 7

• **Pre-run Stretch Clinic** - (rain or shine) 11:45 a.m. - 12:05 p.m., at the Biology Department, Bldg. 463.
• **Employee 5-kilometer (3.1-mile) Fitness Run** - (rain or shine) 12:10 - 1 p.m., start at the Biology Department, Bldg. 463.

Wednesday, October 8

• **Health, Fitness & Safety Fair** - 11 a.m. - 2 p.m., at Berkner Hall, Bldg. 488.
• **Stress Management and Relaxation Techniques Workshop** - noon - 1 p.m., in Berkner Hall auditorium, Bldg. 488.

Thursday, October 9

• **Health, Fitness & Safety Fair** - 11 a.m. - 2 p.m., at Berkner Hall, Bldg. 488.
• **Reiki Healing Circle** - noon - 1 p.m., in Berkner Hall auditorium, Bldg. 488.

For more information and to sign up for the stretches, walk, run and/or health screenings, look for a mailing to all employees or see next week's Bulletin.

Volunteers Needed for Healthfest *'97*

Healthfest '97 — BNL's 5th celebration of health, fitness and safety — is scheduled for October 6-9. But again this year, volunteers are needed to make Healthfest happen. If you can help with the walk, run or stretch by registering participants, patroling the courses, etc., or during one or two of the days of the fair with such tasks as setup, door-prize registration, etc., then please call Mary Wood, Ext. 5923.

IBEW Meeting

Local 2230, IBEW, will hold its regular monthly meeting on Monday, September 22, at 6 p.m., in the Knights of Columbus Hall, Railroad Avenue, Patchogue. There will be a meeting for shift workers at 3 p.m. at the union office. The agenda includes regular business, committee reports and the president's report.

IPAP Access

As in the past, due to year-end closing, the IPAP System will not be accessible for FY98 data entry until Friday, October 3.

Quality Training

The next series of training sessions offered by the Quality Management Office to quality-assurance representatives and other interested Lab personnel will start on Tuesday, September 23, in Berkner Hall, Room A. The first session will introduce quality concepts and the BNL approach to quality. The remaining 11 sessions will run on successive Tuesdays, usually in Berkner Hall, Room D. All sessions will start at 9:30 a.m. and last for approximately 1½ hours. To obtain a course schedule or to register by September 22, contact Gina Bernard, Ext. 3689, or e-mail ginab@bnl.gov.

Attn. Retirees, LTD Participants: Option To Change Medical Coverage by 10/31

BNL retirees, participants on long-term disability (LTD) and their spouses now have five health-care coverage options available: the Medical Insurance Program, administered by CIGNA; CIGNA Healthcare for Seniors (HMO); HIP VIP (HMO); US Healthcare Medicare 5 (HMO); Vytra Medicare (HMO). The HMO, or health maintenance organization, options are being offered to retirees, participants on LTD and spouses, if any, who are eligible for Medicare.

Under the Medical Insurance Program administered by CIGNA, participants choose their own physicians and health-care facilities. To receive reimbursement for covered medical expenses, claim forms must be submitted to CIGNA.

As HMO members, participants select providers and health-care facilities within the HMO's network. Some key HMO features are: Hospitalization is covered in full; visits to the primary care physician cost just $5; prescription drugs are unlimited; allowances for eyeglasses are available; and there are no deductibles or coinsurance amounts and virtually no forms to fill out.

For more information on HMOs, representatives will be in Berkner Hall auditorium to answer questions on Tuesday, October 21, and Wednesday, October 29, from noon to 1:30 p.m. Literature will be available, including enrollment forms, and lists of participating physicians and facilities.

Retirees, LTD participants and spouses interested in changing medical programs may do so from October 1 though 31, by obtaining the required forms from Muriel Pfeiffer, Ext. 2877, Bldg. 185, and returning them to her completed by October 31. Those who want to continue with their present coverage do not have to do anything.

Changes to medical coverage may only be made during the annual open-enrollment period or when a qualifying event occurs. Qualifying events such as birth or adoption of a child, marriage, divorce or legal separation, loss of dependent status, or spouse's gain or loss of employment allow you to make certain changes to your coverage within 31 days of the event's occurring.

Computing Corner

MIX Meeting

All are welcome at the next Monthly Information eXchange (MIX) meeting with the Computing & Communication Division (CCD), to be held at 11 a.m. on Wednesday, September 24, in Room B, Berkner Hall. There, approaches to large-scale system administration will be discussed by James Flanagan, and Robert Barone will talk about Windows 95 networking and file sharing

PC Training

Some seats are still available in the following classes in October:

Date	Class
10/3	PowerPoint, introduction
10/6, 7 & 8	Visual Basic programing, version 5, introduction
10/13	Windows 95
10/15	PowerPoint, intermediate
10/23 & 24	ACCESS, intermediate
10/27	EXCEL, intermediate

Lab Training

If you are interested in attending a class in LabVIEW or Lab Windows, contact Pam Mansfield, Ext. 7286.

To be placed on a waiting list for training on a specific program, submit a Training Request Form, which can be obtained from Pam Mansfield, Bldg. 515. To register, see your training coordinator, or call Mansfield, Ext. 7286, or Julie Pergan, Ext. 4144.

Hospitality Group Trip

On Saturday, September 27, join the Hospitality Group's bus trip to one of the New York area's most superb museums, the Brooklyn Museum, which has collections of Oriental and Western art that draw visitors from around the world. In addition, the beautifully kept Brooklyn Botanical Gardens are on the museum doorstep, so trip-goers can wander among trees, shrubs and flowers and visit the herb garden, the Japanese garden and the magnificent conservatories.

Twenty seats at $7 each remain on the bus-with-bathroom that will leave the Recreation Building in the apartment area promptly at 9 a.m. and leave from Brooklyn at 5:30 p.m. Take a picnic or eat in the Museum or the Garden cafes. The Museum costs $4; at the Gardens, you donate what you like. For tickets, call Sharon Sugama, 929-0643.

Astronomical Society

Stars and moons and planets may not heed the event, but on Tuesday, September 23, members of the Astronomical Society are asked to change their habitual courses and meet at noon in Room C, Berkner Hall. New ideas and new members will be warmly welcomed. No stargazing experience is necessary. For more information, call Keith Power, Ext. 7772.

Cashier's Hours

The Cashier's Office will be closed on Wednesday and Thursday, October 1 & 2, and it will reopen at 2:30 p.m. on Friday, October 3. In case of an emergency, call Anne Corr, Ext. 2427

Arrivals & Departures

Arrivals

Dinko Franceschi.....Medical

Departures

This list includes all employees who have terminated from the Lab, including retirees:

Holly E. Bowen.....Safety & Env. Prot.
John J. Giarratano.....Plant Eng.
Chris R. Gordon.....Medical
Timothy J. Murray.....Fin. Services
Philip Pagano.....Reactor
Xiao-Ye Wu.....Medical

Classified Advertisements

Placement Notices

The Lab's placement policy is to select the best-qualified candidate for an available position. Candidates are considered in the following order: (1) present employees within the department/division and/or appropriate bargaining unit, with preference for those within the immediate work group; (2) present employees within the Laboratory; and (3) outside applicants. In keeping with the Affirmative Action Plan, selections are made without regard to age, race, color, religion, national origin, sex, disability or veteran status.

Each week, the Human Resources Division lists new placement notices, first, so employees may request consideration for themselves, and, second, for open recruitment. Because of the priority policy stated above, each listing does not necessarily represent an opportunity for all people.

Except when operational needs require otherwise, positions will be open for one week after publication.

For more information, contact the Employment Manager, Ext. 2882; call the JOBLINE, Ext. 7744 (344-7744), for a complete list of all job openings; use a TDD system to access job information by calling (516) 344-6018; or access current job openings on the World Wide Web at http://www.bnl.gov/JOBS/jobs.html.

SCIENTIFIC RECRUITMENT - Doctorate usually required. Candidates may apply directly to the department representative named.

POSTDOCTORAL RESEARCH ASSOCIATE - Trained in nuclear or high-energy experimental physics to join the PHENIX experiment at RHIC. Experience with detector hardware is preferred. Responsibilities will include supervising the fabrication of the PHENIX time expansion chamber and participating in its testing, commissioning and computer simulation. Will search for evidence of the quark-gluon plasma in lepton, photon and hadron signals. Contact: Edward O'Brien, Physics Department.

LABORATORY RECRUITMENT - Opportunities for Laboratory employees.

DD6405. HELPER A - Under general supervision, performs a variety of tasks in a shop or building trade that require a substantial knowledge of a skill in that trade, although the knowledge or skill of a journeyman is not expected. Duties will usually include handling minor assignments in the trade, with a minimum of supervision, and assisting one or more journeymen in more complex assignments. Central Shops Division.

OPEN RECRUITMENT - Opportunities for Laboratory employees and outside candidates.

NS4769. ENGINEERING POSITION - (term appointment) Requires BS in mechanical engineering, and experience with fluid-flow calculations and control systems, to design and specify large flammable-gas storage and mixing areas for detectors used in RHIC physics research. Ability to interface with numerous groups and good communication skills are required; proficiency in AutoCAD is a plus. Will design, install and integrate gas-detection systems with BNL-RHIC safety systems, including hardware, system specifications, testing and procedure writing. Alternating Gradient Synchrotron Department.

NS3966. MANAGER, PLANNING & AUDITING GROUP - Requires bachelor's degree in a relevant field (master's degree is a plus) and a broad background in safeguards and security functions, including: audit and quality-assurance programs; nuclear-security operations; information, operations and computer-security programs; and security-alarm, assessment and access-control systems. Will manage BNL's personnel security-clearance program, classified-document accountability and control systems, technical and engineering support programs, including technical and computer security. Will administer the Division's internal audit, inspection and QA programs. Must be able to obtain and maintain a security clearance. Safeguards & Security Division.

Coming Up

The second concert of the 1997-98 BERA Concert Series will feature pianist Kathleen Boyd, a doctoral student from the State University of New York-Stony Brook, on Tuesday, October 7, at 8 p.m. The suggested donation for the performance is $6 per person.

See Supplement for BNL's occupational-injury statistics.

Occupational Injuries — Charting BNL's Performance

Safety: What's the Bottom Line?

As I talk to people around the Laboratory about our safety and health performance and the need to improve it, I'm often asked about the "bottom line."

Some people have told me that all this emphasis on worker safety is overblown, that we are doing just fine. Many say that BNL is the safest place they have ever worked. Still others claim that we have a long way to go. I'm sure you've heard the same comments. So I thought it would be helpful to share the facts with you, and then let you decide if we are doing OK or should be doing better.

In industry, safety is measured in a number of ways, and BNL and the U.S. Department of Energy (DOE) use these same measures: the number of accidents and injuries and their consequences.

Two things happen when one of us is injured on the job. The first and most serious is that someone gets hurt. From my perspective, this means we've failed because our goal is to have everyone go home at night in the same shape as when they arrived for work in the morning. Whether minor cuts or more serious injuries, all are unacceptable.

The second thing that happens when we have an injury is that our productivity as a Laboratory is affected, since one of our team members can't perform up to his or her full potential for a while.

The measure of on-the-job injuries is the Occupational Safety & Health Administration (OSHA) Recordable Case Rate — the number of injuries per 200,000 hours worked. The graph at the top right shows a modified version of these data — the actual number of recordable cases at BNL for all of last year and for this year through August.

The loss of productivity is measured as Lost and Restricted Workdays. Again, this is usually calculated per 200,000 hours worked, but we're showing the actual number of days in the graphs below.

The loss of productivity is also related to the cost of injuries to the Laboratory. In calendar year 1996 alone, the direct cost to BNL was about $1.3 million.

So how are we doing? If you look at the OSHA Recordable Cases chart at top right, our coworkers are getting hurt on the job at about the same rate as last year. The graph of Actual Lost Workdays below tells us that we have cut the number of lost workdays in half this year, but the Restricted Workdays chart at the bottom of this column shows that we have more than doubled the number of days of restricted duty since last year. This is actually a step forward for us since the cost of restricted workdays is substantially less than lost workdays.

But the disturbing fact remains: People are still getting hurt! And where do we stand with respect to the other national laboratories? Based on DOE analyses, BNL ranks near the bottom: a disappointing 10 out of 15.

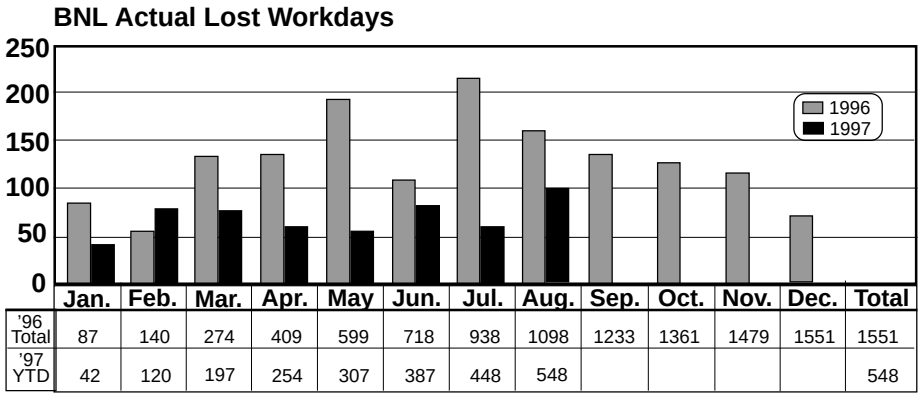
Many companies have made dramatic improvements in their safety performance. The methods are embodied in the DOE Integrated Safety Management (ISM) approach to "Doing Work Safely." As we proceed with BNL's Management Systems Improvement Program, we will be implementing ISM principles and functions to help us improve our safety performance.

This report is one way in which BNLers will be able to keep track of how we're doing. You'll receive it each month as a supplement to the Brookhaven Bulletin.

So: What's the bottom line? I think we can do better! I see no reason why BNL can't be one of the top five labs in the next three years — and number one in the next five years. By working together, we can make this happen.

— Mike Bebon, Interim BNL Deputy Director

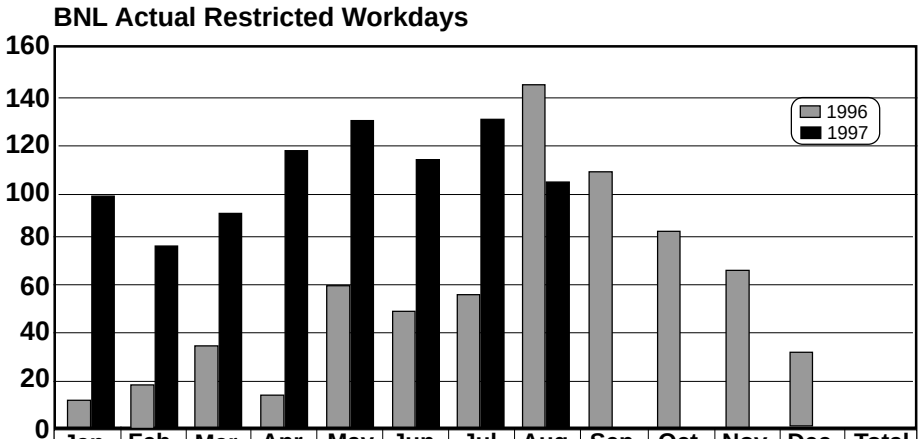
BNL Actual Lost Workdays



	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
'96 Total	87	140	274	409	599	718	938	1098	1233	1361	1479	1551	1551
'97 YTD	42	120	197	254	307	387	448	548					548

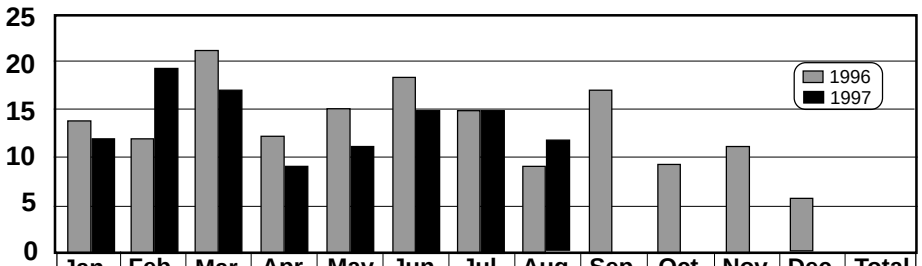
In these two charts, some of the lost and/or restricted workdays each month may be the result of injuries or illnesses that were initiated in a previous month.

BNL Actual Restricted Workdays



	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
'96 Total	11	30	64	78	138	185	242	386	501	583	649	683	683
'97 YTD	100	178	270	388	518	634	766	870					840

BNL OSHA Recordable Cases



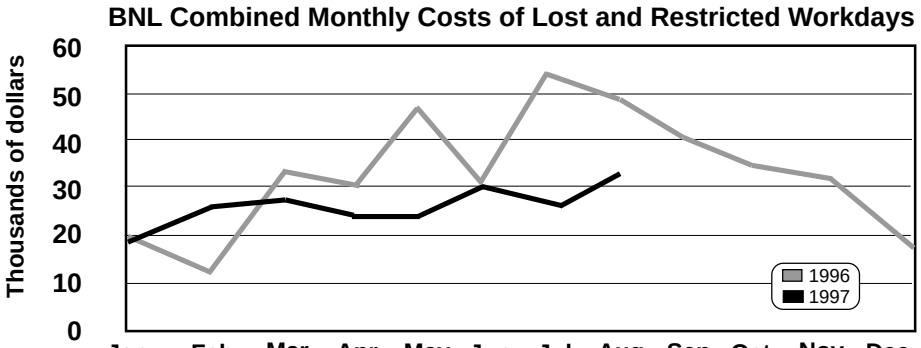
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
'96 Total	14	26	47	59	74	92	107	116	133	142	153	159	159
'97 YTD	12	31	48	57	68	83	98	110					110

This August, 37 injuries and one illness were reported to BNL's Occupational Medicine Clinic. Of those, the 12 described below were OSHA-recordable, meaning that they met the requirements for being reported to the U.S. Occupational Safety & Health Administration. The OSHA-recordable injuries do not include first-aid cases, injuries to non-employees, or athletic or recreational injuries.

Most of BNL's recordable injuries are due to lost or restricted time. August's reportable injuries translated to a rate of 3.79 per 100 workers — somewhat lower than the yearly rates of 4.1 to date for calendar year 1997 and 4.3 for all of calendar year 1996. The August injuries included:

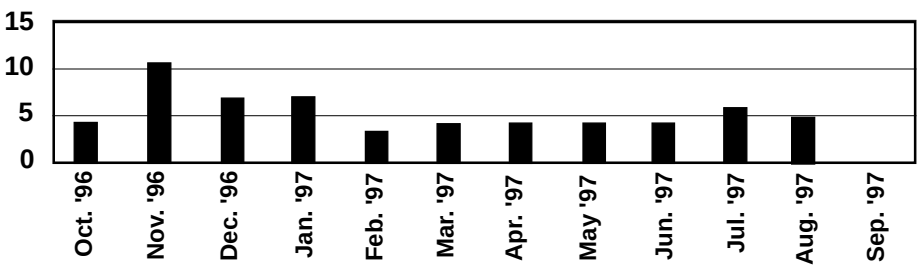
- **Six sprains/strains** —
  - An employee pulled a back muscle while lifting and carrying a load upstairs; **result:** 2 lost workdays.
  - An employee suffered a strained neck and arm while working extensively on a computer; **result:** no lost time.
  - A worker slipped on a stairway; **result:** 5 lost, 3 restricted workdays.
  - While maneuvering equipment, a person suffered shoulder and back strain; **result:** 3 lost, 24 restricted workdays to date.
  - A worker sprained an ankle jumping off the back of a truck; **result:** 2 restricted workdays.
  - An employee experienced sciatica while walking away after cutting wood from material; **result:** 15 lost workdays to date.
- **One fracture** — A worker fractured a rib in a fall from the top of a compressor onto a concrete floor; **result:** no lost time.
- **One chemical splash in eye** — An employee developed a conjunctival hemorrhage in one eye after inadvertently splashing it with chemicals; **result:** 2 lost, 2 restricted workdays.
- **One deep bruise** — A worker pulling wire cable struck an elbow on a cable tray. **result:** 8 lost, 8 restricted workdays.
- **One cut** — An employee was sharpening a knife, without wearing gloves, when the knife slipped and cut a finger, which required suturing; **result:** 5 restricted workdays.
- **One repetitive motion —** While doing work involving pushing, pulling, twisting and turning, but using no material handling equipment, a worker exacerbated a preexisting arthritic condition of the wrist; **result:** no lost time.
- **One skin rash** — After attending a training class and wearing protective clothing used previously by others, an employee developed a rash on the neck; **result:** no lost time.

BNL Combined Monthly Costs of Lost and Restricted Workdays



Average Costs: lost workday = $215, restricted workday = $102

BNL Traffic Accidents



BNL's grounds may be quiet and campus-like, but New York State's rules of the road still apply. When rules are broken, here or off site, accidents can occur, as the following did during August:

- **Vehicle v. bicycle** —A Lab vehicle approaching a corner was hit on the right side by a bicyclist coming around from the opposite direction. **Result:** no injuries; no damage to bicycle; scraped paint and other small damage to vehicle.
- **Rear-ended off site** — While an employee was driving a Laboratory vehicle off site and waiting for a traffic light to change, the vehicle was rear-ended by another vehicle that had been struck at full speed by a third vehicle. **Result:** driver sustained neck and shoulder pain; rear-end damage to vehicle.
- **Struck by a deer** — An employee was driving a Lab vehicle past BNL woodlands when a young deer darted out from behind a small building and struck the driver's door. **Result:** deer was killed; vehicle door was dented.
- **Hit-and-Run** — A car parked in a space in front of BNL apartments was damaged in a hit-and-run incident. The impact caused the parked car to crash into one parked next to it. A Labwide police search did not find an obvious or suspicious vehicle that could have caused the accident. **Result:** damage to both parked cars.
- **Bad backup** — While backing up a car, a driver struck the passenger side door of a parked Lab vehicle. **Result:** numerous dents in door of Lab vehicle.