

At BNL: Rare Opportunities to Learn About Accelerators, Nuclear Chemistry Nuclear Chemistry Classes Now in Session

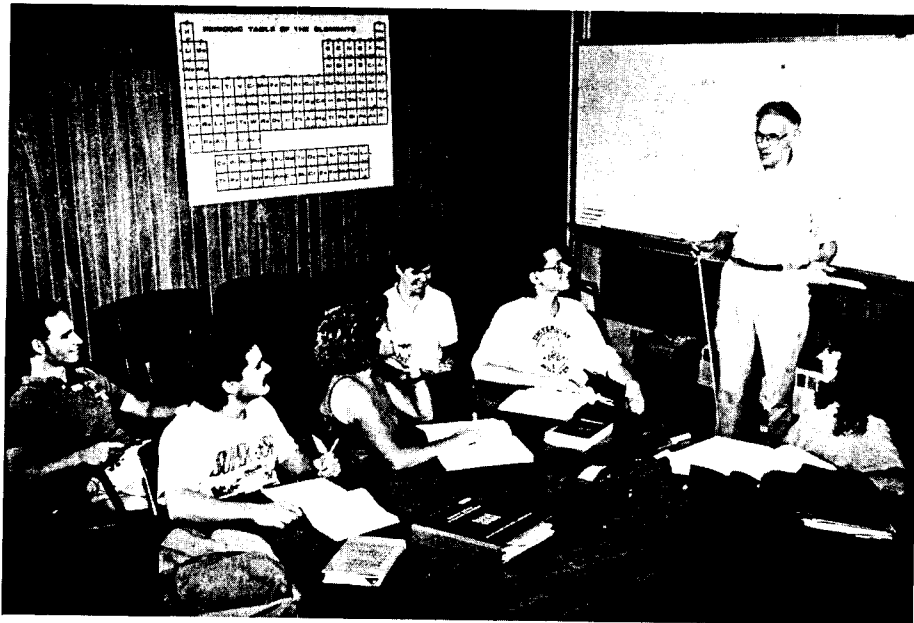
Nuclear chemistry applies chemical expertise to the study of atomic nuclei and their reactions, such as fission and fusion. Although nuclear chemistry and radioactivity have many important scientific, medical and industrial applications, nuclear chemistry is not offered to most undergraduates at U.S. universities and colleges.

As the use of radioactive materials in our technological society has grown, so too has the need for chemists trained in nuclear techniques. But this need is unmet — and growing.

To encourage college chemistry majors to consider careers in nuclear chemistry, BNL's Chemistry Department and the Office of Educational Programs are conducting a new program — a six-week, intensive Nuclear Chemistry Summer School for 11 juniors and seniors from across the nation. The program is sponsored by the American Chemical Society's Division of Nuclear Science & Technology (NS&T) and funded by the U.S. Department of Energy (DOE).

"Science education is important for the future development of this country — so I thought that, by organizing the summer school in nuclear chemistry at Brookhaven, we could play a part in training the next generation of nuclear chemists," explains Seymour Katcoff, a nuclear chemist in BNL's Chemistry Department since 1948 and the summer school's coordinator. "Their skills will be needed by government laboratories, nuclear medicine facilities, and the pharmaceutical and nuclear industries."

From June 25 through August 4, Katcoff is co-teaching the course along with John Alexander, a professor from the State University of New York (SUNY) at Stony Brook; and Ivor Preiss, a professor from Rensselaer Polytechnic Institute (RPI). In addition, Daeg Brenner, a professor from Clark University who performs



BNL's Seymour Katcoff delivers a lecture during the Nuclear Chemistry Summer School. Seated are (from left) teaching assistant James Keenan, Rensselaer Polytechnic Institute, and students David Bracken, San Diego State University; Elizabeth Lantz, University of California, San Diego; Janet Jacobsen, University of Southern California; Patrick Bier, Gannon University, Pennsylvania; and Victoria Degler, University of Illinois.

research at BNL's High Flux Beam Reactor, is lecturing on nuclear structure and models.

This is the second summer school of its kind that is under NS&T sponsorship and DOE funding. The first was begun in 1984 by nuclear chemist Patricia Baisden of Lawrence Livermore National Laboratory and has been held every summer since then at San Jose State University, California. This school has been so successful that it was decided to establish an East Coast counterpart — at BNL.

Selected from 75 applicants by an NS&T education and training committee that includes BNL Senior Chemist Joanna Fowler, the 11 chemistry students come from as far as California.

Don't Pass Up Accelerator School

Everything you always wanted to know about accelerators but weren't taught in graduate school will be the subject of the seventh U.S. Particle Accelerator School (PAS), to be held at BNL on Monday, July 24, through Friday, August 4.

Sponsored by the U.S. Department of Energy and the National Science Foundation, PAS is a two-week symposium on a dozen accelerator-related topics — from basic design principles to the building of the proposed national Superconducting Super Collider (SSC).

BNL's accelerator physicists — and those who use accelerators to do their science — are invited to register and attend any or all of the scheduled talks.

"The Accelerator School is a unique and important opportunity for BNL staff — especially since so many Laboratory projects depend upon the technology of particle accelerators," notes Alessandro Ruggiero, the acting chairman of BNL's Accelerator Development Department.

This year, topics will include, among others: radio frequency, free electron lasers, accelerators at BNL, synchrotron radiation sources, accelerator technology, electron colliders and superconducting magnets.

As William Weng, manager of the Booster project being built at the Alternating Gradient Synchrotron (AGS), explains, "I'm encouraging those I work with to register and participate as much as possible in the two weeks of Accelerator School — their only obligation is to apply whatever they have learned to the Booster project."

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BNL Lecture: Compact Light Sources For Super-Dense Chips

Ten years ago, the U.S. manufactured 80 percent of the world's computer chips — the miniature electronic circuits containing tens of thousands of transistors, diodes and other components. These integrated microcircuits perform significant numbers of functions and constitute the subsystems that make up computers.

Over the past ten years, however, the U.S. share of the world chip market has fallen — and today Japan holds the 80-percent share. This reversal in the marketplace — which has resulted in U.S. dependence on foreign chip manufacturers and threatens U.S. national security — has provoked an international trade war. So, as a national resource, BNL's National Synchrotron Light Source (NSLS) called its synchrotron strategists into play.

In 1986, the NSLS began a national initiative to develop the compact source of x-rays that U.S. industry needs to make microchips of the future, ones densely packed with one billion bits of memory. And, in 1988, it received its first outside funding towards the building of that compact synchrotron by 1992.

In the 253rd Brookhaven Lecture, Senior Physicist Richard Heese, NSLS, will explain BNL's role in

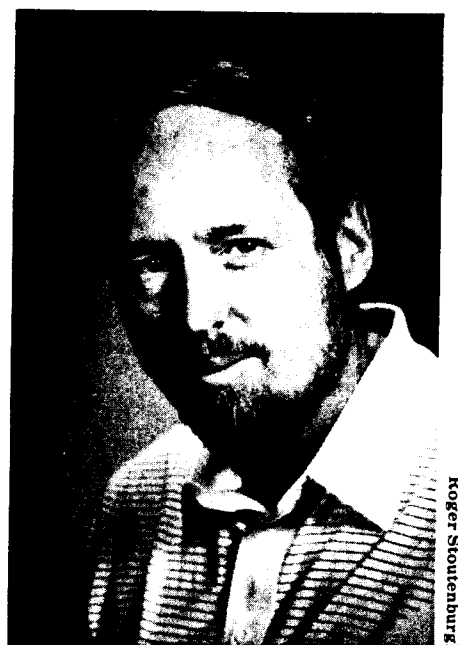
helping the U.S. computer chip industry regain ground in the world market. His talk, "Compact Light Sources for Super-Dense Chips," will begin at 4 p.m. on Wednesday, July 19, in Berkner Hall. Heese will be introduced by NSLS Deputy Chairman Samuel Krinsky.

Heese will begin by describing a

(Continued on page 2)



Ivor Preiss (seated, center), Rensselaer Polytechnic Institute (RPI) explains a beta-ray spectrum taken with a multichannel analyzer. On hand are BNL's Yung Yee Chu (standing, foreground) and (standing, back, left) Eena-Mae Franz, who supervise the labs for the Nuclear Chemistry Summer School; (standing, from left) students Michael Kay, Cornell University; Deborah Watson, Mills College, California; and teaching assistant Karen Stevenson, RPI; (seated) students Brant Hacker (foreground), North Park College, Illinois; (back, from left) Lyman Smith, State University of New York at Stony Brook; Craig Brown, St. Norbert College, Wisconsin; and Rajesh Vaid, Pace University.



Richard Heese

Weather Takes the Lab by Storm

A severe thunderstorm swept through BNL Monday night at about 7 p.m., toppling trees, damaging buildings, and leaving parts of the Lab looking like a disaster area.

Hardest hit by the storm was Brookhaven Avenue, where hurricane-force winds toppled two trees and knocked down about four large limbs. Miraculously, the damage to buildings was minor.

The greatest building damage occurred at the National Synchrotron Light Source, Bldg. 725, where one of the white panels on the front of the building was found hanging precariously.

"When the storm came through, it peeled back the panel," said Bruce Medaris, Deputy Manager, Plant Engineering (PE) Division. "As far as we know, there was no structural damage."

The panel was removed by PE Carpenters Richard Geib and Peter Stolz, under the guidance of Carpentry Supervisor Peter Fennelly and Mike Cardarelli, General Supervisor of Building Maintenance.

At Least It Wasn't St. Swithun's

Many Lab employees may be bemoaning Monday night's foul weather and the damage it caused, but it could have been worse.

It could have been Saint Swithun's day.

One thousand and eighteen years ago on July 15, the body of an obscure anglican Bishop was moved to a grave in the restored church of Winchester, England. Legend has it that miracles occurred, causing word to spread of the bishop, Saint Swithun, and his day, July 15. Of the legends surviving from that time, most well-known is this weather myth:

*Saint Swithun's day if thou dost rain
For forty days it will remain;
Saint Swithun's day if thou be fair
For forty days 'twill rain na mair.*

The winds also damaged the roof of the Firehouse and knocked down a utility pole near Waste Management's Bldg. 445.

In front of the Research Library, Bldg. 477, a tree was uprooted and fell against the building. Another tree fell at the intersection of Brookhaven and Railroad Avenues, blocking the road. A large branch also fell against the Personnel Building, Bldg. 185.

On Mitchell Lane, in front of the Guest House, Bldg. 257, a large tree fell across the road, barely missing a shiny red BMW that was parked there.

But the greatest sentimental loss was the blue spruce "Christmas" tree near the main gate at Princeton Avenue and Upton Road, which was destroyed.

The security force was quick to respond to the devastation. At the Safeguards & Security Division, on-duty Lieutenants Michael Delph and George Misson, with the help of Sergeant Worth Austin Jr., got the wheels in motion to fix the problems.

To assure that fire trucks could get through, if necessary, road crews were quickly dispatched by PE's Roy McWilliams, Site Superintendent. Using front-end loaders, PE's Heavy Equipment Mechanic Operators Jim Durham and Edward Miezianka moved the debris under the supervision of Warren Hulse, Supervisor of Roads and Grounds.

By 9:30 p.m., all of the roads were clear. But the entire site was left strewn with twigs and leaves tossed by the storm, and the task of cleaning it all up was left for Tuesday morning.

The skies over BNL had looked ominous since about 4 p.m. Monday. When the storm finally hit at 7 p.m., it broke suddenly into a hard, driving rain accompanied by strong gusts of wind and frequent, crackling lightning strokes.

According to Meteorology Associate Marty Leach, Department of Applied Science, the weather tower at the west end of Brookhaven Avenue recorded gusts of wind up to 95 mph. Nearly half an inch of rain fell during the storm, and Leach estimated that



Bob Callister Jr. (left) and Wayne Cummings, of Plant Engineering's Site Maintenance Group, clear the limbs of a tree at the corner of Brookhaven Avenue and Upton Road that was damaged in Monday's storm.

half of that fell during the first 15 minutes.

"The storm was certainly unusual for Long Island," said Leach. "I've been here 10 years and this is the first one I've seen like this."

But was it a tornado?

That's a difficult question, considering the fact that nobody on site reported a funnel cloud.

"There's no evidence that there was

a funnel cloud," said Leach. "My opinion is that it was not a tornado but was more likely a microburst."

Microbursts, famous for causing airplane crashes, happen when a pool of cold air descends rapidly. Leach believes Monday's damage was caused by that cold air slamming into the ground.

"It's almost like you took a bucket of water and turned it upside down," Leach said. — Kevin Eber

BNL Lecture

(cont'd)

synchrotron, the device for confining and accelerating electrons in a closed orbit by using magnetic fields.

As well, he will define synchrotron radiation — the electromagnetic waves generated by these charged, relativistic particles as they are accelerated around a synchrotron. It was first observed in 1947 coming

from electrons circulating within the second synchrotron ever built. The observers included BNL retiree John Blewett, who was working at General Electric Laboratory in Schenectady at the time.

Briefly, Heese will outline the evolution of electron synchrotrons, including the National Synchrotron Light Source. As he will observe, the first-generation electron storage rings, like GE's device, were originally built to accelerate particles — not to emit synchrotron radiation, which was at first considered a nuisance by-product.

With the realization that synchrotron radiation is bright light in a continuous spectrum — an ideal probe for many materials science, chemistry and biology experiments — the synchrotron's value as a "light source" has appreciated. So, as Heese will mention, second-generation light sources, such as the NSLS' x-ray and vacuum ultraviolet (VUV) rings, have been developed and dedicated to the production of synchrotron light.

One of the first experiments to utilize the NSLS' VUV light, as Heese will point out, has revolutionized the U.S. semiconductor industry's approach to making computer chips: In 1982, IBM established the first x-ray lithography station at a U.S. synchrotron, one of the first in the world.

In addition to being a printing process, lithography is a technique used to fabricate integrated circuits. First, a silicon single wafer is coated with a radiation-sensitive film called the resist and then covered with a

template of a circuit pattern called a mask. The masked wafer is then exposed to light, such as x-rays — and the most promising light source being explored for printed-circuit lithography is a synchrotron producing low-energy x-rays.

Last year at the NSLS, IBM made the first computer chips in the world ever to be made solely using x-ray lithography. With 0.5 microns between each component, these chips were two to three times denser than microchips mass-produced today.

Not just any synchrotron will do for the mass production of chips using x-ray lithography: Though used to prove the principle, the 51-meter-around VUV storage ring, which uses conventional magnets to accelerate electrons, is just too big and too delicate for industrial use.

As Heese will explain, chip makers want a compact synchrotron that can be brought in as a unit, set down on the semiconductor factory floor and be ready to go with the push of a button.

So, U.S. chip makers have called upon the NSLS to come up with a compact synchrotron — one using high-field superconducting magnets — and the Department of Defense has come up with the funding both to develop the technology and transfer the know-how to industry.

Richard Heese is project manager of the NSLS' X-Ray Lithography Source (XLS) initiative: He is in charge of coordinating source development within the NSLS and transferring the technology to the XLS' industrial partners, Grumman

Corporation and General Dynamics. Heese received his Ph.D. in physics in 1973.

After the lecture, those attending are invited to join the speaker for discussion and hors d'oeuvres. In addition, anyone interested in joining the lecturer for dinner at a restaurant off site should call Marty Woodle, Ext. 2521, beeper 0183.

Inside Info

Robert Palmer, Special Assistant to the Director and co-head of BNL's Center for Accelerator Physics, has been named a member of a distinguished scientific policy committee for the Superconducting Super Collider (SSC), the proposed national accelerator to be built in Texas. Palmer is one of 16 members of an international group of distinguished scientists assembled by Roy Schwitters, Director of the SSC Laboratory, to provide insight on major issues and to help define Laboratory policies.

One of the committee's first concerns will be the initiation of the experimental program: how experimental areas should be configured, how experiments should be selected, how detector construction and operation should be managed, and how best to organize international participation in the SSC.

The committee will meet for the first time in August, prior to the symposium on SSC physics and experiments to be held in Dallas, October 1-4.

Two Laureates, Two Lectures

All are welcome to attend the following lectures by Nobel laureates Sheldon Glashow and Jerome Karle, which have been scheduled as part of the student activities run by the Office of Educational Programs. Both talks will be held in the Physics Department's large seminar room, in Bldg. 510.

• **Sheldon Glashow**, Harvard University, will speak this afternoon, July 14, at 2 p.m. Glashow, who won the 1979 Nobel Prize in physics will discuss "What the World Is Made Of."

• **Jerome Karle**, Naval Research Laboratory, will present his lecture on Monday, July 17, at 7:30 p.m. The 1985 Nobel Prize winner in chemistry, Karle will talk about the "Structure of Molecules."

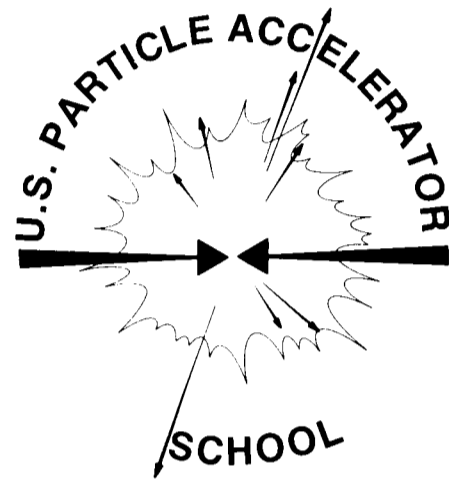
Accelerator

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During 13 sessions, 60 experts in the field of accelerator physics, including 11 BNL'ers, will present hour-long lectures, with questions invited afterwards. The lecture titles include "Basic Accelerator Design Principles," "Pulsed Power for Accelerators," "The AGS — Performance and Potential," "Positrons for Colliders," "The NSLS — Performance and Potential," and "Next Generation Linear Colliders." The full lecture schedule will be published in BNL's Weekly Calendar.

"Accelerator physics is taught at very few places in the world, so this is an equivalent to a Berlitz course in accelerator physics — a summer school not to be missed," says AGS Chairman Derek Lowenstein. "I hope that the people at the AGS — especially the younger ones new to the field — can fit the Accelerator School into their busy schedules and take the time to learn from the old masters."

The school grew from a recommen-



dation made by a 1979-80 subpanel of the High Energy Physics Advisory Panel charged with evaluating accelerator research and development. The panel had concluded that not only is there a shortage of accelerator physicists, but there also exists a lack of education and training opportunities in the field.

Thus, the Accelerator School has two basic purposes — to help train apprentices and update experts in the field; and to encourage U.S. universities and laboratories to offer programs in accelerator physics by developing texts, contacts and training for faculty.

"As graduate students, physicists are taught at the university how to build detectors or portions of large detectors — but, until recently, their only opportunity to learn how to build an accelerator or any of its parts has been as postdoctoral apprentices at accelerator laboratories," explains BNL Physicist Melvin Month. "In fact, the school is trying to change that situation — so that younger, would-be scientists are exposed to the rich field of accelerator physics at the universities."

Month founded PAS in 1979 and serves as its director. He was appointed by the school's steering committee, which determines its policy and is chaired by Burton Richter, Director of the Stanford Linear Accelerator Center (SLAC). Steering committee members include BNL Deputy Director Martin Blume; Helen Edwards, head of SSC accelerator physics; Herman Grunder, Director of the Continuous Electron Beam

Accelerator Facility; and Boyce McDaniel, former head of the Cornell Laboratory for Nuclear Studies.

In addition, the Accelerator School exists to encourage interaction between those who build accelerators and those who use them — so, for example, users of BNL's AGS, National Synchrotron Light Source (NSLS) and those who plan to use BNL's proposed Relativistic Heavy Ion Collider (RHIC) are also invited to attend.

"In the case of colliders such as RHIC and the SSC, the design of an experiment is intricately coupled to the properties of the accelerator. So it is very important that young scientists have a good general understanding of how these machines work in order to realize their potential for new discoveries in the future," comments RHIC Task Force Head Thomas Ludlam, Physics Department.

First held at Fermi National Accelerator Laboratory in July 1981, PAS was last held at BNL in July 1983.

"The NSLS strongly supports the Accelerator School, so we encourage our staff and our users to take advantage of the fact that it is being held locally this year," adds Samuel Krinsky, Deputy NSLS Chairman.

In 1987, the annual two-week symposium began meeting every other year, so that, in addition, two-week crash courses in accelerator physics could be offered every year at different universities, all under the auspices of the U.S. Particle Accelerator School. This June, for example, 138 students each completed one of five courses offered at the University of California, Berkeley, including "Principles of Acceleration," taught by BNL's Robert Palmer.

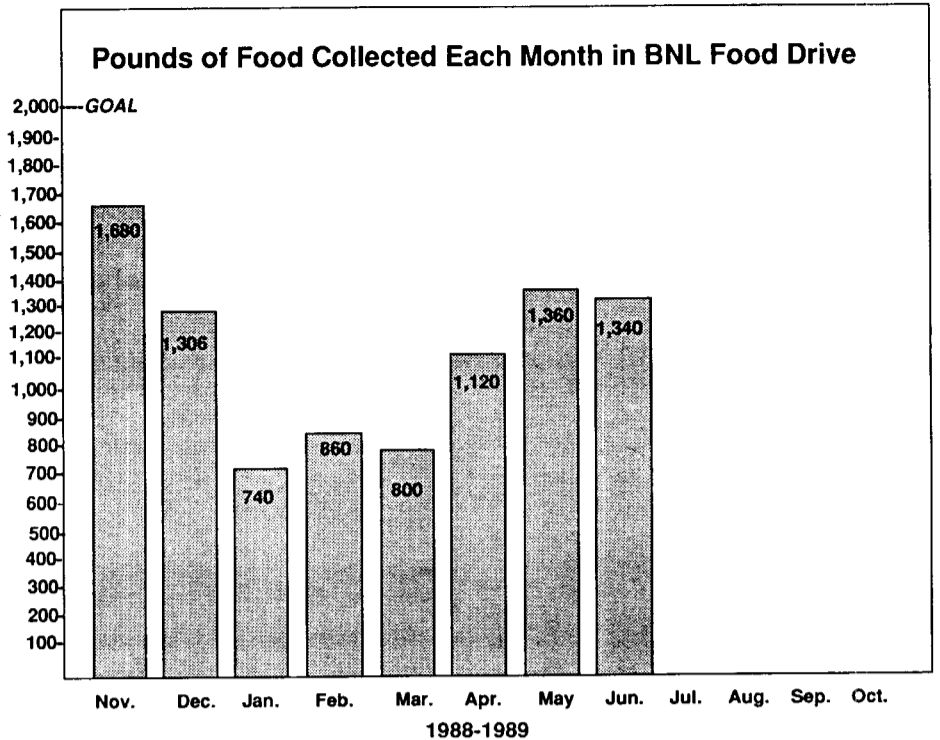
As Month explains, "The university style allows the courses to be presented in greater depth, promotes student interaction and feedback, and encourages younger students to attend, as university credit is earned for courses that are successfully completed."

In 1985, PAS began awarding its Prize for Achievement in Accelerator Physics and Technology. At the Accelerator School's banquet on Thursday, August 3, this year's winners, Daniel Bix of SLAC and Karl Brown of Lawrence Berkeley Laboratory, will each receive a check for \$2,000 and a citation for their contributions to the field.

For a schedule of the lectures and registration information, contact Pat Tuttle, Ext. 3845, or your department chairman or division manager.

— Marsha Belford

Donations Decline, But Needs Still There



After two months of hefty increases, donations to BNL's Food Drive decreased slightly in June, dipping 20 pounds to 1,340.

As generous and as helpful as those 1,340 pounds are for those in need in Brookhaven Town, more is always needed. As you do your weekly shopping or rummage through your pantry this weekend, think of the July Food Drive, which will begin on Monday and run the entire week. If everyone brings in just a little more, the July total will surely rise and, perhaps, be the first monthly total to reach the goal of 2,000 pounds.

If you cannot shop yourself but would like to contribute, you may send a donation to Food Drive Chair Carole Kerr, Bldg. 460, Ext. 7100. When your shopping is done, you'll get a receipt.

Chemistry

(cont'd)

The textbook is *Nuclear and Radiochemistry*, published in 1981 by Wiley, the principal author of which is BNL's Gerhardt Friedlander. The laboratory manual was developed by Preiss.

"The experiments are intended to familiarize the students with the properties of radioisotopes and with the measurement of their radiations using various detectors and their associated electronics," explains Katcoff. Major lab topics include gamma-ray spectroscopy, parent-daughter relationships, nuclear reactions, x-ray fluorescence and radiochemical techniques.

Overseen by Preiss, the laboratory experiments are conducted in chemistry labs and counting rooms located in the Chemistry Department. Yung Yee Chu, Chemistry, and Eena-Mai Franz, Department of Nuclear Energy, instruct and supervise the students during their labs.

James Keenen and Karen Stevenson, both chemistry graduate students of Preiss at RPI, help as teaching assistants. Electronic equipment used by the students is on loan from Canberra Industries, various Brookhaven departments and the radiochemistry laboratories at RPI.

In addition to four mornings a week of lectures followed by afternoons of laboratory, the students are to write two exams and a term paper, and present an oral report of that paper. Also on the schedule are tours of nuclear facilities at Brookhaven, Stony Brook, and the Millstone nuclear power plant in Connecticut, and two special lectures, including one by BNL's Maurice Goldhaber.

Two day-long symposia were also arranged for the students. On Wednesday, July 19, a symposium on radiochemistry in the nuclear industry will be held, and BNL's Gregory Van Tuyle, Department of Nuclear Energy, is one of the invited speakers. Then on Wednesday, July 26, BNL's Joanna Fowler and Alfred Wolf, both of the Chemistry Department, will be among the speakers at a symposium on radiochemistry applied to nuclear medicine.

At 11 a.m. during the latter symposium, Nobel laureate Rosalyn Yalow will discuss "Radiation and Society" in a talk that is open to the Laboratory community. A senior medical investigator for the Veterans Administration Medical Center in the Bronx, Yalow received the 1977 Nobel Prize in physiology or medicine for the development of radioimmunoassay methodology and its application to biomedical investigation.

As Katcoff concludes, "We are trying to provide the undergraduates with an intensive sampling of what goes on in nuclear chemistry — with the hope that they will like what they have experienced and go on in the field."

— Marsha Belford

Summer on Long Island

Taking Stock of Summer Stock

Within easy distance of BNL, employees and summer visitors have opportunities to experience quality theater this summer.

BELLPORT - Gateway Playhouse, 215 South Country Road. Performances Tue.-Fri. at 8:30 p.m., tickets \$15 & \$17; Sat. & Sun. 5 p.m. & 9 p.m., \$18 & \$20. Box office, 286-1133.

- Through July 23 - *Big River*, family musical featuring the adventures of Mark Twain's immortal Huckleberry Finn.
- July 25-August 18 - *Broadway Bound*, third play in Neil Simon's trilogy, which includes *Biloxi Blues* and *Brighton Beach Memoirs*.
- August 20-September 3 - *Beehive*, a musical review of the 60's.

PORT JEFFERSON - Theater Three, 423 Main Street. Performances on the Main Stage on Fri. & Sat., 8 p.m. Tickets, \$14 & \$16 Fri., \$16 & \$18 Sat. Some Sun. & Thu. evening shows and Wed. & Sat. matinees, tickets \$12, \$10. Box office, 928-9100.

- Through Aug. 12 - *Singing in the Rain*, Fred Astaire-Ginger Rogers musical about the transition from silent films to talking motion pictures.
- Aug. 19-23 Sep. - *Fifth of July*. Downstairs at Theater Three, a Second Stage Production, Wed. & Sun. at 8 p.m., and matinee Sun., Aug. 20, 3 p.m. Tickets \$12.
- July 23-Aug. 30 - *Twelfth Night*, Shakespeare's comedy, blending farce and romance.

Children's shows at Theater Three, Thu., Fri. & Sat., 11 a.m. Tickets \$5.

- Through July 15 - *Rapunzel*, Grimm's fairy-tale favorite.
 - July 27-Aug. 5 - *Winnie-the-Pooh*, written for A.A. Milne's son Christopher Robin.
- STONY BROOK** - Norstar Bank International Theatre Festival, Staller Center for the Arts, State University of New York at Stony Brook, Nichols Road/Route 97. Performances on the Main Stage at 8 p.m., except as noted. Ticket prices: Tue.-Thu. \$13, Fri. & Sat. \$15. Box office, 632-7233.

- Through July 15, *Waited Long Enough*, a play starring internationally acclaimed comic Jozef Van Den Berg of the Netherlands.
- July 18 - 22, The Pickle Family Circus, vaudeville, comedy and feats by San Francisco's leading circus troupe. Added Sat. matinee, July 22, at 2 p.m.
- July 23 & 24 - Kutiyattam Dance, a special from India.

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ANITA COHEN, Editor
MARSHA BELFORD, Assistant Editor
LIZ SEUBERT, Reporter

35 Brookhaven Ave., Upton, N.Y. 11973
(516)282-2345

Look! A Limerick!

There once were some men quite renowned
Who built a machine that was round.
For their idea so radiant
They used alternate gradient,
So today their machine's still around.
— Ed Meier
National Synchrotron Light Source

