

What to Expect From MECT: A Much Closer Look At the Head and Neck

This is the first in a series of four articles on the four grants awarded to BNL scientists under a new, special grant program for nuclear medicine research issued by the U.S. Department of Energy, Office of Energy Research.

According to physicist Avraham Dilmanian, some brain lesions that cannot be imaged by conventional computerized tomography (CT) will be detected by MECT — multiple-energy computed tomography — using monochromatic x-rays.

To allow him to develop and prove this medical diagnostic tool, the U.S. Department of Energy has provided Dilmanian with a special research grant in nuclear medicine.

An associate scientist in the Medical Department, Dilmanian will use the funding to build a multiple-energy CT scanner (MECT) at the National Synchrotron Light Source (NSLS).

Monochromatic X-Rays

MECT will take advantage of the very high energy and high intensity x-ray beam available at the X17 superconducting wiggler, which was recently installed within the x-ray ring to produce monochromatic x-rays. MECT will produce tomographic images of the human head and neck with unprecedented sensitivity.

"As well as providing sharper pictures than conventional CT scanners, the multiple-energy CT scanner will be used to perform two diagnostic techniques not possible

with conventional CT," says Dilmanian.

One technique, called K-edge subtraction, is a method for contrast imaging. The other method, known as dual- or multi-photon absorptiometry, produces separate images of elements within the brain having low and intermediate atomic numbers.

Over the next six years, Dilmanian will be working on MECT with William Thomlinson, Dean Chapman, Nicholas Gmur and Herbert Zeman, NSLS; Daniel Slatkin and Nora Volkow, Medical; and James Hainfeld, Biology Department. As well, he has collaborators from Lawrence Berkeley Laboratory, Montefiore Medical Center of Albert Einstein College of Medicine, and the Health Sciences Center of the State University of New York at Stony Brook.

After constructing the scanner, which includes the building of a special monochromator and detector, the MECT research team will perform studies with phantoms, animals and, ultimately, human subjects.

To perform initial feasibility studies, Dilmanian had received support for nine months from the Laboratory Director's Exploratory Research Program.



Roger Stoutenburgh

At beam line X17 of the National Synchrotron Light Source (NSLS), William Thomlinson (left), NSLS, explains the operation of photon shutters to Avraham Dilmanian, Medical Department. The X17 wiggler will provide the high-power x-rays used in Dilmanian's multiple-energy computed tomography (MECT) experiments.

CT vs. MECT

Conventional CT scanning is a technique using a rotating beam of x-rays to produce a picture of a cross-sectional "slice" of the human body. It is used as a noninvasive alternative to exploratory surgery and other procedures as a way of seeing internal organs to diagnose diseases.

In the brain, for example, an existing CT scanner can detect tumors, hemorrhages and other neurologically significant structures.

During a conventional CT scan, an x-ray source sends a pulsed beam through the patient's head. As they travel from the source, the x-rays lose

intensity because they are absorbed or scattered from brain tissue. On the opposite side of the patient's head, an array of electronic detectors picks up the transmitted x-rays, noting the intensity-reduction pattern.

The source and the detector array are rotated around the patient's head, so a full circle of transmissions can be collected. Using the data from these detectors, a computer then reconstructs a picture representing the cross section.

While existing CT scanners use polychromatic x-rays, that is, x-rays with a wide range of energies, MECT will use single energy x-rays. At beam

(Continued on page 2)

\$1,000 for Reentry Woman Scholar



Roger Stoutenburgh

A check for \$1,000 and a certificate were presented to Mary T. Belletti (fifth from left), the fourth winner of the Renate W. Chasman Scholarship for Women, on August 16.

Members of the scholarship committee of Brookhaven Women in Science, the presenters include: (from left) Susan Hobbie, Department of Nuclear Energy (DNE); Penny Baggett, Computing & Communications Division; Gail Williams, Office of Scientific Personnel; Eva Bozoki, National Synchrotron Light Source; Mary Kinsley, Department of Applied Science; Harriet Martin, Technical Information Division; and Pat Webster, Accelerator Development Department. Absent from the picture is Ruth Kempf, DNE.

Belletti, a resident of Mattituck, was graduated from high school in 1978. Overcoming personal and financial difficulties, she resumed her education in 1985 to become a high-school science teacher. Having received an associate's degree from Suffolk County Community College in May 1988, Belletti is now a junior at the State University of New York at Stony Brook, majoring in earth science and secondary education.

The scholarship was established by Brookhaven Women in Science to encourage women who have returned to college for scientific or technical degrees at the undergraduate or graduate level. It honors the memory of the late BNL physicist Renate W. Chasman, co-designer of the electron storage rings at the National Synchrotron Light Source.

Tax-deductible contributions may be made to the Chasman Scholarship Fund, P.O. Box 183, Upton, N.Y. 11973.

Thouless Returns for Third Time As Fourth Haworth Scientist

David Thouless, a professor of physics at the University of Washington, is scheduled to arrive on site next week to deliver two lectures and interact with Lab staff in his field, solid state physics. This will be his third and final visit to BNL's Physics Department as the Lab's fourth Haworth Distinguished Scientist.

In his field, Thouless has contributed to the understanding of phase transitions in two dimensions, such as what occurs when a liquid becomes a superfluid. Working with a colleague, his insights into particular types of phase transitions have been recognized as the Kosterlitz-Thouless transition.

On Tuesday, September 12, Thouless will talk on "Physics, Mathematics and Mathematical Physics," in a Lab-wide lecture for a general audience, at 4 p.m., in Berkner Hall. A reception will follow the lecture at 5 p.m. in the lobby.

On Thursday, September 21, "Scaling for the Quasiperiodic Schrödinger Equation" will be Thouless' topic for a solid state physics seminar. It will be presented at 1:30 p.m. in the small seminar room of the Physics Department, Bldg. 510.

The Haworth Distinguished Scientist appointments were established by Associated Universities, Inc., in 1983. The program honors the memory of BNL's second director, the late Leland J. Haworth, who headed the Lab from 1948-61.

Once appointed Haworth Distinguished Scientist, researchers with an international reputation in fields related to Lab programs spend from one to three weeks a year in residence at BNL for three consecutive years.



Mort Rosen

David Thouless

Inside Info

Morton Rosen, Photography & Graphic Arts (P&GA) Division, was awarded the Master of Photography degree by Professional Photographers of America, Inc. (PPA), during the association's annual convention held in New Orleans earlier this month. The degree, one of the highest honors for professional photographers, is awarded for superior photographic competence.

Founded in 1880, PPA is the world's oldest and largest association for professional photographers. It provides educational services and establishes standards of professional performance for more than 17,000 individual members and 250 international affiliated organizations.

Before becoming P&GA's Photographic Supervisor in May 1988, Rosen was a BNL photographer. The body of work he completed over 30 years vividly documents a broad spectrum of the Lab's research, facilities and people. Outside of BNL, Rosen's photographs have twice graced the cover of PPA Magazine and have also been seen fronting such journals as Science, CERN Courier and Physics Today. He has also received many photographic awards for his scientific subjects.

Software Demo

Digital signal processing in a real-time UNIX environment will be the subject of a demonstration by Concurrent Computer Corporation and Prosig Inc., on Tuesday, September 12. The demonstration will be held in Berkner Hall from 10 a.m. to 2:30 p.m., and will focus on scientific data acquisition.

Prosig Inc. will show DATS, the software tool for scientists and engineers that provides an entire signal-processing environment on a workstation. DATS provides all necessary acquisition, analysis and display facilities.

Concurrent Computer Corporation will concentrate on providing solutions to time-critical applications using their MASSCOMP product line, which combines the environment of UNIX with performance levels usually associated with proprietary systems.

Note to Employees:

Attendance at lectures, meetings and other special programs held during normal working hours is subject to supervisory concurrence.

MECT

(cont'd)

line X17 at the NSLS x-ray ring, MECT researchers will be able to tune in to the x-ray of the specific energy they want, anyone with a value between 30 and 90 thousand electron volts (keV).

Polychromatic x-rays are absorbed and scattered differently at different energies; the subsequent "beam hardening" effect results in low-contrast images for conventional CT scans. Monochromatic x-rays to be used in MECT have only one rate of attenuation at each energy for each tissue type, thereby producing scans with higher contrast.

Dual-Photon Absorptiometry

As a result of using x-ray beams with well-defined energies, MECT can be used to combine one image taken at the low end of the energy spectrum, 40 keV, with one taken at the highest energy, 90 keV.

This dual-photon absorptiometry

LEP Beam Accumulates — With Help From BNL

On Bastille Day and the 200th anniversary of the French Revolution, beam circulated for the first time around the Large Electron-Positron (LEP) collider at the European laboratory CERN. Soon after that, beam was stored in the LEP ring — and BNL had a helping hand in that accomplishment due to ORBCOR, a computer program written by BNL Physicist Eva Bozoki.

Bozoki had created ORBCOR — short for orbit correction in the early 1980s. It was a part of a model-based computer program called RING, which controls the operation of the x-ray and vacuum ultraviolet electron storage rings at the National Synchrotron Light Source.

An algorithm called MICADO, which minimized the orbit displacement around the ring while keeping the minimum needed corrector strength, was incorporated into ORBCOR. MICADO had been originally developed by two scientists at CERN.

In 1986, Bozoki was invited to CERN for six months to adapt ORBCOR for use as an orbit control program for CERN's Proton Synchrotron (PS), which had been turned into a proton and antiproton injector for CERN's collider, the Super Proton Synchrotron (SPS).

After it was successfully adapted for PS, ORBCOR was again modified, and included in the control system first for the SPS and now for LEP.

The largest accelerator in the world, LEP was started up on July 14, and the beam took three turns around the 27-kilometer ring almost immediately. After a few days of studies and with the help of PS's off-line version of ORBCOR, LEP started to accumulate beam.

"With its use at CERN, ORBCOR has really come full circle," says Bozoki, "for what came out of CERN as the algorithm MICADO went back to CERN in the form of orbit control, ORBCOR."

Stockroom Closings

All Supply & Materiel Division (SMD) stockrooms will be closed for inventory on Thursday and Friday, September 14 and 15. Please make all necessary withdrawals of stock prior to 3 p.m., Wednesday, September 13. This will give SMD sufficient time to prepare for the inventory.

Emergency requirements should be processed through John Scharpeger, Ext. 2974.

Sculpture on View

The Standard Model (abandoned), a 40-foot-long, steel and glass sculptural installation by Stephen Rueckert, is being shown in the Collider Center, Bldg. 1005S, Wednesdays, Thursdays and Fridays through September 15, from 11 a.m. to 2 p.m., and Saturdays, September 9 and 16, from 11 a.m. to 4 p.m.

method will produce two different pictures: one of the low atomic-number elements — such as hydrogen, oxygen and carbon — within the organ that was scanned, and the other of those elements with intermediate atomic numbers — for example, potassium, phosphorus, chlorine and calcium.

Using present CT scanners, dual-photon absorptiometry can be done only to make bone-density measurements. Using MECT, however, dual-photon absorptiometry measurements will be able to map the regional concentrations of potassium and calcium within the brain. These measurements will be used to detect brain tissue having inadequate blood supply due to stroke and other causes.

"Potassium is a significant element in the brain," explains Dilmanian. "For example, areas with decreased blood supply use less potassium than normal tissue. A conventional CT scanner can't see it — but we should be able to."

Another dividend of monochro-

Introducing: New Mailbox

A new U.S. mailbox has been installed in the parking lot across from Berkner Hall, where the Wednesday Farmers' Market is held. Mail deposited there will be picked up and brought to the Upton Post Office every weekday at 10:30 a.m. and 4 p.m.



Coming Up

Daniel Slatkin, a pathologist in the Medical Department, will deliver the next Brookhaven Lecture on Thursday, September 21, at 4:30 p.m. in Berkner Hall. The topic of his lecture will be "Boron Neutron Capture Therapy of Brain Tumors."

matic x-rays from a tunable source is a technique called K-edge subtraction. It will be used to image especially small tumors and blood vessels that conventional CT cannot see.

To carry out K-edge subtraction, a patient is first injected with iodine as a contrast element before the scan. Iodine is taken up by tumors within the brain and thereby enhances the contrast of the CT image.

The electrons within iodine's innermost electronic shell — the K shell — begin to be ejected from the atom, as a result of the photoelectric effect, only when the photon's energy is above 33.16 keV, the "K-edge." At this energy, the rate of x-ray absorption and scattering increases sharply, producing a characteristic spectrum of the K-edge.

To do K-edge subtraction, first, scans are made at energies below and above the K-edge of the contrast element; so, for iodine, that is above and below 33.16 keV. The lower-energy scan is then subtracted logarithmically from the highest-energy one to highlight the location of iodine within the brain.

"With K-edge subtraction, MECT will be ten times more sensitive to iodine. Therefore, tumors that conventional CT cannot image will be seen by MECT," concludes Dilmanian. — Marsha Belford

Jennings to Speak At BWIS Meeting

Glenn Jennings, Assistant to the Director for Affirmative Action, will be the guest speaker at the next Brookhaven Women in Science (BWIS) luncheon meeting. He will talk about "Building Alliances: Women and Minorities," on Monday, September 18, in Room A, Berkner Hall, at noon.

Elections of officers for fiscal year 1990 will be held at this meeting.

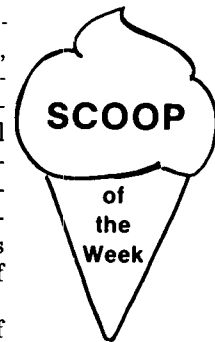
The BWIS dinner meeting scheduled for Thursday, September 14 has been cancelled.

Scoop of the Week

This week's certificate for soft-serve frozen yogurt, redeemable anytime at the Cafeteria, goes to Russell Lowell, Alternating Gradient Synchrotron Department, who told us about "A Bat out of HEEP."

Yes, the Scoop of the Week contest continues, though no scoops have been awarded in the past few weeks. That's not for lack of tips pouring into the Bulletin, but for the lack of time and space to follow up on them. All those who have submitted scoops that the Bulletin intends to follow up on will be acknowledged and receive their scoop certificates at summer's end.

To enter the Scoop of the Week contest in the remaining two weeks, phone in your hot tips to Ext. 5053, or write to the Bulletin, Bldg. 134.



Volleyball News

Outdoor Triples Tournament

An outdoor volleyball triples tournament will be held Saturday, September 16, at 10:30 a.m. Participation is limited to 15 teams, each with three players, on a first-come, first-served basis.

A \$2 entrance fee per person is payable on the day of the tournament. In the event of bad weather, the tournament will be postponed. Registration will be handled on a team basis only, by contacting Kathi Barkigia, Ext. 7661, or Terry Sullivan, Ext. 2840, by Thursday, September 14.

Captains' Meeting

The first Volleyball League captains' meeting will be held on Wednesday, September 20, at noon, in Room 300, third floor, Chemistry, Bldg. 555. General organization of the leagues will take place at this time.

For teams to enter, their representatives must attend the meeting and submit preliminary rosters. Roster sheets will be sent to last year's captains. To form a new team, or if you wish to play but do not have a team, contact Kathi Barkigia, Ext. 7661, or Karen Savino, Ext. 3513.

Arrivals & Departures

Arrivals

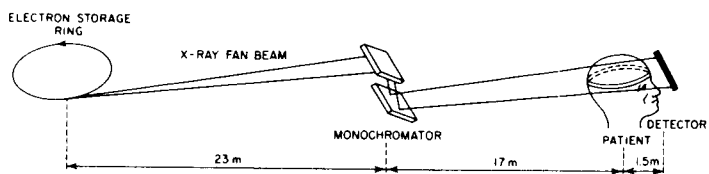
Gary GoldsteinDAS
Philip M. JohnsonChemistry
Sateesh R. ManeAGS
Robert D. PisarskiPhysics
Kanokporn RithidechMedical
Joseph T. RogersNSLS
John J. StrasserDAS

Departures

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

Michael L. KnotekNSLS
Charles R. MeitzlerAGS

A schematic of the multiple-energy computed tomography (MECT) system (distances approximate).



Bus to Bronx Zoo

Tickets are still available for the BERA Art Committee-sponsored trip to the Bronx Zoo and the nearby Botanical Gardens on Saturday, September 23. The bus will leave BNL at 9 a.m. and return by 5 p.m. Bus tickets cost \$15; adult zoo entry is \$3.75, with group tickets for all rides at \$8 each. Call Liz Seubert, Ext. 2346.

Bowlers Needed

Bowlers are needed for the Mixed League on Thursday nights in Shirley. Singles and couples are both welcome. Call Fern Simes, Ext. 2954.

Women bowlers are also needed for the Pink League on Tuesday nights in Port Jefferson. Call Donna Cunningham, Ext. 4599.

Smoking and No Smoking on Site

To promote better health throughout the Lab, BNL established a smoking policy in 1988. Under this policy, smoking is prohibited:

- in conference rooms, seminar rooms, auditoriums and lunchrooms.
- in the Cafeteria, except in the designated smoking area.
- in private offices that employees have designated as nonsmoking areas.
- in designated work areas, for safety reasons.

Employees sharing work locations in which questions of smoking vs. no smoking arise should try to resolve their problems between themselves and, if needed, with their supervisor. If the problem cannot be resolved within the department or division, the matter should be referred to the Manager of the Personnel Division. Priority consideration will be given to nonsmokers.

Golf Tournaments

The BGA will sponsor its sixth golf tournament of 1989 on Tuesday, September 19, at the Rock Hill Golf Club. The tournament format will be a two-person scramble in flight.

The first tee-time will be 10 a.m., running until 12:30 p.m., depending on sign-up. Contact John Usher, Ext. 2096, for a tee time. Please call with at least your scramble twosome; tee-time priority will go to completed foursomes. The deadline for signing up is Thursday, September 14.

Greens fees, to be paid to the starter, are \$29, which includes a mandatory power cart. The entry fee is \$1 for BGA members and \$2 for nonmembers. In the event of rain, please call the Pro Shop, 878-2250.

Seventy-nine BNL golfers teed up at the Indian Island Country Golf Course on August 21. The winners of each group were:

Flight	Low Gross	Low Net
A	Steve Heald	Mike Losquadro
B	Bruce Kavan	Bob Lofaro
C	See-Meng Wong	Rick Jackimowicz
D	Dennis Malloy	Tom Dilgen

Closest-to-the-Pin Awards: Mike Losquadro, Robert Mills

Longest-Drive Awards: Mike Buckley, John Millener.

BERA Needs Lifeguard

A lifeguard for the BERA swimming pool is needed between the hours of 10:30 a.m. to 2:30 p.m., Monday through Friday. Red Cross certification is required. Interested applicants should call M. Kay Dellimore, Ext. 2873, for an application or further information.

FBS Needs Secretary

The on-site branch of Federal Business Systems (FBS), which maintains the Laboratory's telephone system, is looking for a part-time secretary. The 25-hour per week position includes such benefits as medical and dental insurance, and vacation time. FBS is an equal opportunity employer. For information or an application, call Tom Tully, Ext. 5350.

BROOKHAVEN BULLETIN

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

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



In Concert — North Shore Pro Musica

The North Shore Pro Musica, an ensemble of well-known musicians who are local residents, will present a concert in Berkner Hall on Thursday, September 14, at 8:30 p.m.

Founded in 1980, the North Shore Pro Musica has become well recognized for its innovative programming and diverse repertoire. The group is committed to bringing chamber music to areas where it is less available. Additionally, the musicians seek to involve young people in the chamber music experience, either as listeners or players.

Pro Musica's membership is flexible, depending on the program. At the BNL concert, performers will be

Irene Lawton, violin; Boris Jourawleff, violin; Christopher Shaughnessy, viola; Karl Lavine, cello; Terry Keevil, oboe; Elisabeth Palmedo, soprano; and Craig Nies, piano.

In various combinations, the musicians will present the following program: Haydn's Quartet in D Major, Op. 76; three Rachmaninoff songs for soprano, violin and piano; a sonata by Hindemith for oboe and strings; and the Brahms Quintet in F Minor, which is for piano and strings.

The concert is open to the public. Tickets are \$6 each and may be purchased at the door the night of the performance.

English Classes To Be Held on Site

Classroom instruction in English as a second language is available on-site to Laboratory employees, guests and their spouses. Registration will be held on Tuesday, September 19, at 7 p.m. in the Personnel Training Room, Bldg. 459.

At the recommendation of the instructor, participants will be enrolled in either a beginner or intermediate class. Beginners will meet on Saturday mornings at 9 a.m. Intermediate classes will be held on Tuesday evenings at 7 p.m. Classes are free and will emphasize conversational English, with some instruction in grammar and written language.

Theater Group

The BNL Theater Group will meet on Thursday, September 14, at 7:30 p.m. in the Physics seminar room, Bldg. 510. Discussion will center on the Theater Group's participation in the October 21 BERA Special Event.

Pursue Fitness!

All eligible BERA members are invited to enhance their level of physical fitness by participating in one of the following programs of the Aerobic Dance Club:

- Stretcherize — Mondays, fall session starts September 11
- Aerobic Dance — Tuesdays and/or Thursdays, fall session starts September 12 and 14.

All classes are conveniently located on site and timed just after work. Each ten-week session costs \$30 for each day of the week you participate. For more information, including meeting locations, call Pat Campbell, Ext. 3483; Bill Leonhardt, Ext. 2378; or Janet Sillas, Ext. 2345.

Cafeteria Menu

Monday, September 11

Soup: Chicken noodle	(cup) .75
	(bowl) .95
Yankee pot roast w/pot. or veg.	3.10
Roast turkey w/giblet gravy & pot. or veg.	3.10
Lite-line: Broiled turkey w/pot. or veg.	3.10
Hot deli: Tuna-melt burger	3.10

Tuesday, September 12

Soup: Broccoli supreme	(cup) .75
	(bowl) .95
Salisbury steak w/pot. or veg.	3.10
Tuna à la king	3.10
Lite-line: Pear in gelatin	2.85
Hot deli: Meatball hero	2.85

Wednesday, September 13

Soup: Beef barley	(cup) .75
	(bowl) .95
Frank's assorted pizzas	3.10
Fried chicken w/pot. or veg.	3.10
Lite-line: Salmon salad plate	3.10
Hot deli: Ham & cheese croissant	2.85

Thursday, September 14

Soup: Split pea	(cup) .75
	(bowl) .95
Tricolor pasta w/chicken	3.10
Broiled flank steak w/mushroom gravy & pot. or veg.	3.10
Lite-line: Shredded carrot & pineapple salad	3.10
Hot deli: Reuben grill	3.10

Friday, September 15

Soup: Seafood gumbo	(cup) .75
	(bowl) .95
Eggplant Parmesan	3.10
Fillet of whitefish Florentine w/pot. or veg.	3.10
Lite-line: Broiled whitefish w/pot. or veg.	3.10
Hot deli: French dip	3.10

Blood Count

A special thank-you to all BNL'ers who came to give blood during the special Blood Drive last Friday — for a final count of 170 pints collected.

Classified Advertisements

Placement Notices

The Laboratory's placement policy is to select the best-qualified candidate for an available position, with consideration given to candidates in the following order of priority: (1) present employees within the department and/or appropriate bargaining unit, with preference to those within the immediate work group; (2) present employees within the Laboratory as a whole; and (3) outside applicants. In keeping with the Affirmative Action plan, selection decisions are made without regard to age, race, color, religion, national origin, sex, handicap or veteran status.

Each week, the Personnel Office lists new personnel placement requisitions. The purpose of these listings is, first, to provide open placement

(Continued on back page.)

A Bat Out of HEEP



Discount Tickets at
BERA store
Berkner Hall

SIX FLAGS
Great Adventure

NEW ATTRACTIONS
AND THRILLS
COMING YOUR
WAY

Holy bulletin board! Is that a bat, man? As a matter of fact, it's Ding. Ding was named by the group working in the High Energy Electronic Equipment Pool (HEEP), shortly after he found his way into Bldg. 923 late last month. But he was really no dingbat — he knew a comfortable spot when he found it and spent one afternoon just hanging upside down on the bulletin board, dreaming of great bat-adventures. Dingbat is gone now — a bat out of HEEP.

Roger Stoutenburg

