BROOKHAVEN BULLETIN
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BROOKHAVEN NATIONAL LABORATORY

Spotlight on NSLS Research

Microtomography Makes Possible 3-D Images Of Micron-Sized Structures

It is now possible to take three-dimensional, x-ray photographs showing 1,000 times more detail than ever seen before, as a result of a new technique developed at the National Synchrotron Light Source (NSLS).

The new technique is called x-ray microtomography, as it advances conventional tomography into the micron-resolution range. Microtomography makes use of the intense x-ray beam produced by the NSLS x-ray ring.

Microtomography has been under development by a three groups at the NSLS, as well as others elsewhere, since the technique will be useful to a range of researchers, from materials to medical scientists.

"In general, the technique will be useful for looking at the structural details of opaque, heterogeneous materials in a non-destructive manner," comments Guest Chemist Kevin D'Amico, of Corporate Research Laboratories, Exxon Research and Engineering Company. "For example, we are interested in using microtomography to examine oil-bearing, porous rocks and catalytic materials."

A microtomographic reconstruction of cross section of a piece of Illinois no. 6 coal. The coal is about 500 microns in size; the dark areas within the coal represent carbon, the grey areas denote concentrated iron, and the light areas stand for sulfur in high concentration.

The Exxon group at the NSLS is the first one to succeed in producing near micron-resolution microtomographs. Members of the Exxon research team include D'Amico, Guest Physicist Harry Deckman and Brian Flannery, as well as Wayne Roberge, now of Rennselaer Polytechnic Institute.

Using conventional x-ray tomography, it is possible to make images of the insides of objects 20 centimeters and larger, showing details of about one millimeter. With microtomography, the interior of one-millimeter samples can be examined with a resolution near one micron, or almost 1,000 times better.

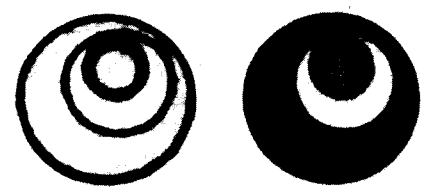
Conventional tomography is the use of x-rays to photograph in 3-D the interior of a sample. Both conventional tomographs and microtomographs are made by sending x-rays through different planes of a sample and at different angles; the data from those scans are then analyzed using a computer to create a three-dimensional image of what lies inside. For example, computer-assisted tomography, or CAT, scanners are commonly used in medicine to image the structures within the human body.

Tomographs are an improvement over standard x-rays, the two-dimensional radiographs produced by casting a shadow of the structures that absorb x-ray energy onto photographic film. Standard x-rays can show only the length and width and side-by-side position of internal structures, but not their depth or composition.

Radiographs are useful to physicians in making many diagnoses, for example, because, from their study of anatomy, medical doctors already know the relative positions of bones and other body parts that show up on x-ray negatives. However, because radiographs lack depth and other quantitative information, they are not as useful to materials researchers, who often want to determine the interior structure and composition of unknown objects.

For this information, scientists use tomography, which has had limited resolution — until now. To improve tomographic resolution, the x-ray beam intensity had to be significantly higher than that of the radiation produced by conventional sources. The NSLS x-ray beam has such intensity, so the Exxon group brought their microtomography scanner to beam line X-10A at the NSLS.

Unlike conventional sources of x-rays, synchrotrons produce a broad range of wavelengths, and an x-ray wavelength suitable for particular measurements can be selected. Different chemical elements absorb different x-ray wavelengths, and the more concentrated an element in a sample, the more strongly it will absorb particular x-rays. So, by tuning the wavelength produced by a synchrotron source, different elements and their differing concentrations can be identified within an unknown object through microtomography.



A cross-sectional microtomograph of a set of three capillary tubes containing two different concentrations of copper sulfate solution, illustrating how microtomography can differentiate between elements of different concentrations and thus yield chemical information about a material's composition. The image at left was obtained using x-rays having a lower energy than the copper atom's characteristic absorption energy, and the one on the right was made with x-rays of a higher energy than the absorption energy of copper.

Mort Rosen

Kevin D'Amico

In addition to needing an intense and finely collimated x-ray beam from a synchrotron, the development of microtomography required a higher-resolution x-ray detector to be built, and a faster-processing computer code to be written.

The microtomography detector has higher resolution than those used for conventional CAT scans. Instead of directly detecting the x-rays that pass through a sample, the microtomog-

(Continued on page 2)

Two Decades of Technical Support for Nuclear Safeguards

It's a cold winter's day on January 19, 1968. Down by the railroad tracks, in the old Critical Assembly Building, a new group in the Department of Nuclear Engineering is starting its first day on the job. The small group is the Technical Support Organization (TSO), headed by Herbert Kouts, and its charter reads "to advise and assist the Atomic Energy Commission (AEC) on various aspects of nuclear safeguards."

It's been over a year since Richard Dodson, Gerhart Friedlander, William Higinbotham and Frank Miles started bicycling, driving or walking down to Kouts's building for meetings to explore the possibility of having a safeguards technical group to support the Safeguards Office of the AEC. Now, with funding of $25,000 for 1968, TSO is established at Brookhaven.

An early project TSO will undertake is a "Conceptual Design for Safeguarding Nuclear Material" for AEC's Office of Safeguards and Materials Management. The study will identify three general elements of safeguards: physical security, accountability and surveillance, and make recommendations on future action. This, and similar studies to be performed by TSO later on, will form the basis of much of the safeguards and security policy used in years to come by the AEC's future descendants, the Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC).

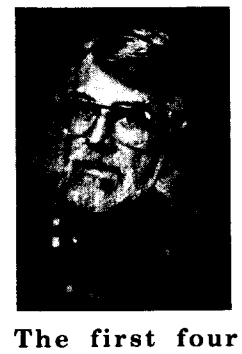
Just over twenty years later, TSO now part of BNL's Department of Nuclear Energy (DNE) and headed by Joseph Indusi, continues to advise and assist DOE, as well as other government agencies, on nuclear safeguards and security decision-making.

Said Indusi, "We're basically a think tank. The Safeguards and Security Office of DOE has several safeguards research and development responsibilities. One is to develop systems to protect nuclear materials against theft, misuse or sabotage. Another is to provide technical assistance on safeguards to the International Atomic Energy Agency. Our job is to help them."

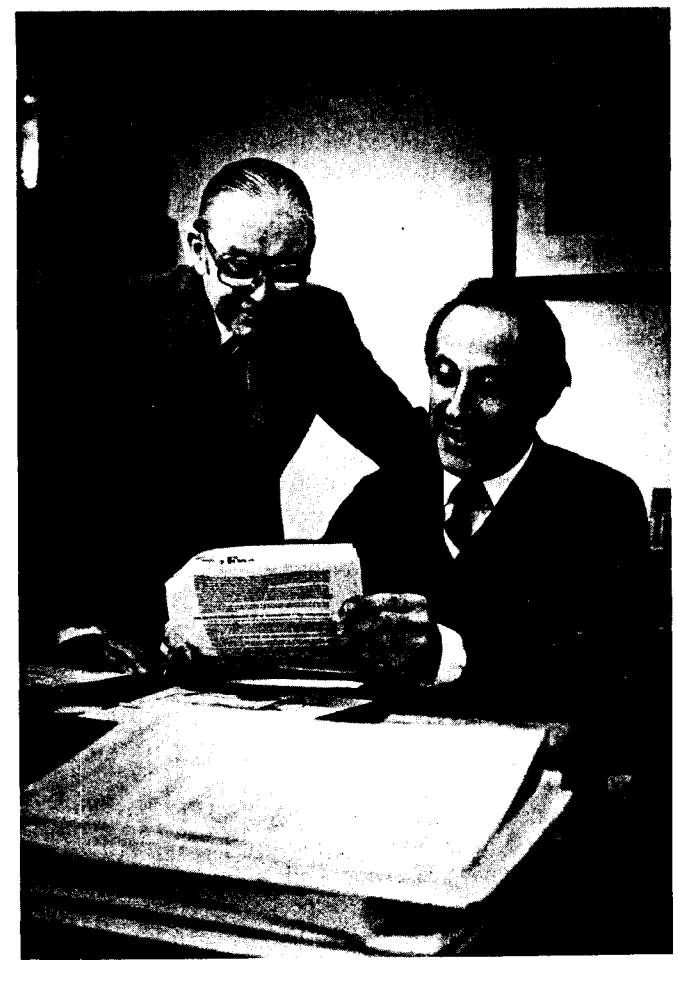
Indusi explained that TSO's work includes technical planning, reviewing reports on safeguards research and development, advising on possible changes in techniques for nuclear safeguards verifications here and abroad, and analyzing safeguards systems of national and international nuclear fuel cycle facilities.

Other work involves technical studies related to the classification of certain safeguards and security information. TSO also supplies technical

(Continued on page 2)



Photos
by
Mort Rosen



The first four heads of the Technical Support Organization: (clockwise from top left) Herbert Kouts, William Higinbotham, Joseph Indusi and John Cusack.

BNL's First Woman in the Driver's Seat

When Gail Radich became a full-time Chauffeur last October 26, another BNL female employee donned the uniform of a non-traditional job for women.

Actually, Radich is waiting for the tailor to stitch up her set of blue-grey uniforms, the winter and summer three-piece suits and overcoats issued to the full-time BNL chauffeurs. One of her first driving assignments, in fact, was to chauffeur herself into New York City, to be measured for her uniforms. Her suits will have pants, like those worn by the other chauffeurs.

"Staff Services thought about my wearing a skirt," explains Radich, "but, because of the weather and my getting in and out of cars, it was decided that pants are much more practical — and I agree." Radich will not, however, wear a tie with her full-time uniform, as do the male chauffeurs; her neckwear will be like a riding choker.

Mort Rosen

Gail Radich

In the meantime, Radich wears the dark blue pants and jacket issued to part-time drivers, a position she undertook on weekends last year, in addition to her working weekdays in the mailroom. "When I started driving part-time, I wasn't thinking of the possibility of a full-time job — I just thought I'd try it," says Radich.

She liked it and now likes being one of the Lab's three full-time drivers, along with Rudolph Funn and Linwood Johnson. "I care about people, so all my passengers are very important to me. Often, the drivers are the first to meet visitors to the Lab, so their first impression of us is very important," explains Radich. "The visitors don't know us, and often don't know the Lab or the English language. Regardless, it is our job to make them feel comfortable and safe — get them where they are going on time and not leave them stranded anywhere.

"My passengers are nice to me — after they get over the initial shock of having a woman chauffeur," she continues. "Some men refuse help with their luggage, but I always offer to take one suitcase out of their hands. Women always let me help them, but no one has expected me to carry anymore than they can."

While Radich has over 30 years' of licensed on-the-road experience and a clean driving record, she learned to drive without a license off the road —as a ten-year-old riding a tractor on her parent's farm in Southold. She still lives in Southold, with her husband Joseph, a carpenter group leader in Plant Engineering, and her daughter Jolyn. When she is riding around, but not behind the wheel, Radich can be found behind the reins of her Thoroughbred mare, Gretchen.

"My family has been very understanding of my odd hours and being on call," says Radich, "and of the fact that I have to get my rest if I am going to be physically alert to drive someone to the airport at 5 a.m."

After getting her junior license at 16 and taking drivers' education in high school, Radich received her senior license; she was issued a chauffeur's license in 1987. In 1979, a year after she first drove to work at BNL, Radich got behind the wheel of a BNL mail truck for a couple of years. In addition, she has driven a bus for her church and chauffeured a children's dance group from performance to performance.

"I feel very free and adventurous when I'm driving: I'm outdoors, I'm going different places, meeting new people — and every day is different," says Radich. "But I also feel very responsible for the safety and comfort of my passengers — driving is a responsibility, not a right, and driving other people is much more of a responsibility."

"Responsible, sensible, patient and laid-back" is how Radich describes her driving style. So, when the Long Island Expressway is a bumper-to-bumper parking lot, she doesn't blow her radiator.

Instead, Radich may try a different route. "Linwood and Rudy are very helpful with directions — they really know their way around," she says. Radich feels accomplished getting around New York City and the New York airports. Newark Airport and Westchester County are new territories that she has yet to explore, but she is not worried.

Radich concludes, "At the beginning, I felt tense — I didn't want to get lost with someone else in the car who had to get some place on time. Now, I feel relaxed because I'm learning by doing. Knowing all the routes comes with experience — it's a challenge, and I have more confidence now."

— Marsha Belford

Technical Support (cont'd)

experts for DOE Safeguards and Security inspections and evaluations throughout the DOE complex.

The group consists of 21 scientists and technical experts, and four secretaries. "We pride ourselves on having a multidisciplinary staff," said Indusi. "For example, we have engineers, chemists, physicists, mathematicians — and a librarian for what is probably the widest-ranging nuclear safeguards library in the U.S. Because of our long experience, we are often expected to answer requests at short notice. It's important to cover all bases having an impact on safeguards."

Indusi, who joined TSO fifteen years ago, became Division Head in 1986. He succeeded John Cusack, now a consultant, who led the group from 1975 until his retirement in 1986. In its 20-year history, TSO has only had four division heads, the other two being Kouts, today's DNE Chairman, who led TSO from 1968 to 1973, and William Higinbotham, now retired and a Consultant, who headed the organization from 1973 to 1975.

Recalled Higinbotham, "Some of our most interesting — and difficult — work could be described as 'putting out fires.' "

For example, in 1969, the SEFOR research reactor near Fayetteville, Arkansas, failed to become critical. So, at DOE's request, Higinbotham said, "Four TSO staff found themselves in the middle of nowhere, measuring the contents of fuel rods." Some rods proved to contain only 12%, not 20% plutonium. Where was the rest of the plutonium?

"We had so much data," said Higinbotham. "I knew all those rods forwards, sideways and backwards. Gene Weinstock and Marty Zucker set up a little shack near the Erwin, Tennessee, plant where the rods were made, to measure the 55-gallon drums of waste with gamma rays. We also measured the scrap — we measured everything."

By the end of two years, when the measurements and calculations had been checked and twice rechecked, the "missing" plutonium had been recovered. Some had been in the waste, some lost to miscalculation or clerical error.

The work of the TSO has led to several firsts now in common worldwide use. For example, an automated electromanometer developed at BNL in 1978 uses the most modern digital techniques for very accurate measurements of large volumes of plutonium and uranium solutions. It was demonstrated here and in Japan, and is now used in reprocessing plants in Britain, Germany, Japan and this country.

"But our primary work in safeguards is with system studies and conceptual designs," said Indusi. "TSO builds a prototype if it's appropriate, demonstrates proof of principle — and generates ideas. We expect to be generating ideas in support of nuclear safeguards for decades to come."

— Liz Seubert

Microtomography (cont'd)

raphy detector observes visible light given off by a phosphor.

As the sample is rotated, x-ray beams pass through different planes and angles. The x-rays strike a specially fabricated glass plate coated with fine grains of a specially fabricated phosphor, which was developed by Deckman. Excited by the x-rays, the phosphor emits visible light, which is focused by a lens onto a square array of light sensors, called a charge-coupled device, making up the detector.

By using different lenses, the light from the phosphor can be magnified to different powers, so the spatial resolution of the microtomographs can be varied. "By using the indirect detection method employing the phosphor and a lens, Harry could build a detector with much higher resolution," explains D'Amico.

To make a microtomographic reconstruction, the detector must observe a huge number of exposures — more exposures than for a conventional CAT scan and too many for the CAT scan computer code to reconstruct in a reasonable amount of time.

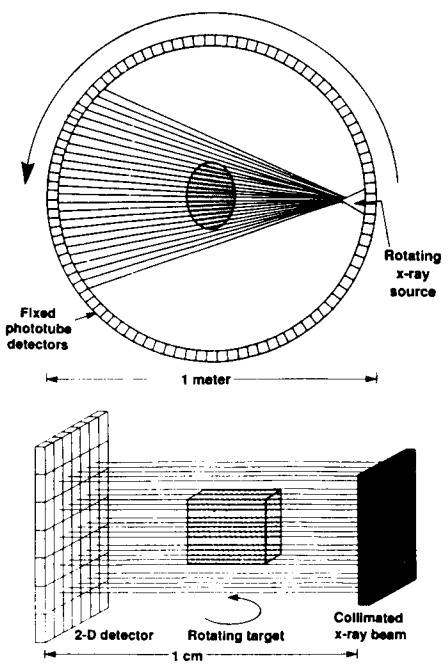
So, new software was written by Flannery and Roberge to control an off-the-shelf array processor and a VAX computer. The system can reconstruct a microtomographic image in just a few hours.

On the NSLS x-ray ring experimental floor, Deckman and D'Amico, along with their Exxon colleagues John Dunsmuir and James McHenry, prepared the device and utilized it for their experiments employing synchrotron x-rays.

As the scheduled shutdown of the x-ray ring continues, the Exxon group is analyzing the data they have collected so far, and they are changing the location of their microtomographic scanner to beam line X-2 and improving their set-up.

"When the Exxon line again has beam, we will make microtomographs of more complicated samples undergoing chemical reactions," concludes D'Amico. "Because microtomography is noninvasive, we think that it can be used to study contained systems under conditions of temperature, pressure and environment that represent the conditions in catalytic reactors or biological systems. Microtomography is an excellent new technique for qualitatively looking into complex systems."

— Marsha Belford



A schematic comparison of a conventional medical CAT scanner (top) and the x-ray microtomography device (bottom). The medical scanner acquires data from a fixed sample through a single plane at a time by rotating the radiation source along a circle of detectors. The microtomography system uses a fixed radiation source to irradiate a rotating sample and a panoramic detector to record data simultaneously in multiple stacked planes. The data are used to reconstruct a three-dimensional image.

4 Gospel Choirs In Extravaganza

Four choirs will grace the stage in Berkner Hall on Saturday, February 6, in celebration of Black History Month. The 7th Annual Gospel Extravaganza, presented by the Afro-American Culture Club, will begin at 7 p.m.

The four groups featured in this year's Extravaganza will be: the Central Jersey Community Choir; the Young Adult Choir, Somerset, New Jersey; the Jenkins Brothers, Somerset, New Jersey; and the Channel of Blessings, Freeport, New York.

Tickets to the Extravaganza are $8 for adults when purchased in advance, $10 at the door; tickets for children under 12 are $5 in advance, $7 at the door. For more information, contact April Donegain, Ext. 2459; Mary Durham, Ext. 7143; Frances Ligon, Ext. 3709; Bruce Penn, Ext. 7213; or Public Affairs, Ext. 2345.

HMO Enrollment Open to February 26

Between now and February 26, eligible BNL employees can either join a Health Maintenance Organization (HMO), change to the AUI Group Medical Insurance Plan administered by Connecticut General Life Insurance Company, choose another HMO or opt to keep their present coverage.

Effective March 1, BNL employees working 20 or more hours a week will be able to choose their next year's coverage from either the AUI Plan or one of five HMOs: ChoiceCare; Empire Blue Cross-Blue Shield Healthnet; Health Insurance Plan of Greater New York (HIP); Maxicare New York, Inc.; or U.S. Healthcare.

Under the AUI Plan, employees may choose any physician or health care facility, and fees for services are reimbursed according to plan policies. In comparison, an HMO provides a number of health services on a prepaid premium basis for its enrolled members. This means that, instead of charging a fee for each service provided, the HMO collects the premium fee from members' employers in advance.

That fee entitles the member to most health care services, such as physician visits, surgical costs, x-rays, hospitalization charges and diagnostic tests. Some HMO services require a small copayment from the member, but most services are covered by the prepaid fee. A basic goal of the HMO is to provide care not only when a member is ill, but also to provide preventive and routine care.

Four of the HMO plans are Individual Practice Associations in which members are able to select a primary care physician from a list of participating private physicians. The primary physician, under contract to the HMO, is responsible for referring members to participating medical specialists or admission to a participating hospital when necessary.

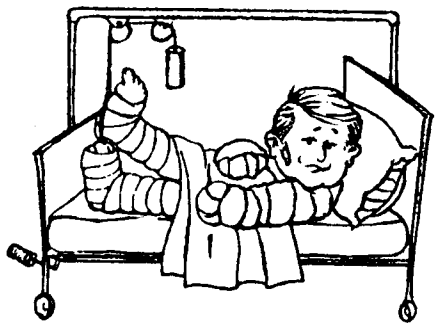
HIP is a facility-type HMO that provides medical services only by HIP physicians at a HIP medical center, of which HIP has over 50 in the greater New York metropolitan area, with the nearest in Ronkonkoma.

AUI will subsidize the cost of an HMO by paying up to the premium amount it currently pays for the AUI plan. At this time, there will be no charge for employees who enroll in any of the HMO plans, unless they are also covered by the AUI Dental Assistance Plan. Employees who enroll in an HMO and the Dental Plan will pay monthly charges of $2.08 for individual and $5.20 for family coverage.

To help employees make an informed decision on the HMO options, all active BNL employees will receive a letter comparing the benefits of the AUI Plan with those offered by the five HMO plans.

Representatives of the various HMOs will be at Berkner Hall on four consecutive Wednesdays — February 3, 10, 17 and 24 — between 11 a.m. and 1:30 p.m., to answer any questions about their plans. Plan literature, including lists of participating physicians and application forms, will be provided by the HMO representatives or can be obtained at the Personnel Services office in Bldg. 185, Ext. 2877.

To change coverage, employees must obtain the necessary forms from Personnel Services. The deadline for medical coverage changes is Friday, February 26, with coverage effective March 1, 1988, through February 28, 1989.



Join the Mountain Club for a Water Walk

These Mountain Club members hiked across the frozen Great South Bay several winters ago. This year, the Mountain Club will do its annual "Walk on Water" tomorrow, Saturday, January 30. The group will leave from the Bellport Dock at 10 a.m., and the hike to Fire Island and back should take about four hours. Bring your lunch. For further information, call Don David, Ext. 4821, or 286-2267.

Hospitality News

Kazuko Kuno will be the guest speaker at the next Hospitality Committee morning get-together, which will be held on Tuesday, February 2, at 9:30 a.m., in the Brookhaven Center. Kuno will describe and demonstrate a traditional Japanese tea ceremony.

Spouses of Laboratory employees and guests are welcome to join us for this interesting and enjoyable presentation. Please bring the children; babysitting will be provided free of charge. Coffee, tea and danish will be served.

Equipment Demo

KineticSystems Corporation will present a demonstration of CAMAC (IEEE-583) and ASYST Software, together in a comprehensive package for IBM personal computer data acquisition. The demo is slated for Tuesday, February 2, from 9 a.m. to 4 p.m., in the lobby of Berkner Hall.

In Stormy Weather:
Dial 282-INFO

Nominations Being Accepted

The Nominating Committee appointed by the BERA Executive Board is now accepting nominations for candidates for the 1988 BERA Board Election, to take place during the week of March 21 through 25. Any employee who wishes to propose a name for nomination may contact a member of the committee by Monday, February 8. Members include: Ken Asselta, Ext. 5110; Rick Backofen, Ext. 2907; Kathi Barkigia, Ext. 4509; Roseann Callister, Ext. 3173; Marilyn Gibbons, Ext. 3475; John Guthy, Ext. 4411; Jim Roessler, Ext. 5051; Joan Slavinsky, Ext. 2910; and George Walczyk, Ext. 4243.

Before calling a committee member, please make certain the person being proposed will agree to accept the nomination if selected by the committee.

Softball

The Softball Board is currently accepting nominations for the vacant position of Softball League President. Please submit nominations in writing to Sharon Smith, Bldg. 510A, no later than Friday, February 12.

PC User Meeting

The next PC User Group meeting will be on Wednesday, February 3, at 10 a.m. in the Applied Math Seminar Room, Bldg. 515. INTEL Corporation will present an introduction to their 80386 microprocessor, the one used in PS/2 model 80 and similar machines. They will also demonstrate their SYP301 computer. Refreshments will be served.

Weight Watchers

Since Weight Watchers came to the Lab in February 1986, over 6,000 pounds have been lost by BNL'ers. If you wish to add to this total by subtracting from your weight, sign up for the next eight-week session. Registration will be held at the first meeting on Wednesday, February 10, at 5:15 p.m. The cost is $60 for continuing members, and $30 for first timers, as the Laboratory splits the fee with them. All meetings are held on Wednesday, from 5:15 to 6:15 p.m. in the conference room of Bldg. 535.

BROOKHAVEN BULLETIN

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Getting Tax Forms

Federal and state tax forms are no longer available in the lobby of the Public Affairs Office. They can be obtained at participating banks, post offices or libraries.

If you are unable to obtain needed federal forms, call the IRS forms number: 800-424-FORM. For assistance, call 724-5000.

For New York State tax forms, call 800-462-8100; for assistance, call 800-443-3200.

New Vehicle Stickers Required in February

Expired vehicle registration stickers will no longer be honored for entry to the Laboratory site after Monday, February 1. Beginning Tuesday, February 2, persons who do not have 1988 stickers must show their Laboratory ID cards or other satisfactory means of identification for entry. Registration cards for new stickers are available at Police Headquarters, Bldg. 50.

Arrivals & Departures

Arrivals

Edward R. Beadle ..... Accel. Dev.
Frederick A. Goulette ..... Medical
Peter R. Mendolia ..... AUI
Scott L. Newton ..... Cent. Shops
Karl R. Pond ..... Fiscal
Michael Tartakovsky ..... Accel. Dev.

Departures

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

Richard N. Hill ..... Con. & Proc.
Sherie Michaile ..... Medical
Daniel J. Monastero ..... NSLS
Gary S. Perri ..... NSLS
Karl Sieradzki ..... DAS

Volleyball

Standings as of January 18

League I	
Upfagrabs	26-4
Dinkers	22-8
Xrayted	17-13
Cannonballs	10-20
Phoubars	10-20
Bumpers	5-25
League II	
Nuts & Bolts	20-7
Set-Ups	17-7
Fossils	16-11
Chunga's Revenge	15-12
Slammers	13-14
Photons	5-19
Upton Ups	4-20
League III	
Printouts	20-7
Sourcerers	20-7
Spikes	16-11
Screwballs	15-12
Renegades	15-12
MISfits	13-14
Airheads	7-20
Good Times	2-25
Open League	
Dakota	22-2
Phoenix	18-6
Serendipity	16-8
Not Too Bad	9-15
Rowdy Radicals	7-14
Duituits	5-19
Leftovers	4-17

Basketball

Games of January 21

First Game

Penetrators	**47**	**Hollywood**	**46**
J. Cyr	14	B. Gunther	10
T. Comstock	13	E. Meier	9
R. Garappolo	8	G. Mack	8
T. Abbott	8	B. Turner	6
L. Jacks	2	S. Boyson	6
F. Johnson	2	D. Nordstrum	3
		E. Taylor	2
		B. Kowalski	2

Three-point shots: Abbott, Comstock, Garappolo (2)

Second Game

Knicks	**49**	**Longshots**	**25**
W. Cummings	16	F. Thompson	10
Q. Harrison	12	J. Garrison	6
T. Mendez	6	F. Malone	5
T. McGill	6	T. Mayo	2
M. Williams	5	M. Tardd	2
G. Thompson	4		

Three-point shots: Cummings, Garrison (2)

Third Game

Runaways	**71**	**Celtics**	**74**
T. James	20	O. Aliefendioglu	26
S. Gilbert	17	P. Browne	14
P. Johnson	11	C. Edwards	10
R. Moran	9	P. Ratzke	8
J. Desmond	7	M. Fulkerson	6
G. Shepherd	5	N. Schaknowski	4
A. Stillman	2	M. Colon	3
		J. Gaeta	3

Three-point shots: Aliefendioglu (5), Gilbert, James (2)

Bowling

Red/Green League

High games were bowled by L. Jacobson 236, J. Connelly 226, R. Mulderig 212, H. Marshall 209, S. Dimaiuta 208/203, M. Guacci 207, J. Petro 207, C. Scarlett 204, R. Jones 202, E. Gill 202, L. Schairer 201.

Purple League

Tom Sperry rolled a 223, Gil Spira 207, Bob Jones 205, Buzz Jacobs 202, Dick Adams 200, Ed Meier 200, Sharon Smith 180. Fern Coyle converted the 6/7 split.

White League

Sandy Asselta bowled a 201/185, Ed Sperry IV 215, Karen Vogel 198.

Cafeteria Menu

Week of February 1

Monday, February 1

Chicken noodle soup	(cup)	.75
	(bowl)	.95
Broccoli & cheddar quiche w/1 veg. (lite-weight)		2.85
Spaghetti w/meat sauce & garlic toast		2.95
Hot deli: Pastrami	(bread)	2.75
	(roll)	2.85
	(hero)	2.95

Tuesday, February 2

Garden vegetable soup	(cup)	.75
	(bowl)	.95
Savory baked chicken w/1 veg.		2.95
Skinless baked chicken w/1 veg. (lite-weight)		2.95
Beef ragout burgundy over noodles		3.05
Hot deli: Chicken patty sandwich on a bun		2.85

Wednesday, February 3

Northern bean soup	(cup)	.75
	(bowl)	.95
Baked stuffed pork chop w/1 veg.		3.05
Taco	(each)	.95
Stuffed tomato salad plate (lite-weight)		2.25
Hot deli: Roast breast of turkey	(bread)	2.75
	(roll)	2.85
	(hero)	2.95

Thursday, February 4

Minestrone	(cup)	.75
	(bowl)	.95
Baked meat loaf w/gravy & 1 veg.		2.95
Fettuccine carbonara w/1 veg.		2.85
Seasonal fruit plate (lite-weight)		2.75
Hot deli: Grilled Reuben sandwich		2.95

Friday, February 5

New England clam chowder	(cup)	.75
	(bowl)	.95
Pasta primavera w/garlic toast		2.85
Baked filet of fish w/1 veg. (lite-weight)		2.95
Fried fisherman's platter — fish, clams, calamari & french fries		3.50
Hot deli: Fishwich on a bun		2.95

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 information on all non-scientific staff positions; second, to give employees an opportunity to request consideration for themselves through Personnel; and, finally, for general recruiting purposes. Because of the priority preference policy stated above, each listing does not necessarily represent an opportunity for all candidates. As a guide to readers, the listings are grouped according to the anticipated area of recruitment.

Except when operational needs require otherwise, positions will remain open for one week following publication date.

For further information regarding a placement listing, contact the Employment Manager, Ext. 2882.

SCIENTIFIC POSITION OPEN: The following staff position is open. Candidates may apply directly to the department representative named or through the Office of Scientific Personnel, Ext. 7813.

HIGH ENERGY PHYSICS SAFETY PROGRAMS - Position available in the Alternating Gradient Synchrotron Department for an individual to be responsible for the proper development and maintenance of departmental safety programs in the accelerator and experimental areas. Physics/engineering background is necessary. Contact: D.I. Lowenstein, Chairman.

LABORATORY RECRUITMENT - Opportunities for Laboratory employees only.

2778. CRAFT APPRENTICE - CABINETMAKER - Participates in a formal, four-year training program during which time the apprentice receives on-the-job instructions and enrolls in outside study programs in subjects related and supplementary to the apprentice's occupation. At the successful completion of the four-year program, the apprentice will be graduated to the position of Cabinetmaker. The position description for Cabinetmaker is as follows:

> Under minimum supervision lays out, constructs, modifies and maintains furniture, laboratory equipment and buildings and component parts. Works with wood, wood substitutes and combination materials and flooring, roofing and wall materials. Uses hand, portable and fixed tools common to building construction and cabinet making trade. Works from prints, rough sketches and verbal instructions. Requires broad shop skills to perform difficult operations requiring ingenuity on complex jobs where previous standards or methods of operation do not offer complete solution. May perform Carpenter duties as required.

2779. CRAFT APPRENTICE - MACHINIST (2 positions) - Participate in a formal, four-year training program during which time the apprentices receive on-the-job instructions and enroll in outside study programs in subjects related and supplementary to their occupations. At the successful completion of the four-year program, the apprentices will be graduated to the position of Experimental Machinist. The position description for Experimental Machinist is as follows:

> Works on various materials from prints, sketches, or verbal instrucitons. Sets up and operates machine tools and also performs benchwork on jobs where standards of operation may require unique application. Performs layout, preparation, measurement, setup, assembly and installation. Makes own tools, performs maintenance incidental to operation of machines, and may specialize.

2780. CRAFT APPRENTICE - PLUMBER - Participates in a formal, four-year training program during which time the apprentice receives on-the-job instructions and enrolls in outside study programs in subjects related and supplementary to the apprentice's occupation. At the successful completion of the four-year program, the apprentice will be graduated to the position of Plumber. The position description for Plumber is as follows:

> Under minimum supervision lays out, constructs or installs, repairs, and maintains water and gas distribution systems, related facilities and auxiliary equipment, and equipment utilizing water, gas and heat distribution services.

2781. CRAFT APPRENTICE - STEAMFITTER (2 positions) - Participate in a formal, four-year training program during which time the apprentices receive on-the-job instructions and enroll in outside study programs in subjects related and supplementary to their occupations. At the successful completion of the four-year program, the apprentices will be graduated to the position of Steamfitter. The position description for Steamfitter is as follows:

> Under minimum supervision lays out, constructs, or installs, repairs and maintains heat, steam and water distribution systems, related facilities and auxiliary equipment and piping and equipment utilizing heat, steam and water distribution services.

NOTE: Those employees who applied for Craft Apprentice positions in March 1987, can reactivate their applications by calling Ext. 2882. All other interested employees may obtain applications from the Personnel Division, Building 185.

2782. OFFICE SERVICES POSITION - Requires two to three years' experience in an office setting, good typing and good communications skills. Will assist Department administrative group performing diverse duties specific to that group. Prior experience with computer terminal usage is desirable. Physics Department. (Reposting of Job #2679).

2783. OFFICE SERVICES POSITION - Will provide clerical/administrative support in all phases of Housing Office functions. Responsibilities will include arranging housing reservations for large groups of visitors, data entry, typing invoices, setting accounts and filing. Staff Services Division.

2784. OFFICE SERVICES POSITION - Requires AAS or equivalent experience, accurate typing skills and a demonstrated ability to perform detailed work. Responsibilities will include processing library materials, maintaining stacks, locating materials for library users and data entry. Previous library experience helpful. Technical Information Division (Reposting of Job #2765).

OPEN RECRUITMENT - Opportunities for Laboratory employees and outside applicants.

2785. DESIGNER POSITIONS (2) - Requires a minimum of ten years' experience in mechanical drafting/design. Must be able to perform professional level design functions and have a basic knowledge of engineering fundamentals, machine design and machine shop procedures. An understanding of MIL-STD-100 and ANST Y14.5-1982 is required. CADD experience helpful. Accelerator Development Department.

2786. MANAGER, SAFEGUARDS AND SECURITY AUDIT - Requires a bachelor's degree or equivalent experience, and a broad and extensive background in various safeguards and security functions. These functions include nuclear material control and accountability; physical, personnel, information, operations and computer security; protective force training and exercises; and emergency management of security forces. Additional requirements include at least five years' management experience in a safeguards and security environment and an ability to obtain a DOE "Q" clearance. Will be responsible for establishing and administering audit and QA programs for the Division. Safeguards and Security Division.

Motor Vehicles & Supplies

76 RABBIT - new battery, new clutch, you install, $100; 77 Dasher, runs, some damage. 698-7983.

84 HONDA CIVIC 1500 SPORT - hatchback, expertly maintained, highway miles, $2,800. 821-0622.

81 CHEVY CHEVETTE - new brakes, exhaust, clutch, no rust, am/fm cass., sunroof. Mark, Ext. 4132 or 924-4328.

77 PINTO WAGON - hatchback, 4 speed, cruise, brand-new engine head, good cond., 821-0990 after 5 p.m. or wknds.

81 DODGE OMNI 024 - p/s, p/b, a/t, a/c, am/fm cass., new tires & muffler, 80k+ mi., $1,500. 874-3796.

CYLINDER HEADS - reconditioned for VW Bug, Weber carb. & assorted studs, all for $100. Fred, Ext. 4407 or 4435.

RALLY SPORT RIMS - 14", $10/each; 86 Toyota MR2, white, a/t, fully loaded, 26k highway mi., must sell. 744-0725.

81 CAPRI - a/t, a/c, new tires, clean, $2,000. Ext. 3147 or 924-1038.

79 HONDA CIVIC - 4 speed, good gas mileage, runs well, asking $850. 732-8216.

72 BLAZER - 350 engine, 4wd, new tires & rims, needs clutch, $650 neg. Stan, 589-4792.

81 COUGAR XR-7 - 305 V8, new engine, exhaust, tires, p/s, p/b, a/c, more, excel., $4,000. Ellen, Ext. 2816.

82 FIREBIRD - fully loaded, mint cond., $7,000. 369-5824 after 5:30 p.m.

77 HONDA ACCORD - a/t, a/c, runs well, new brakes, exhaust, good tires, excel. in/out. 758-5582 eves.

80 MAZDA 626 - 5 speed, am/fm, new tires, good cond., $1,000. 281-5565.

76 JEEP CJ-7 RENEGADE - a/t, p/s, new soft top, many new parts, runs well, $2,700. Ext. 4142 or 345-3915 eves.

75 DODGE COLT - red, runs well, new brakes, great transportation, best offer. Ext. 4006.

79 OLDS DELTA 88 - full power, loaded, excel. cond., $1,500. 395-1554 after 7:30 p.m. & wknds.

79 MONTE CARLO - light blue, T-tops, 8 cyl., 89k mi., a/c, p/s, p/b, new tires, $2,800. Ann, Ext. 3406.

79 THUNDERBIRD - black, 88k mi., am/fm cass., a/t, full power, good cond., $1,300. Jerry, Ext. 7427 or 475-5591.

SLIDE-ON CAMPER - 11', self-contained, hot water, refrig., oven, shower, toilet, king-size bed, $2,000. Ext. 4142.

82 NISSAN STANZA - hatchback, 4 dr., a/t, a/c, am/fm stereo, new cab, brakes, battery, tires, mint cond., asking $2,800. Ext. 2349 or 3070 eves.

82 FORD ESCORT - 4 speed, 88k mi., am/fm cass., new clutch, good cond., $1,000. Ext. 4023 or 929-3721.

TIRE - w/w, radial, 195/75/14 on rim, new, $35; 4 Tiempo tires, all-weather, 195/75/14 on sport rims, new, $65/each. Ron, Ext. 4028 or 669-5428.

82 DATSUN 200SX - 5 speed, a/c, SL pkg., 99k mi., excel. cond., asking $2,800. John, Ext. 7770 or 4480.

Boats & Marine Supplies

22' SEAFARER SAILBOAT - 1974, 3 sails, Volvo outboard, full keel, asking $4,000. Fred, Ext. 4407/4435 or 499-1214.

7' DINGY - Eli Tri hull, 2 seasons old, orig. $450., asking $250. 821-1525.

Miscellaneous

COAL/WOOD BURNING STOVE - Wellington, $100. Ext. 3147.

WEIGHT BENCH - Marcy Monster, year old, orig. $110, asking $75; walk/run treadmill exerciser, orig. $280, asking $100. G.T., Ext. 2198 or 744-4662.

HEADBOARD - footboard & rails, twin, $35; end tables, 26" round, 20x28 rectangle, $25 ea.; cordless phone, $25; percolator, $5. Jim, Ext. 7669.

HUMIDIFIER - Edison woodgrain console, 4 gal., $30; kitchen set, table w/leaf, 3 chairs, $30. Tony, 698-9274.

KEROSENE HEATER - 9400 Btu, good cond., w/5 gal. can of fuel, $65; wood screens & storms, 14 ea., good cond., $50. Ext. 3794.

SKIS - boots, poles, man's size 8½, $100. Augie, Ext. 3884.

FRANKLIN STOVE - hopper for coal stove, used once, asking $60. 689-9234.

PC JR. - with or without accessories, extra memory, hard disk interface, more, low price. 331-2298 eves.

COMPUTER GAME - Atari 2600, 22 cartridges incl., $70. Dan, Ext. 4605.

GENERATOR - Sears, portable, 1350 watts, excel. cond., $300. Joe, Ext. 2898.

CEMENT BLOCKS - pool, coping, 20x40, cheap. 728-8771.

FIREPLACE - free standing, black, open front w/screen, $75. Bert, Ext. 2050.

STEREO TAPE DECK - Wollensak, 7" reel-to-reel, $50. Al, Ext. 5128.

BIKE - 10 speed, front rim bent, rest in great cond., $25 firm. Billy, 286-0243 after 4 p.m.

Send a Love Note To Your Valentine

Is there a special message you'd like to send to your valentine next month? If you can keep it short and sweet, you can have your Valentine's Day message printed in the Bulletin on February 12. Send your 15- to 20-word "love note" to the Bulletin, Bldg. 134, by Wednesday, February 3, on an ordinary Bulletin classified ad form, marked "Valentine's Day." You must sign your name and include your life number and extension, but your name will not be printed unless it is clearly part of the message. Copy must be deemed tasteful, and all "love notes" will be accepted at the Bulletin's discretion. Only one message per employee, please.

PARACHUTE - manufactured by Strong, 26', new $865, sell for $595. Ext. 5400 or 878-6098.

SLED - $3.50; playpen, like new, $15; 6 qt. pressure cooker, $10; sewerage hand-snake, $30; butcher's scale, $20. 878-6637.

BABY BASSINET - stained hardwood on wheels, $20. 878-1698.

WOOD/COAL STOVE - Godin, small, oval, mint cond., asking $350. 286-0237.

SKIS - 2 pr., Hart 160, Tyrolia bindings, Caber boots, 8½, $130; Hart 170, boots, 10, $70. 744-9812.

SOFA/LOVESEAT - beige-brown earth tone plaid, excel. cond., $250. 473-7667.

TAPE DECK - Tandberg 9000, w/30 tapes, $150. Augie, Ext. 3884.

BEDROOM SETS - Colonial & contemporary, double bed w/hdbd. & dresser, one w/nightstand, one w/armoire, $150/ea., $250/both. 471-2370.

SKI POLES - Scott, 46", fluorescent, $15. Ext. 7727.

BABY COMBO STROLLER - high chair, rocker, car seat. $100. 878-1698.

FIREWOOD - split, seasoned, hardwoods, pick-up near Lab, small or large amounts, $125 /full cord. Tom, Ext. 4084 or 878-1060.

TOOLS - 10" Craftsman table saw, low hours, ball bearing motor, $275; floor standing scroll saw, $75. Ext. 4142.

FURNITURE - 3-piece living room set, black/green plaid, $250; book/stereo shelf unit, $100. Sue, 289-7218.

MODEM - 2400 baud, 100% Hayes comp. external speaker, 2 jacks, cable, mint, $200 firm. Chris, 878-2421.

TYPEWRITER - Smith & Corona, manual, good cond., $25. Bill, 924-1346.

Car Pools

STONY BROOK VAN - needs riders, call for details. Sid, Ext. 4125 or Paul, Ext. 2476.

Lost & Found

FOUND - gold earring, pierced ear, bamboo design, sidewalk rear of post office. Grace Searles, Ext. 4464.

Real Estate

Real Estate advertised for sale or rent is available without regard for the race, color, creed, sex or national origin of the applicant.

For Rent

YAPHANK - small 3 rm. bungalow, single preferred, $400/incl. elect. 924-3946.

SOUND BEACH - 1 bdrm. apt., kitchen, living/dining rm. combo, w/w, full bath, closets, storage, priv. ent., 2 mos. sec., ref. 744-0725 eves.

HILTON HEAD, SC - 2 bdrm. condo, sleeps 6, beach, pool, golf, tennis, Feb. & Mar., $320/wk. 585-9149.

CENTER MORICHES - 3 bdrm., l/r w/fp, kitchen, sunroom, beautiful view of bay, boat ramp, $900/mo. Ext. 5277 or 549-5802 eves.

STONY BROOK - rm. w/priv. bath, use of kitchen, quiet house, non-smoker. 862-7998.

CATSKILLS - 3 bdrm. chalet w/sleeping loft, fully furn., great skiing, near Hunter & Windham Mtns. Bea, Ext. 3642 or Kay, Ext. 4501.

STONY BROOK - house to share, must like cats, no additional pets, $315 + ⅓ util. Ext. 2027.

For Sale

MIDDLE ISLAND - new 1 (possible two) bdrm. condo, 2 baths, 5 appl., w/w, cent. a/c, view of pond, 5 min. to Lab, $108,500. Ext. 2746 or 924-3729.

SHAWNEE - on Delaware, timesharing wk., 3rd wk. in Jan., sleeps 8, $6,900. Jim Pontieri, 589-1893 after 5 p.m.

MANORVILLE - 1 acre, 175x230, all wooded, off Eastport Manor Rd., $77,000. 821-3955.

MASTIC - 3 bdrm. country ranch, 2 baths, eik, 2-car garage, fenced, priv., 120'x200' lot, public water, $124,000. 281-2002.

MIDDLE ISLAND - 1 bdrm. co-op, corner unit, gas heat/cooking, cent. a/c, pool, tennis, 5½ mi. from Lab, $65,000. 924-6104.

MANORVILLE - lovely 3 bdrm. ranch, on quiet cul-de-sac, 1½ baths, mint cond., 1+ acre, immed. occupancy, excel. neighborhood, South Manor schools, $145,000. Ext. 5400 or 878-6098.

ROCKLEDGE, FL - block & stucco, 2 bdrm., 2 baths, d/r, kitchen, l/r, family rm., 12x25 combination porch, excel. location, $64,500. 305-631-2840.

SETAUKET - north of 25A, hilltop setting, private, 3 bdrm. ranch, 2 baths, open l/r, f/p in den, 2 car garage, patio, beautiful landscaping, asking $242,000. Ext. 7560 or 689-7494.

HILTON HEAD, SC - 3 bdrm. condo, sleeps 8, 2 baths, washer/dryer, wet bar, 6 tennis courts, whirlpool, 3 swimming pools, golf, ocean view, asking $89,000, will rent. 929-8912.

Wanted

ROOMMATE - to share apt., Mid-Island, 2 bdrm., male/female, 8 mins. to Lab, $400/mo. Ext. 3217.

INFANTS - 3 mo. old for Ph.D. study of infant memory, involves pleasant play task in your home. Ext. 3372 or 929-6495.

WEIGHTS - & bench. Liz, Ext. 2346.

SHARE BOARD - Western riding horse, $115/mo. Ext. 3147.

SINGER - bass or tenor to sing with on-site octet. Janet, Ext. 2345.

TRAINS - Lionel, American Flyer, accessories, any cond. brings good price. Carole, Ext. 7100 or 924-4097 eves.

AIR COMPRESSOR - 2 h.p., prefer 10 gal. tank. 878-1698.

VACUUM - upright & electric broom. Ext. 4144.

Classified Ad Policy Deadline is 4:30 p.m. Friday for publication Friday of the next week.