

## From Sawdust to Ethylene — A Flashy Process for Making Chemicals

Two thousand tons of Douglas fir sawdust can be converted to 268 tons of ethylene, 130 barrels of BTX (benzene, toluene and xylene), 3100 barrels of methanol, and char. The process is called flash pyrolysis of biomass. And it will be used primarily to supplement the production of transportation fuels and chemical feedstocks, currently being refined from crude oil.

Wood consists of cellulose, hemicellulose and lignin, which are extremely long chains of carbon atoms. When wood particles are placed into a gaseous environment of high temperature (800-1050°C) and pressure (50-500 pounds per square inch) and short residence time (0.5-4 seconds), carbon monoxide, hydrogen, and hydrocarbons, such as ethylene and BTX, are formed. Polyethylene and other plastics are synthesized from ethylene, benzene is a component of gasoline, and BTX and methanol, which is synthesized from carbon monoxide and hydrogen, are used to synthesize various chemicals.

Meyer Steinberg, Peter Fallon, Muthu Sundarum and Jim Hurley of the Process Sciences Division, with a grant from the Solar Conservation Office of DOE, developed the flash pyrolysis process seven years ago, initially to convert coal to benzene, ethane, and methane (natural gas). Coal is still fed through the 20-foot high down-flow tubular reactor. Wood, however, is more advantageous because as biomass, it is less complex

and contains less ash, thereby being more reactive. Douglas fir is used because of its abundance and availability.

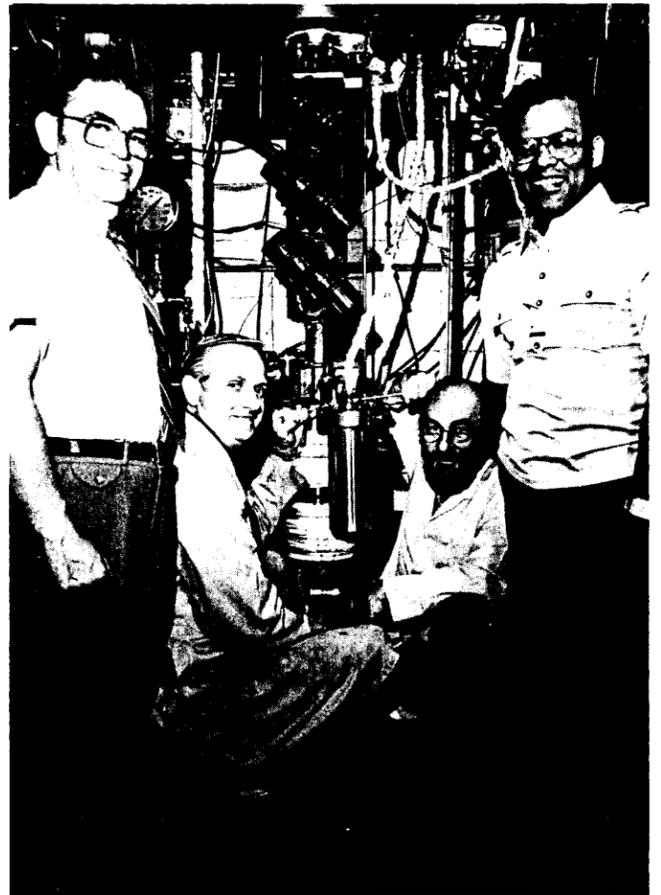
"There is a possibility of getting one-hundred million barrels of fuel oil equivalent from sixty million tons of wood products every year," says Steinberg. "And a large part of the wood would be waste from the paper industry which now generates most of its energy from wood waste material."

The process has been supported because it produces less pollution compared to the combustion of coal, crude oil will probably increase in price and decrease in amount, and it emits carbon dioxide which is needed by the photosynthetic pathway of plants to produce more biomass. The process is therefore recyclable, unlike the refining of fossil fuels which also emits carbon dioxide, worsening the global heating effect.

Basic studies of flash pyrolysis reactions have been made. Because helium is non-reactive, it is used primarily as a control and has been chosen to determine whether its thermal and diffusional properties influence the yields of gaseous and liquid hydrocarbons. Hydrogen and methane are reactive gases which are readily available and are used and recycled in the flash hydrolysis and flash methanolysis processes, respectively.

Oven-dried saw-dust (0.3 to 1 mm), mixed with fumed silicon dioxide to reduce agglomeration between heated wood particles, is fed by gravity into

From left, Meyer Steinberg, Jim Hurley, Peter Fallon and Muthu Sundarum at the down-flow tubular reactor in Bldg. 526. The reactor is designed for the flash pyrolysis of biomass, a process used primarily to convert Douglas fir sawdust to transportation fuels and chemical feedstocks, which are currently being refined from crude oil.



Roger R. Stoutenburgh

the reactor. Within three to four minutes, a steady temperature within the four reaction zones is achieved with four clam shell heaters. A process gas, preheated in an electrical resistance tube, simultaneously enters the reac-

tor whose temperature is controlled by four independent thermocouples and is monitored by eight others in the reactor zones.

A finned tube cooler, located at the  
(Continued on page 3)

## Task Forces Take on Accelerator Issues

New directions for the Accelerator and Physics Departments were indicated by Associate Director Paul Reardon at the July 13 meeting at Berkner Hall, held shortly after the High Energy Physics Advisory Panel (HEPAP) recommended discontinuing construction of BNL's colliding beam accelerator (CBA) and beginning a broad-based national effort to construct a superconducting super collider (SSC). Expanding on this idea, last week Reardon announced the formation of several task forces which will address three major issues: improvements to the Alternating Gradient Synchrotron (AGS), the concept of a heavy ion collider, and research and development for the SSC.

### AGS Improvements

Derek Lowenstein and Horst Foelsche will head AGS improvement studies. AGS intensity is now  $1 \times 10^{13}$  protons per pulse; the task force will investigate means of bringing that to  $2 \times 10^{13}$ , as well as study the later addition of a booster synchrotron injector to further increase intensity to  $10^{14}$  protons per pulse. Also, the AGS is now being modified to circulate polarized protons at the rate of  $3 \times 10^{10}$  protons per pulse starting next year. A development program headed by Theo Sluyters will be started to increase the intensity of polarized proton ion sources by a factor of 100. The AGS task force will also consider the addition of an accumulator ring to increase polarized proton intensity by another factor of ten. Reardon said, "Preliminary proposals on these AGS improvement projects will be available by the end of this fiscal year."

### Heavy Ion Collider

Mark Barton and Harald Hahn will head a task force assigned to develop a proposal for a heavy ion collider to fit into the CBA tunnel. A second task force, joining nuclear and high energy physics and headed by Arthur Schwarzschild and Tom Ludlam, will define the needs for heavy ion nuclear and high energy physics experiments and associated detector requirements. As yet unformed is a third group — a joint AGS/Tandem effort — which will consider injection and acceleration of heavy ions in the AGS from the Tandem Van de Graaff accelerator

"through a tunnel we hope to construct in 1984," Reardon said.

### R&D for SSC

A task force led by Ernest Courant will develop the machine requirements for a 10-20 TeV collider. And Associate Director Robert Palmer's group will work on superconducting magnets based on the 2-in-1 magnet design pioneered at BNL. CBA's present magnets, which reach magnetic fields just over 5 Tesla, are about five meters long, with a niobium-titanium superconductor around a five-inch aperture. But to reduce the cost for a 10-20 TeV  
(Continued on page 3)



Mort Rosen

At a meeting last week in Bldg. 911, Robert Palmer shared his ideas about magnets for a superconducting super collider with members of the Physics and Accelerator Departments.

## NSLS Phase II Gets Go Ahead

The first sum of money for NSLS Phase II, a three-year project to expand the National Synchrotron Light Source, has been appropriated by Congress and approved by President Reagan. According to Associate Director Martin Blume, \$2.5 million has been granted for fiscal year '84, with a commitment of more funds to follow the next two years. The total budget for the project is \$19.7 million.

Jules Godel has been named project manager of Phase II, and a team has been assembled under him to see to the project's completion on schedule and within budget.

Experiments have been underway for a year at the ultraviolet ring, which is the brightest source in the world in its spectral range. The x-ray ring is expected to be delivering photons to users in the fall. "Space at the rings is already oversubscribed by the scientific community," says Godel. "There is a clear need for new experimental beam lines and a building expansion to accommodate users and our staff."

Half of the \$19.7 million budgeted for the project will be used to expand the present structure by adding laboratories, offices, work areas and experimental support space for both rings.

The rest of the money will be spent on six highly advanced experimental beam lines, five of which will incorporate devices called "wigglers" and "undulators." These magnetic devices significantly increase the intensity or shift the frequency of the photon beam.

# He's Been Working On The Railroad!

They were called iron horses, big black machines belching smoke across the vastness of America, connecting people and places with miles of track. For a hundred years, steam locomotives helped settle and build this country.

Then in the 1950s, facing increased competition from highway transport, railroad companies began phasing out steam locomotives in favor of more efficient engines powered by cheaper diesel fuel. By 1960 only a handful of steamers were in regular operation.

Today, the closest people can come to a live steamer on Long Island is to pay a visit to South Haven Park, where steam locomotives take passengers on a half mile trip through the woods. The only difference between these locomotives and the original ones is that they stand knee-high.

**WHEEE-WHEEEEEEEEEEEEEEE!  
CHOOOO-CHOOO-CHOO-CHOO...**

Blue Point blows its whistle and slowly pulls out of the loading area, a full passenger car in tow. Southern Pacific is off on a siding, its owner tinkering with the engine.

IR.D. Verhoop is ready to go. Its builder, BNL's Tom Oversluizen, hitches on a flat car, then a passenger car. He fills the boiler with water, lowers himself onto the flat car and backs up to the loading area. While people clamber on, he checks his steam pressure and stokes the coals in the boiler's firebox. Then he blows the whistle and opens the throttle. IR.D. Verhoop quickly gathers speed, reaching about ten miles an hour.

Up ahead, a track crew signals. "Go

slow. Blue Point just derailed here." "Weekend vandalism," mutters Oversluizen. The train passes over the fix slowly but smoothly and picks up speed again.

There is a rhythm to steamers: poke at the fire, shake out the ashes, shovel in more coal, check the water and pressure gauges, let in more water. Oversluizen is both fireman and engineer.

Back at the loading area, new passengers get on. A man and his son grab seats right behind Oversluizen. In spite of the smoke and cinders, the man wears a grin all around the track. At the end of the ride, the boy scrambles off and the man reluctantly gives up his seat. "This is a part of America you don't see anymore," he says wistfully.

Actually, Oversluizen's train is a Dutch tram. Steam locomotion in Europe met the same fate as it did in the U.S. Dutch-born Oversluizen remembers steamers and can recall riding one. He has always been fascinated with steam, and by extension, nostalgic about steam locomotives.

"Steam means noise, smoke, smell, moving parts," he says. "You can stare at the back of a radio as long as you want and see nothing. Electricity is dead. Steam is alive!"

His first steam engine, a Dutch tanker, took him ten years to build. His second, the Dutch tram, took six years. He is now working on his third, an American Atlantic, and figures four years for that one.

The locomotives are built from scratch, based on notes Oversluizen has gathered at libraries where engi-

neering records can be found. After spending long hours in careful research, he spends considerably more hours in his basement machine shop, the organ music of J.S. Bach his only company.

He estimates that a locomotive takes anywhere from four thousand to six thousand hours to build. Every engine and body part must be made. For this precision work, Oversluizen's skill has been finely honed over the years. He started building models as a child and today designs one-of-a-kind experimental equipment for the National Synchrotron Light Source.

Oversluizen has a special fondness for the Dutch tram. It has a unique steam valve gear which was devised for small engines, and his locomotive is named after the designer of the gear.

Except for size, IR.D. Verhoop is a replica of the real thing. The originals were used for short hauls and could be operated by an engineer without the aid of a fireman. They were small — weighing 20 tons as compared with

the 200 tons of mainline passenger engines. The entire engine was capped over in an attempt to make it less frightening to horses.

At South Haven, Oversluizen and the other train builders can show off their work to park visitors. The builders belong to the Long Island Live Steamers club, which was founded in 1966. The club meets at the park every Sunday to work on the tracks. On the second and last Sundays of the month, May through October, park visitors may take rides on the trains. This weekend, both days, the club is having a summer meet, when all members make it a point to be there with their trains.

"People enjoy the rides, of course, and club members are happy to answer any questions," says Oversluizen. "Young people today don't know much about steam engines, and the old-timers have only their memories. The locomotives we build are a way of recreating some of the history for everyone."

— Mona S. Rowe



—photos by Reben



## Employee Charges Battery Abuse

For a long time, Paul Zahra has felt that most employees don't know how to properly maintain the nickel-cadmium (ni-cad) batteries used in calculators, pocket pagers and other instruments. Now, as a result of a training program which helps em-

ployees create projects aimed at reducing resource loss at the Lab, Zahra, a senior technician with the Safety & Environmental Protection Division, has mounted what he calls an "awareness campaign" to stem abuse of rechargeable batteries.

As Zahra explains it, the problem is one of too much of a good thing — people tend to overcharge equipment powered by ni-cad batteries. For example, calculators lie plugged into chargers indefinitely, without ever being used on battery power — even though most manufacturers suggest portable usage to prolong battery life. When a pocket pager is not in use, it can usually be found in a charger, even though one overnight charge will power it all week. And many other portable instruments designed to be charged by line power and used on battery power are operated solely from line power.

Such misuse costs the Laboratory because batteries and/or chargers must be replaced more often. Zahra's goal is to educate employees on the proper use of ni-cad batteries to achieve at least 80% cooperation and a cost saving estimated at about \$5,000 each year. Towards that end, he has prepared a list of tips for battery care (see box). In addition, he has arranged for the Supply & Materiel Division to issue an instructional notice, briefly outlining proper main-

tenance procedures, with every new ni-cad battery, battery pack or calculator.

The training program which enabled Zahra to address his pet peeve is Resources Management. Personnel offers this program twice a year to all regular employees who would like to learn the skills needed to continually develop feasible ideas for cost savings. And the Employee Suggestion System now offers employees who have participated in the Resources Management program an ongoing mechanism through which to channel their ideas to management and gain the appropriate recognition.

That's what Zahra did. He wrote and submitted a suggestion, based on the project he did for the program. That suggestion has been approved for an award, with the amount still to be determined.

Cory Ince, who runs both the suggestion system and the training program, said, "The program offers non-monetary benefits to employees too, since they learn how to look at their work areas more effectively." Any employee interested in attending the next session of Resources Management, scheduled for the fall, should have his or her supervisor contact Ince at Ext. 7994.

### Tips on Ni-cad Batteries

**Do**

- 1) Use a calculator almost exclusively on battery power. Use a.c. only for important calculations or during charge periods.
- 2) Charge calculator batteries for no more than 14 hours.
- 3) Charge pocket pager and spare battery for no more than 14 hours. A pocket pager will operate for 40 hours without needing another charge. Charging once a week is usually sufficient.

**Don't**

- 1) Leave calculator plugged into powerline all the time.
- 2) Put calculator on charge unless battery is low. Most calculators have low battery indicators.
- 3) Leave pocket pager in its charger for an extended period.

Generally, these procedures apply to any instrument using nickel-cadmium batteries. The rule-of-thumb is to charge the batteries for no more than an overnight period and only when a low battery level is indicated by the equipment.



Mort Rosen

Georgia Irving watches Paul Zahra check the terminal wall on a nickel-cadmium battery. As a support person in the spring session of the Resources Management training program, Irving, who works on property management for the Director's Office, helped Zahra organize his ideas and present them to upper management.

# BROOKHAVEN BULLETIN

Published weekly for the employees of BROOKHAVEN NATIONAL LABORATORY

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## Flash Pyrolysis (Cont'd)

reactor's base, cools the products to below 300°C. Char and ash separate out. A water condenser removes heavy oils; a refrigerator condenser, lighter materials; and a reducing pressure valve, the remaining gas.

Analysis of a 60 to 75 minute run (the reactor is operational two or three times weekly, four hours each time) is done via a gas chromatograph attached to various sample tubes along the reactor's length, corresponding to different wood residence times. Thus, the gas concentrations can be determined, and along with the total gas amount, the percent conversion of carbon can be calculated. Ninety-eight percent conversion has been achieved in hydrolysis of Douglas fir.

"Our primary goal is to provide a data base for flash pyrolysis, methanolysis and hydrolysis so people know the levels of what valuable gases and liquids are produced under different process conditions," says Steinberg. "It should take another year or two to complete the experiments."

—Steve Eisenberg

## Task Forces (Cont'd)

accelerator, the task force will develop a higher field, 8 Tesla, using a new superconducting material, niobium-3-tin. The magnets will have a tiny one-inch bore and will be about 15 meters long. Palmer had previously considered such a design for a "Sandatron," a version of an SSC that would be located on Long Island. "We must transfer our skill and as rapidly as possible go into something that would be useful for this new accelerator," he said last week, "...so I propose that we go extremely fast on the prototype, using the Sandatron design and CBA's expertise, factory and staff."

Of this third issue, Reardon said, "It is expected that formal proposals from both task forces will be available for submission to DOE by the end of the fiscal year so BNL can participate with other labs in the national R&D effort to resolve critical SSC issues."

Besides this three-pronged program, "Considerable effort will be expended on responsible completion of CBA R&D activities, including acceptance testing of the large refrigerator system that is now being installed," Reardon said, adding, "all in all, we are still very busy."

— Anita Cohen

## Reminders

- African Art Show & Sale  
Saturday, July 30, Room A Berkner Hall, 2-6 p.m. Sponsored by the Afro-American Culture Club. Wine and cheese will be served. All items on display imported from African countries.
- Art Show — Prints by Fairfield Porter  
Weekdays through Friday, August 5, Room B Berkner Hall, 11:30 a.m.—1:30 p.m.
- T-Shirts on Sale  
Until Friday, August 5, from Renee Flack, Bldg. 460, Ext. 3316. Blue with white logo, "Brookhaven National Laboratory, Summer 83," \$5 each.

## Hospitality News

The Hospitality Committee's next monthly morning get-together will be held Tuesday, August 2, from 9:30 to 11:30 a.m. at the Brookhaven Center. Georgia Schwender, a photographer, will be the guest speaker.

Ms. Schwender, who attended the Art Institute of Boston and whose work has been exhibited in New York City, Long Island, and Boston, will give an informative talk on the correct way to use a camera to achieve the best results.

All wives of Laboratory employees, guests, and visitors are welcome. Coffee, tea and danish will be served.

Please come and bring the children. Babysitting will be provided free of charge.

## Arrivals & Departures

### Arrivals

None

### Departures

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

Michele M. Henderson . . . . . Chemistry  
Peter J. Schultz . . . . . Physics

## Safety Shoes

The safety shoe store in Bldg. T88 will be closed for the week of August 8-12, and no shoes will be issued then. The store will reopen August 15 at 12:30 p.m.

## Softball

### Scores for week of July 18:

League I	
All games rained out.	
League II	
Titans 18 — Light Source 7	
Magnuts 5 — Medical 3	
Dirty Sox 16 — Random Errors 9	
Roga 7 — Lights Out 5	
Roga won this one in extra innings.	
League III	
Survivors 23 — No Names 1	
E-Z Riders 15 — Mole-Esters 3	
Nads 6 — TNT 5	
League IV	
The Source 18 — Who's On First 9	
Random Sample (won) — Septembers (forfeit)	
Mudville Sluggers (won) — Who Cares (forfeit)	
Turkeys 8 — Spacekadets 7	
No Feedback 16 — Underalls 4	

### Standings at end of first half:

	League I		Post-poned
	Won	Lost	
Phoubars	6	1	
Ravens	5	1	1
Blue Jays	5	2	
Six Pax	4	2	1
Big Sticks	2	4	1
Moles	2	5	
Ice Pops	1	5	1
AMD	1	6	
League II			
Medical	6	1	
Roga	6	1	
Magnuts	5	2	
Titans	4	3	
Lights Out	3	4	
Dirty Sox	2	5	
Light Source	1	6	
Random Errors	1	6	
League III			
E-Z Riders	5	2	
No Names	5	2	
Survivors	5	2	
Nads	3	4	
TNT	2	5	
Mole-Esters	1	6	
League IV			
The Source	7	0	
Turkeys	6	1	
Septembers	5	2	
Random Sample	4	3	
Spacekadets	3	4	
Who Cares	3	4	
Underalls	2	4	1
Mudville Sluggers	2	5	
Who's On First	0	6	1



Mort Rosen

Singly, they're known as (from left) Roger Adams, Bill Gefers, George Lilja and Arnie Feltman. Collectively, they're called the Atom Smashers, BNL's own beloved barbershop quartet. Along with many other talented local performers, the Atom Smashers will weave their magic spell in the 6th annual BERA Vaudeville Show. This family entertainment extravaganza will be presented in the cozy Cabaret of the Brookhaven Center on Friday and Saturday, August 5 and 6, at 8 p.m. Admission is only \$3; \$2 for those under 18 or over 65. There will be a cash bar with drinks and snacks. For information, call Penny Baggett, Ext. 5154.

## Service Awards

The following employees received service awards during the month of July:

### Thirty-Five Years

David E. Alburger . . . . . Physics  
Mary R. Dohrman . . . . . S&EP

### Thirty Years

John M. Densieski . . . . . Chemistry  
Richard W. Emanovsky . . . . . Accelerator  
Helen Z. Kondratuk . . . . . Biology  
Leigh F. Phillips . . . . . S&EP

### Twenty-Five Years

Lawrence M. Cook . . . . . Medical  
Amanda L. Harrison . . . . . Medical  
H. George Latham . . . . . Biology  
Chester A. Smith . . . . . Accelerator  
Paul R. Tichler . . . . . Reactor

### Twenty Years

Howard W. Bell, Jr. . . . . S&M  
Ezekle O. Bell, Jr. . . . . Central Shops  
Alfred W. Berretta . . . . . S&EP  
Chellis Chasman . . . . . Physics  
Anne M. Flood . . . . . Accelerator  
William E. Harrison, Jr. . . . . Accelerator  
Frederick Ligon . . . . . Plant Engineering  
George E. Meinken . . . . . Medical  
George Parzen . . . . . Accelerator  
Laurence Passell . . . . . Physics  
James N. Petro . . . . . Reactor  
Allan K. Roger . . . . . Plant Engineering  
Charles W. Tierney . . . . . Applied Science  
Mona M. Vitale . . . . . Accelerator

### Ten Years

Barbara E. Campbell . . . . . Fiscal  
Nicholas Fanizzi . . . . . Plant Engineering  
Nicholas D. Houvener . . . . . Reactor  
Randolph B. Logan . . . . . Plant Engrg  
Michael J. Losquadro, Jr. . . . . Ap Math  
Carl R. McKeever . . . . . Plant Engineering  
Jacqueline M. Mooney . . . . . Physics  
Michael J. Punda . . . . . Supply & Material

## Pool Races

During last Friday's pool special, the children took to the water with kickboards and showed some pretty fancy maneuvering getting to the finish line. Winners were:

### Children 4 and 5 years old

- 1st Melanie Suller
- 2nd Janne Vehanen
- 3rd Vanessa Murdock

### 6 and 7 years old

- 1st Ryan Murdock
- 2nd Rakesh Singh
- 3rd Jennifer Chen

### 8 and 9 years old

- 1st Kathleen Holden
- 2nd Keith Chan
- 3rd Anne-Claire Thiry, Mark Novis

### 10 years and older

- 1st Alan Wolf
- 2nd Christy Rohig
- 3rd Jennifer Chan

### Coming Events:

Today at 3:13 — Relay Races  
Next Friday — Ping Pong/Spoon Races for the big kids, Cup Race for the young ones.

## Bowling

Although it is early to think about bowling this fall, applications must be submitted at this time. If you are interested in bowling and have not filled out an application, they are available at the BERA Sales Office located in the Cafeteria. Questions can be directed to Charlie Bohnenblusch, Ext. 4758.

## Astronomy Club

The BNL Astronomical Society holds observing sessions at its observatory site at the Lab's east end. Meetings are held on Fridays or Saturdays, when the moon is out and dark skies are limited only by light pollution. Some of the members bring their own telescopes, and everyone shares each other's optics. Most members don't have their own scopes, but that does not interfere with the fun.

The next meetings are scheduled for August 5 and 12. All people interested in astronomy (or just enjoying the beautiful sky) are invited. For specific information about observation nights, call Rick Jackimowicz, Ext. 3803, or Bob Mills, Ext. 5043. Anyone interested in joining the society should call Cesar Sastre, Ext. 4077.

## Volunteers Needed

Volunteers are needed for a gallbladder physiology study at University Hospital, SUNY Stony Brook. The study involves the passage of a tube into the duodenum to aspirate bile and the use of a technetium-99m labeled compound for imaging of the gallbladder.

Adults (male or female) in good health without known digestive disorders can call Dr. Atkins at 444-2431 or Dr. W. Brugge at 444-2122 for further information. An honorarium will be paid.

George Eleazer, Jr., a former AUI Scholarship winner, is doing a doctoral dissertation for Hofstra University on the effects of birth presentation on psychological development. He is looking for volunteers to participate in a study of children born at Brookhaven Memorial Hospital between 1970 and 1978, in either a breech presentation or a normal vertex. A complete psychological evaluation will be performed at the hospital. Results will be shared with each child's parents.

If you are interested in having your children participate in this study, call Cynthia Eleazer at 286-0531.

## 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, 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 Personnel Placement Supervisor, Ext. 2882.

**LABORATORY RECRUITMENT:** Opportunities for present Laboratory employees.

1916 MAIL CLERK - (temporary to 9/2/83) Staff Services Division.

**OPEN RECRUITMENT:** Opportunities for present Laboratory employees and outside applicants.

1917. SCIENTIFIC ASSOCIATE - Must have experience in the designing, building and maintaining of computer controlled electronics. Additional responsibilities will involve assisting in experiments and measurements using this equipment to interface with DEC 11/34 hardware. CAMAC, analogue to digital conversion and software experience desirable. A degree in a related discipline and/or equivalent experience is required. Physics Department. (Reposting of Job No. 1841.)

1918. TECHNICAL POSITION - Requires an AAS degree in the physical sciences or equivalent, a strong background in chemical procedures and mechanical abilities. Duties include field sampling, preparation of samples for radioactivity measurement and quantitative analysis of samples, using alpha-beta counters, as well as use of a data base for data reduction and the preparation of analytical reports. Safety and Environmental Protection Division.

1919. NUCLEAR REACTOR OPERATOR TRAINEE - Requires AAS degree in a technical field or equivalent experience. Prior reactor background and experience in maintaining and operating electrical and mechanical equipment very desirable. Must be able to work rotating shifts, obtain "Q" clearance and maintain reactor qualifications. Will operate and maintain HFBR and auxiliary equipment. Reactor Division.

### Auto & Auto Supplies

TREK CAMPER - 11-1/2'. 878-0516.

77 HONDA XL75 - \$200. Bob, Ext. 4672.

APACHE RAMADA CAMPER - \$1,850. 798-7564.

79 FORD FUTURA - \$3,000. 399-4122.

55 FORD ENGINE - & auto. trans., 272-V8. Tom, Ext. 5212.

TAILGATE - \$50; front & rear bumpers, \$25/ea.; pick-up cross bed, metal box, for Chevy C-10 pick-up, \$75. Jim, Ext. 4040 or 289-0876.

81 KAWASAKI MOTORCYCLE - LTD 440. Ext. 5212 or 475-6797.

68 FIREBIRD - convertible, \$2,450. George, 369-6801 or 924-5823.

74 PONTIAC GRAND PRIX - \$995. Ext. 3404 or 744-9866.

70 BARRACUD STOCK - 924-0886.

82 RAMPAGE PICKUP - take over payments. 928-0886.

81 HONDA EXPRESS MOPED - \$175 neg. 281-8229 after 5:15 p.m.

CAR ALARM - \$20. Joe, Ext. 4259.

73 DATSUN 110 - \$700. 878-4285 after 5 p.m.

75 SUNBUG SUPER BEETLE - Tom. 928-5806.

74 BLAZER TOP - new \$1,400, asking \$500; 74-79 rear quarters. \$400. 744-3968 leave message.

74 DATSUN 260Z CABURETORS - \$200; wheel covers. 6/\$55, 4/\$40. 744-3968 leave message.

79 SUZUKI TRAIL BIKE - asking \$675. Ext. 3457 or 698-5701.

70 OLSMOBILE DELTA 98 - \$300. 588-5287.

69 VW BUG - needs valve adjust., \$800 neg. 744-0049 eves.

70 BULTACO 250 - \$125. 744-0049.

73 BUICK CENTURY - \$875. Ext. 4534 or 924-7916.

78 JAWA MOPED - \$275. Ext. 3894 or 744-9812.

80 HONDA DIRT BIKE - CR80, helmet, \$450. 928-2244.

73 OLDS CUTLASS SUPREME - \$500 firm. Ann, Ext. 281-0393.

74 VEGA - \$300. Duke, Ext. 3371.

80 CUTLASS SUPREME - \$6,200. Ext. 7608 or 475-6772.

76 DATSUN B210 HATCHBACK - \$1,000. Sharon, Ext. 3995.

STEEL BELTED RADIAL TIRES - (2), P155/80R13 on Chevette Rims, \$50. Jake, Ext. 4532.

79 HONDA MOTORCYCLE - CM400T, \$1,000. Ext. 7125.

73 PONTIAC SAFARI WAGON - \$800. 473-9379 after 6 p.m.

72 VW - 286-2935 after 9:00 a.m.

82 PLYMOUTH RELIANT - \$5,395. 924-6443.

77 BUICK LESABRE CUSTOM - \$2,500. Ext. 3117.

74 PONTIAC GRAND PRIX - Ext. 3404 or 744-9866.

76 MOTOR HOME - 26', 475-1696 after 6 p.m.

TRAILER HITCH - bolt on type, \$70. Ed or Jean, 929-4522.

78 HONDA MOTORCYCLE - CX500, \$995. Ext. 2259 or 473-8356 eves.

79 PONTIAC SUNBRIRD - \$2,200. 744-5224.

70 BARRACUDA - 924-0960 eves.

AM/FM STEREO RADIO - w/signal seeker bar, \$35. Ext. 7732.

69 OLDS CUTLASS SUPREME - \$725. 744-5224.

73 FIAT ENGINE - \$150. 924-0960.

80 VW RABBIT DELUXE - fantastic sound system, \$4,000. Renee, Ext. 3316.

70 CHEVELLE MALIBU - \$700. Paul, Ext. 4156.

81 VOLVO GL - 878-0717.

80 TOYOTA COROLLA - \$3,800. 282-3074.

81 HONDA MOTORCYCLE - CM400-E, \$1,000. 924-8634.

72 DODGE MAXI-VAN - \$750. Tom, Ext. 4976.

80 CHEVY - \$3,200. Ext. 3131 weekdays or 731-6581 weekends.

74 DODGE VAN - \$1,000. Gerry or Dee, 878-1124.

74 TOYOTA COROLLA - \$1,400. Fred, Ext. 2057 or 261-5735.

72 VW BUS - \$1,000. 654-2076.

78 MUSTANG II - \$2,800. 567-5593 eves.

VW PARTS - brand new, Augie, Ext. 2419 or 289-4211 eves.

81 HONDA ACCORD LX - \$7,000. Ext. 4547 or 472-1182.

70 AMC MATADOR - \$450. Ted, Ext. 4163 or 286-0065.

78 DATSUN 510 - station wagon, \$2,900. Ext. 7747.

72 TOYOTA MKII - station wagon, \$550. Jack, Ext. 4411 or 929-8287.

72 CAPRI - \$500. 744-4838 after 6 p.m.

### Boats & Marine Supplies

CLAM RAKE - 18 tooth, excel. cond., \$25. Ext. 4547.

81 GLASS BOAT - Tri Hull w/65 HP Mercury, 10 hours on motor, many extras, asking \$2,000. Ext. 4547.

12' ALUMINUM BOAT - Sears, excel. cond., \$375. 473-0178 eves.

16' GARVEY PICKERAL - 40 HP Mercury, both very good cond., \$1,200. John, 878-2543.

22' TONG BOAT - new fiberglass deck, ready for water, \$700. 286-9606.

14' APOLLO SAILBOAT - fiberglass, main & jib, seats 4, \$700. 878-4285 after 5:00 p.m.

18' CAPE COD KNOCKABOUT - fully equipped, prime cond., handles beautifully. 286-2412.

16' HOBIE - w/double trapeze & trailer, \$2,200. Ext. 5504.

33' HOUSEBOAT - Nautaline, self-contained, sleeps 6, complete rebuilt outdrive, mech. perfect, will demonstrate. Ext. 2939.

35' PEMBROKE - sedan, f/b, cruiser twins, luxury live-a-board, mint cond., dinette, shower, sacrifice, \$10,000. 475-8710.

ELI DINGHY - 1979, fiberglass, 7' oars, oar locks, unsinkable, \$150 firm. 325-0315.

18' ALUMINUM - 1981, 30 HP Chry., 1981 Hylander, galvanized trailer, excell. cond., many extras, \$2,100. 727-4473.

ANCHOR - 100 lbs., mushroom, used 1 season, \$100. 751-6418.

**Yard Sales**

MOVING SALE - GE washer & dryer, like new; queen mattress set w/headboard; bicycle; other items. 744-0342.

**Miscellaneous**

HAMS - 20' Rohn, 25G tower & 3 element tri-bander. 744-9677.

MARE - bay, white mane, 15 hands, tack included, \$800. Ext. 2766 or 727-0153.

VELVET RIDING HAT - size 6-5/8, made in Eng., in orig. box, perfect cond., \$15; 5 piece drum set, including cymbal & high-hat, asking \$130. Bob, Ext. 4672.

BOX SPRINGS - (2) 39", 1 new, \$40, 1 slightly used, \$30; 2 metal bed frames, \$10 ea.; metal wardrobe cabinet, 2 dr., 70" x 28", \$20. Jim, Ext. 4040 or 289-0876.

BASF BLANK CASSETTES - C-90, Pro II, CrO<sub>2</sub>, \$2.75 ea. Ext. 2521.

RIDING MOWER - Sears 26" w/lawn sweeper, 3-speed, 6 HP, excel., \$285. 331-9349.

19" B&W TV - Zenith. 698-3856.

NEW ALBUMS - rock & roll, new & old band's, single, \$3, double, \$5. Ext. 5212 or 399-0168.

SHAG RUG - Flokati, 8' x 10', imported from Greece, \$250. Ext. 5212 between 11 p.m. & 1:00 a.m. or 399-0168 between 12 p.m. & 4 p.m.

DISK DRIVE - Mate-I, \$245; disk drive controller, \$60, diskette, \$24, for Apple II, new. Richard, Ext. 7912.

DRYER - elect., runs well, \$25. Roy, Ext. 4662 or 744-8779.

RECLINING CHAIR - fabric cover, gold, good cond., \$40. Ernie, Ext. 3357 or 281-7873.

ALCOHOL STOVE - 2 burner, \$25. Ext. 4095.

LAWN MOWER - Sears w/grass catcher, like new, \$100; queen size foam mattress & frame, \$50. Ext. 2733.

REFRIGERATOR - Panasonic office size, \$90, 7' pool table, \$30; bar & 2 stools, \$25. 472-1102.

KEROSENE HEATER - Sanyo, 1 yr. old, 12,900 BTU, radiant, \$85; Sears oversize dehumidifier, 28 PTCAP, \$40. 472-1102.

UPRIGHT FREEZER - small; children's clothing to size 8; large bathroom vanity in excel. cond. 298-4398.

HAM RADIO AMPLIFIER - Palomar, Bi-Linear, 10, 11, 15, 20, 40 meter bands, am/fm, SSB max. output, 450W, asking \$275. 878-6692.

MASON JARS - qts., \$2.50/doz., pts., \$1.50/doz. 281-8943.

GARDEN WISHING WELL - & fisherman figures, good cond., \$100 ea. Jerry, Ext. 4337 or 286-2680.

AIR CONDITIONER - Fedders, 8,000 BTU, excel. cond., \$125; 14" McCollough chain saw, \$55. 286-0904.

R/C PLANES - (3) Kraft Sportseries, 4 servos, charger, motor, extras, \$325. Ext. 7608 or 981-9474.

LAWN SPREADER - for fertilizing, seeding, etc., Scotts stainless steel, 24", like new, used only once, \$35. 286-0379.

SOFTWARE LIBRARY - Freeloader 500 "HOME" 9 programmed diskettes for APPLE, never used, \$60. Harriet, Ext. 4853 p.m. or 473-4948.

BEDROOM SET - Colonial, 7 pcs., incl. hope chest, less than 1 yr. old; Colonial buffet & hutch, asking \$350; butcher block table w/4 cane chairs, asking \$250; pro. pool stick w/case, great cond., asking \$25. 399-4122.

STEEL SHELVES - 2'x3'x10', \$35 per section. Paul, Ext. 3371 or 924-8143 after 5:00 p.m.

BOXSPRINGS - (2) & mattresses. Jim, Ext. 4040 or 289-0876.

FREEZER - small, upright, in excel. cond.; large blue & white bathroom vanity, \$50. 298-4398.

STORM DOOR - colonial w/screen, brown, 32"x80", \$25; red rug w/padding, 12'x15', \$25. 744-0722.

81 CAMPING TRAILER - Coleman Sun Valley, pop-up camping trailer, sleeps 6, used 5 times, \$3,000. Chuck, Ext. 4483.

HONEY - new crop, unfiltered, unheated, \$1.75/lb., will deliver. George, 744-3289.

REFRIGERATOR - approx. 12 cu. ft., ice compartment, good second refig., runs well, best offer. Ken, Ext. 3564.

OUTDOOR FURNITURE - wrought iron, sofa, 2 chairs, 2 tables, cushions need recovering, \$150. Bernie, Ext. 4842 or 331-2298.

ELECTRIC GUITAR - \$150; guitar amp, \$250; dorm refrigerator, \$75; Kenwood stereo, \$700. Mitch, 277-4091.

STOVE - electric Lady Kenmore, white, made to last, \$35. Peter Gollon, Ext. 3469 or 271-5774.

WEIGHTS - 14 plates, \$20; new pressure cooker -canning pot, 16 qt., \$40; 3 doz. canning jars (qts.), \$9 all. 878-6637.

MAPLE DINING SET - 4 chairs, rush seats, leaf, excel. cond. Ext. 2145.

WESTERN SHIRTS - \$8; summer shirts, \$6, new, never worn, top quality, x-large only. 878-0717.

SCREEN HOUSE - brand new in carton, \$275. 289-5889 after 5:30 p.m.

BOTTLE CAPPER - \$10; scallop dredge, \$10; chain hoist, alum. housing, 1 ton, \$100. 289-0413.

NATURAL MINK STOLE - excel. cond., \$200. Ext. 3532.

DISK DRIVE - 5", 40 track, single sided, MPI Model 51, 4 weeks old, new condition, \$125. Dick, Ext. 2911.

CAMERA - Minolta XM-7 w/75-150mm, f.4.5, 200mm lens, \$180 firm. Ext. 3357.

8-TRACK TAPES - Rock & Classical, \$2 ea. Janet, Ext. 2345.

ROTOTILLER - 36" beltdriver, for 10 HP tractor, Ford, very good cond, \$250; spreader, 1 bushell size, used once, mounts on back of trailer, power driven, flexible shaft, \$50. Ed or Jean, 929-4522.

ELECTRIC ORGAN - Gulbransen, \$25. Dick, Ext. 2911.

CRIB - mattress, \$35; child's safety helmet, for use w/bicycle child carrier, \$8. 751-3666.

FREEZER - Coldspot, upright, 15.8 cu. ft., excel. cond., manual defrost. \$250. 588-6724.

POOL LADDER - 6', metal a-frame, \$10; crib, very sturdy, \$20, dresser w/attached mirror, \$35; new 3x5 flag, \$5. 878-6637.

BEDROOM FURNITURE - dresser, 6 drawer & night table, attractive, good cond., \$99. Sandy, Ext. 3369 or 286-1022.

PLANTS - Pachasandra, excel. ground cover, 25 for \$3.00, 50 for \$5.50, 100 for \$9.00. Janice, 929-4522.

B&W TV - Magnavox 23", needs minor repair, \$25. Paul, Ext. 4156.

UPRIGHT PIANO - \$400; velvet couch & chair w/mahogany block, \$150; kerosene heater, \$75. Ext. 5504.

MARIGOLD PLANTS - mixed colors, \$1.10/doz., avail. Mondays. Bill Stars, Ext. 3371/3172 or 298-9648 eves.

FLAKEBOARD SHEETS - 24" x 48" ea., 5 pcs., \$5 for all. Ext. 2366.

PORTABLE WASHER & DRYER - Sears, excel. cond., still under warranty, gold, \$400 for pr. 928-4830.

LADIES BICYCLE - 10 spd., good cond., \$50. 281-2002.

DESK - & chair, natural pine w/varnish finish, 7 drawers, \$50. 929-6692.

POOL FILTER - HP, D.E. Hayward, used 1 season, \$200; vacuum, skimmer, ladder, winter cover, etc, \$300 takes all. 929-6692.

RAILINGS - (2) for a 3-step stoop, heavy duty, wrought iron, like new. Jim, 744-3792.

**Free**

DOG HOUSE - large & heavy, will require truck to move, Shirley area. Pat, Ext. 2880.

OIL FILTERS - (4) 6 cyl., AMC; tune-up kit; manual (1974). Jerry, Ext. 4487.

LAB/SHEP MIXED DOG - small, 2 yrs. old, all "taken care of", very loving, desperate for home before 7/29/83. 878-0164 eves.

CAR PARTS - doors, windows, fenders for 1967 Plymouth Satellite, Dan, Ext. 3357.

**Car Pools**

MANHATTAN/QUEENS/BROOKLYN - riders wanted 8:30 to 5:00 p.m. Rad, Ext. 3825 or (212) 966-1280 eves.

**Lost & Found**

LOST - change purse, burgundy, snap-close type. Sandra Green, Ext. 4933.

### Real Estate

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

### For Sale

RIDGE - one acre wooded bldg. plot, 100 x 400, quiet residential neighborhood, \$13,500. 924-3236.

MARGARETVILLE, N.Y. - year round, 2-plus bdrms., 2 baths, elec. & wood heated, full cellar, f/p, 2-car garage w/shop & loft, all heated & insulated, storage bldg., 8 acres, 2 cleared, stream, adjoins state land. (914) 586-4634.

SAYVILLE - cedar & brick ranch, 7 rm., eik, d/r, 2 full baths, full basement, garage, central air, extras, excel. cond., can be made mother/daughter apt., \$69,900. 589-2681.

WADING RIVER - colonial cape, 4 bdrms., 2 baths, d/r, eik, 2-car garage, 2,100 sq. ft., sets on 1.9 wooded acres, Shoreham/Wading River School District, asking \$115,000. Ext. 4313 or 929-4551.

**For Rent**

HAMPTON BAYS - summer rental, 1 acre waterfront, secluded, 2 bdrm., sailboats, weekly. 728-2104 eves & weekends.

BELLPORT VILLAGE SOUTH - near bay, stores, fully furnished, spacious, modern house, incl. all appliances & piano, late Aug. to Xmas or Jan., rent neg. to responsible tenant. 286-0379.

MILLER PLACE - 2 story, colonial, 8 rms., 4 bdrms, 2-car garage, acre, 90-180 days, immed. occupancy, \$850/mo. Ext. 7532.

LAKE RONKONKOMA - room for rent w/full use of house, \$235/mo. 981-7875.

SOUND BEACH -