BROOKHAVEN BULLETIN
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BROOKHAVEN NATIONAL LABORATORY

B.C. Bronzes Explored At BNL

Provenance is a strong word in the art world. It means the origin of an art object, and its history once it's left the artist's hands.

The accuracy of assigning the provenance of a painting or urn can make or break a curator's reputation. It can also mean the difference between a price tag of $400 and $400,000. Clearly, much can be at stake, tensions can run high.

Into this ticklish area of art history has been injected new applications of technology, partly developed at BNL, that can help reveal the provenance of ancient Chinese bronzes.

Recent work led by Pieter Meyers, Research Collaborator in Chemistry, and conducted here and at the Metropolitan Musum of Art, is focusing on the Arthur M. Sackler Collections of bronzes at the Met, which have more than 400 items dating from the 21st century B.C. to the 2nd century B.C. Most are wine and food vessels used in burial rituals. Those under closest investigation date from the Shang Dynasty, between the 16th and 11th centuries B.C.

Mort Rosen

Pieter Meyers examines a vial with drill specimens of an ancient Chinese bronze which have been irradiated with neutrons and are about to be placed in a sample changer for measurement of gamma ray energies.

"Basically," says Meyers, "we're trying to answer three questions: how it was made, when it was made and where it was made. We're part of a more or less systematic study trying to find out everything we can about these pieces."

Meyer's technical studies, which are paired with those by art historians, leave no square inch of a vessel untouched. He begins with a microscope examination and a careful surface scan to see how the parts were joined, if there are repairs or tool marks.

X-ray diffraction is then used for identification of corrosion products, an important part of forgery identification. "It's not difficult to see that corrosion takes a completely different form in thousands of years than it does in a matter of days," Meyers points out. By looking at the way corrosion penetrates the metal, the crystal size and the metal/corrosion interface, natural versus artificial corrosion can be discerned.

Next is x-ray radiography, which reveals characteristics of manufacture, such as solid or hollow sections, joints, mends and breaks.

Splitting the hairs finer, another technology – metallography – reveals the alloy composition, cooling rate and purity. Coupling this information with alloy phase diagrams, a detailed picture emerges of the bronze's temperature history and extent of cold working.

But the main activity at BNL is elemental analysis which is "part of every description of an object," Meyers says, "just like height and weight."

The operation is as it sounds – finding out what elements are in the bronze. Studies so far show they are a ternary alloy of copper, tin and lead, probably smelted separately and later combined.

Testing is completed with trace element analysis by atomic absorption spectrometry and neutron activation analysis. Quantifying the levels of different trace metals can help link the metal with the original ore body, and aid in locating a vessel's geographic origin.

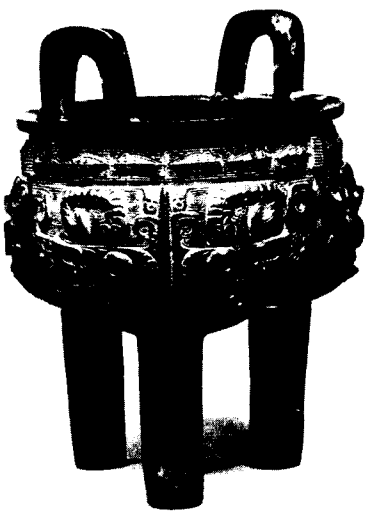
Finishing the experimental phase, analysis begins, and reams of data are treated with multi-varied statistics and other sophisticated mathematical tests. Then, integrating art historical studies of vessel style, shape and iconography with the technical work, a bronze's identity slowly comes to light.

A significant part of this unraveling is distinguishing real from forged vessels. Because genuine Chinese bronzes command such high prices – $10,000 to the $100,000 range – forgeries are frequent. "In Western collections," Meyers says, "a considerable number of the objects are thought to be forgeries. Some are from the beginning of this century, some are earlier."

Trace element composition is one weapon against the art forger. Since genuine Chinese bronzes have, for example, zinc concentrations in parts-per-million, higher zinc levels mean forgery, according to Meyers.

A careful look at corrosion also reveals authenticity, but a major part of detecting the questionable forgery is in vessel style – "anachronistic traces," Meyers calls them, "such as a Zhou motif on a Shang vessel. In Chinese excavations, only ten percent of the vessels have inscriptions," he notes, "but in Western collections, around 50 percent have inscriptions."

Metropolitan Museum of Art



A.M. Sackler Collections

A Chinese bronze vessel of the Late Anyang style, late Shang Dynasty, between the 11th and 12th centuries B.C. The x-ray radiograph, left, reveals the legs are hollow. The lighter areas in the central and right legs are ancient patches over holes left by the casting process. The left leg has thicker walls and was evidently cast separately and later attached. The motif is a typical dragon mask configuration, common to the late Shang period. The vessel is about a foot tall, and was probably used for food.

Inscriptions, which enhance vessel value, usually refer to the noble or emperor for whom the vessel was made, and are sometimes a poem honoring a special occasion. Forged inscriptions are usually engraved or etched, while real ones are cast into the vessel.

Adding to the pool of data, Meyers hopes to experiment with lead isotope ratios in the near future. Lead comes from natural decay of thorium and uranium. Each ore body has a characteristic ratio of the five lead isotopes. Using this isotope fingerprint, the ratio in the bronzes can be matched with those from ore bodies, thereby locating the metal's source.

Warmer Chinese-American relations have made possible plans for closer exchange with Chinese art historians and scientists. Meyers hopes to fill in gaps in information on ore body composition, and obtain a Chinese history of Chinese metallurgy.

"The most interesting part of all this," Meyers says, "is that through all these sophisticated and technical studies, we can reconstruct parts of ancient history, as if all the objects are talking to you. They reveal their hidden secrets, but it's not easy."

—James Kent

The Chemistry Is Right

As a child, Louise Hanson was encouraged to learn how to speak German. It wasn't because of her ancestry. It was because her parents felt that anyone who became a scientist should know the language, since much of the old scientific literature is in German. Hanson's parents are Dr. J. and Dr. I.L. Karle, noted crystallographers.

"There was never any question about a career in science," said Hanson. My parents believed that that's what one did as an educated person – male or female."

Luckily for Hanson and her parents, she had the talent to match the push.

She did her undergraduate work in chemistry at the University of Michigan. Then she spent a year in Germany under a Fulbright Scholarship, producing a paper on crystal structure. Back at Michigan for graduate studies, she married Jonathan Hanson, a crystallographer, who took her to the University of Seattle, where she was graduated with a Ph.D. in chemistry. Her graduate research was on porphyrins, compounds that form the nuclei of chlorophylls and hemoglobin.

Before coming to BNL, Hanson worked as a porphyrin chemist for four years at the National Institutes of Health in Maryland. She also spent two semesters at the American University in Washington, D.C., teaching analytical chemistry. Part of a National Science Foundation program, the course was designed to help women with science training re-enter the job market by refreshing their knowledge and skills. Hanson described the women as middle-aged housewives who had given up their careers to have families. "My biggest challenge was to give them a sense of confidence," she said.

She also set a personal example for her students. "I was very pregnant during the first semester," she said, "but they knew I was coming back to teach the second session."

Hanson said that 90 per cent of the women enrolled in the NSF program got jobs in technical fields or went on to graduate school. "They were a highly motivated group," she noted.

At Brookhaven, Hanson has continued her interest in helping women in science. A member of the BNL Women In Science group, she is active on the lecture committee and brought crystallographer Dr. Jenny Glusker to the Lab for the first Women In Science Lecture.

Doug Humphrey

Louise Hanson

She has also spoken to high school students, who ask "what do you have to know" kinds of questions. "College women are more apt to worry about how to juggle a career with a family," she said.

How does she?

"With lots of help from my husband," she said. Hanson had always expected to have a career of her own. "Perhaps that's because my mother had a successful professional life and still raised three children. Now I

(Continued on page 2)

Picnic P.S.

With a cast of hundreds, the new "Brookhaven's Quest" will have its official premiere at the employee picnic tomorrow. Stop in to see it at Berkner Hall. You just might see yourself on the screen.

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If OUTING '80 is postponed until Sunday, due to inclement weather on Saturday, an announcement will be made on radio stations WALK and WRIV.

•

The pool will be open on Saturday, August 23, only to those bearing Outing '80 admission tickets.

Doug Humphrey

Weekend Tours

The Laboratory will be closed to the public for the next two weekends because of the employee picnic on Saturday and the Labor Day holiday on September 1. Tours will resume on September 6 and 7.

Picnic Basket

If you are planning a picnic basket for the employee picnic on August 23, here are four menus suggested by the International Cooking Exchange.

Braised Cornish Hens
Apple Coleslaw Cherry Tomatoes
Crusty Bread Fruit & Cheese
Chilled Champagne or White Wine

•

Sandwich Loaf
choice of fillings – tuna, egg, shrimp, or chicken and bacon salads; cream cheese/nuts; and cream cheese/pineapple
Raw Vegetable Platter Apple Sauce Cake
Chilled White or Rosé Wine

•

Fried Chicken
Crudités Green Beans
cherry tomatoes Vinaigrette with
mushrooms chopped onions
carrot curls black olives
Stuffed Eggs with Herbs
Pound Cake with Berries
Watermelon Iced Tea and Lemonade

•

Pâté
Salad Nîçoise French Bread
Assorted Cheeses Fresh Fruit
Chilled White Wine

•

Of course, bologna sandwiches would also be great.

Timetable

Activities
(Starting at 2:00)

At the Ball Field:
Softball
(shuttle bus will leave picnic area every 15 minutes)

At the Gym:
Basketball
Badminton
Ping-Pong
(no hard-soled street shoes allowed on Gym floor)

At the Pool:
Swimming
(to prevent overcrowding, the Pool will be cleared each hour)

At the Picnic Area:
Dancing
Horseshoe Pitching
Sprinkler for the kids

Contests and Games

2:00	Tennis Doubles Round Robin
2:30	"Fun Run" (2 mile race for those 12 years of age and up)
2:30 – 4:00	Games and Contests (including bicycle obstacle course contest)
4:00	Dance Contests 1) Disco (for kids) 2) Disco 3) Lindy 4) Latin (Cha-Cha) 5) Charleston
6:00 – 7:00	More Games and Contests

Cafeteria will be open at 1:00 p.m.

Entertainment

10:00 – 2:00	Exhibit Center Tours
1:00	Parade down Brookhaven Avenue; musical selections by Suffolk County Police Department Pipe and Drum Corps; exhibition by Knights of the Purple Haze; exhibition by Revolutionary War Artillery Group
2:00 – 3:30	Disc Jockey
2:00	Exhibition by BNL Fly Tyers
3:00	Demonstration by BNL Remote Control Model Airplane Club
3:30 – 5:00	Dance Band (exhibition by a professional dance team)
5:00	Demonstration by BNL Karate Club
5:30	Table Tennis Exhibition in Gym
5:00 – 6:30	Disc Jockey
6:30 – 8:00	Dance Band

Hanson (Cont'd)

understand why she was tired all the time."

Because she needs to conserve her energy, she doesn't get involved with many activities in addition to her work and her family. She usually gets concert series tickets to performances at BNL and at Stony Brook. But her harpsichord playing has lost its fine edge in recent years.

Hanson is a chemist in the Department of Energy and Environment. Pursuing her interest in porphyrins, she does basic research on the role of chlorophylls in the primary process of photosynthesis in green plants and certain bacteria. Most of the chlorophylls act like antennae to collect light energy. This energy is transferred to a reaction center, where it is converted to chemical energy by release of an electron from a special donor chlorophyll. The initial acceptor for the electron is also a chlorophyll-like molecule. Hanson models these donor and acceptor species with theoretical calculations so that they can be characerized *in vitro* (in test tubes) and detected *in vivo* (in biological systems). She said, "The research is fundamental, but it has obvious application to artificial solar devices."

Her husband also works at the Lab. Although they both started out in chemistry, he has evolved into a computer analyst and is with the Applied Math Department.

Thinking back on her career so far, Hanson said that she has never run into any difficulties as a woman in a field dominated by men. She is still very interested, though, in encouraging women who are willing to make a serious commitment to science. As she says, the way things are going today, more women will have to work for the rest of their lives. They shouldn't be relegated to taking just any kind of job with low pay and low status.

Hanson's child, Jeffrey, is now three years old. Will he be encouraged to continue in the family tradition?

Her one comment was that when she told her parents his name, her mother was concerned that his initials matched those of his father. How were people going to tell them apart when he publishes?

Nursery School

The Upton Nursery School will hold two enrollment days on August 26 and 27. The officers and staff will be on hand in the Cafeteria lobby to discuss the school's program and to encourage parents of pre-schoolers to enroll their children in the Nursery School.

The Upton Nursery School is open to children of BNL employees, or their relatives, and to children of BNL visitors. Because parents cooperate in the running of the school, a high quality program is offered at reasonable rates.

The teachers are professionals in early childhood education and are assisted in the classroom by a parent or teacher assistant. Children attend school two or three mornings a week. The classes provide a varied and stimulating program including art, music, outdoor activities, and field trips.

This year, the school's sixteenth, classes will begin on September 15. Fees are $40/month for the three-day program and $27/month for the two-day program. Parents are urged to visit the Cafeteria on enrollment days to meet the officers and staff and discuss the nursery school program.

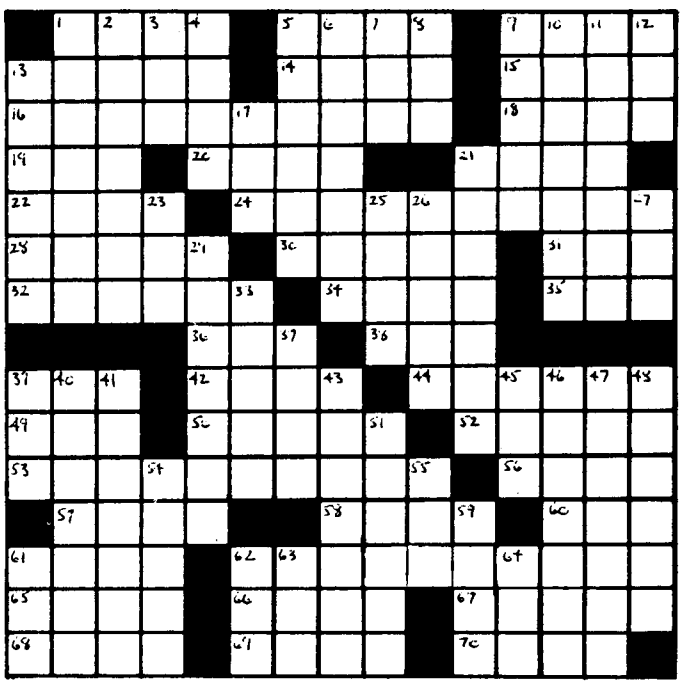
For more information, call Karen Brunschwig, 924-0030, Ruth Fernow, 928-8465, or Colin Stewart 286-9616.

Selected Reading

Environ. Sci. Technol. 14, No. 8, August 1980
Hazardous wastes here and there. 906–9

L.I. Forum 43, No. 8, August 1980
Wilbur Ketcham and the Narrasketucks. R. Hausrath. 156–64

Crossword Puzzle



Across

1 Denlea and Nekerman, familiarly
5 Org. that meets in lodges
9 Desk-calendar entry: Abbr.
13 Commune west of Zurich
14 Barrels per day, e.g.
15 Biology has more than one
16 *Part I of a relevant quotation*
18 Novice
19 A Caesar
20 Early Scandinavian
21 "Send these, the homeless, tempest --- to me"
22 Dolphin genus
24 *Part II of the quotation*
28 Smarted
30 Chinese governmental departments
31 Passing grade
32 *Part III of the quotation*
34 Litter member
35 Sellout sign
36 Card game
38 Surname of 10 BNL employees
39 Advanced deg.
42 "The jig - - -"
44 - - - Koestler, author of the quotation
49 German exclamation
50 Network: Fr.
52 ISABELLE's is round, roughly
53 *Part IV of the quotation*
56 Auto pioneer
57 Melville title
58 An employer of 16 Across
60 Chinese pagoda
61 Tried hard for the E-Z Riders
62 *End of the quotation*
65 Luxury
66 Ailanthus or eucalyptus
67 Geometric solids
68 Graphic or liberal
69 Patricia of Medical
70 BERA and DOE

Down

1 San - - -, Texas river
2 Element No. 77
3 Zucker of the Accelerator Dept.
4 Emulated BNL carolers
5 Like Br'er Rabbit's patch
6 One of the famous 16 Across
7 Cooperstown name
8 Some BNL employees: Abbr.
9 Put - - - to (halt)
10 Study for some 16 Across
11 Marie, to Pierre Curie
12 - - - Center, Postal Service location
13 Lend a hand
17 Cafeteria standby
21 16 Across, frequently
23 Ques. and - - -
25 Michael of Energy & Environment
26 Nine: Comb. form
27 Earth: Comb. form
29 One of the famous 16 Across
33 That is - - -
37 Anguished cry
39 Supply for Building 461
40 Candidate for 39 Across
41 One of many 16 Across
43 6 Down or 29 Down
45 Even if, for short
46 Staccato
47 *Bulletin* items
48 Makes oneself perfectly clear
51 Donald or Isabel of Medical
54 Wimbledon champ, 1973
55 Compass point
59 Seat of Butte County, Idaho
61 Red or Sulu
62 Kin of NYSE and AMEX
63 Monk's title
64 And not

Puzzle answers next week

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CARL R. THIEN, Public Relations Officer

In Memoriam

Eilene O'Laughlin, Office Services Assistant in the Fiscal Division, died at Mather Hospital on August 18 after a long illness. She was 60 years old. Ms. O'Laughlin had been with the Laboratory since April 16, 1947, and was the widow of Lloyd O'Laughlin, an employee of the Photography and Graphic Arts Division, who died seven years ago. She was a resident of Belle Terre, and is survived by two sisters, Mildred McVean and Eleanor Miller.

Children's Program

Swimming Pool

Last Friday's special featured a cup race for the older children and a ping-pong ball race for the small-fry. Much splashing and cheering was heard as the contestants paddled and swam to victory. Winners were:

4–6	1st	– Neesha Sing
	2nd	– Daniel Gutlich
	3rd	– Kathleen Holden
7–9	1st	– Katia Gutlich
	2nd	– Alyse Holden
	3rd	– Keith Holden
10+	1st	– Sean Holden
	2nd	– Kristen Holden
	3rd	– Leo Chiang

Coming Event

On Wednesday, August 27, the annual Water Carnival will be held from 2:00 to 5:00 p.m. The event is open to all employees' children ages 4–15. Prizes will be awarded to the winners.

On-Site Program

The final Friday special was "Carnival Field Day." The scene was alive with activity featuring contest and game booths as well as Olympic-type racing events.

A Note From The Program Directors

As the 1980 Children's Summer Recreation Program draws to a close, program directors Guy Mastrion and Richard Parsons sincerely hope the children had an interesting and rewarding summer.

Special accolades go to the counselors and swim instructors who worked so diligently in providing an excellent and varied recreation program. They included: Ann Brassard, Gary Milliesen, John Ingoglia, Cathy McCafferty, Mike Buckman, Gail Mastrion, Laura Ross, Magda Valentin, Sharon Peters, Robert Messineo, Guy Mastrion, Jr., Judy Mills and Marge Acevedo.

Gymnasium

The gym will resume the normal Saturday schedule on September 6 as follows:

10:00 a.m. to 1:00 p.m.
Volleyball and Badminton
1:00 p.m. to 6:00 p.m.
General Activities

1980 Tennis Aces

Doug Humphrey

This year's tennis champs gathered on center court. From left, Tom Koetzle, men's singles; Andy Kevey, men's doubles; Sue Kevey, women's singles and mixed doubles; and Chris Saitta and Mona Rowe, partners in women's doubles. Missing from the group is Jag Dalal, who teamed with A. Kevey and S. Kevey for men's doubles and mixed doubles, respectively. As winner of men's singles, Koetzle will have his name inscribed on the Allen Auskern Cup, a perpetual trophy established in memory of Auskern, who was a well-known player at the Lab.

CREF Values

September	44.60	October	41.18
November	42.56	December	43.19
January	45.37	February	44.59
March	40.33	April	41.82
May	43.70	June	44.81

July $47.84

Softball

League I

Ravens 5 – Blue Jays 1
Six Pax 4 – Deegenerates 3
Source I 16 – Phoubars 13

A few home runs for the Source: R. Church, W. Rambo, J. Flannigan, J. McCafferty Jr., and Ed Meier Jr. Ed was also 4 for 4.

League II

Titans 10 – Cardinals 9
Roga 36 – Dirty Sox 8
Moles 8 – AMD 7

League III

Big Sticks 8 – Nuke Powers 7
Lights Out 15 – Brewmasters 4
Huff & Puff 18 – Binary Bombers 16
Medical 17 – Ice Pops 6

League IV

Thrids 10 – Turkeys 4
Survivors 5 – E-Z Riders 4

Well-played game by both teams with the Survivors pulling it out in the 8th.

Balls & Strikes 17 – Diamonds 10
Random Sample vs. Nads
(Game Postponed)
Balls & Strikes 6 – Diamonds 4

League V

No Feedback 10 – Mudville Sluggers 9
TNT 18 – Who Cares 9
Who's On First 15 – Source III 9
No Names 19 – Underalls 2

Two double plays by Juan Alverez and Dave Nally. Home run was hit by John Pepe in the top of the fourth.

Makeup Game:
TNT 8 – No Names 7

Soccer

The N.Y. Oldtimers beat BNL 4-2 on a beautiful soccer Saturday last week. The game was evenly played in the first half with Labone pulling BNL even, 1-1, with a goal coming off a rebound shot from Batchelor. The early part of the second half found the Oldtimers at their best with BNL unable to prevent three quick goals, 4-1. One of these was by U.S. Soccer Hall of Famer Jack Hynes. With 20 minutes left to play BNL drew back a goal on a direct kick situation. Hershcovitch hit the cross bar and Skalyo headed the rebound into the corner of the net, 4-2. Both defenses regained their composure and no more scoring resulted.

Pickup games are played Monday evenings starting at 5:15 p.m. and will continue into October. Interested participants may contact Ken Batchelor, ext. 4674.

NYC Train Trip

The Hospitality Committee is planning a group railroad trip to the city on Wednesday, September 3. Departure will be at 7:55 a.m. from the Patchogue LIRR station. Round-trip fare for adults is **$3.25,** children under six years ride free.

Reserve a ticket by sending your fare through the U.S. mail to P.O. Box 322, Upton, New York 11973, no later than **Thursday,** August 28. Make checks payable to "Brookhaven National Laboratory." Your tickets will be given to you on the train. Refunds will be made only if cancellations are received by the Friday preceding the scheduled trip.

Cafeteria Menu

Week Ending August 29, 1980

Monday, August 25		
Tomato vegtable soup	(cup)	.45
	(bowl)	.55
Cheese omelet and 1 veg.		1.40
Spaghetti and meatballs w/garlic bread		1.45
Hot Deli-Pastrami	(on bread)	1.50
	(on roll)	1.60
Tuesday, August 26		
French onion soup	(cup)	.45
	(bowl)	.55
Pork & cabbage crisp		1.50
Meatloaf & hash browns		1.50
Hot Deli-Corned beef	(on bread)	1.50
	(on roll)	1.60
Wednesday, August 27		
Pepper pot soup w/spaetzle	(cup)	.45
	(bowl)	.55
Seafood creole on rice		1.50
Southern fried chicken w/corn fritter		1.50
Hot Deli-Veal pattie & peppers hero	(on bread)	1.40
	(on roll)	1.50
Thursday, August 28		
Chicken gumbo soup	(cup)	.45
	(bowl)	.55
Roast fresh ham & 1 veg.		1.50
Cheese ravioli & 1 veg.		1.40
Hot Deli-Italian meatball hero	(on bread)	1.45
	(on roll)	1.55
Friday, August 29		
Manhattan clam chowder	(cup)	.45
	(bowl)	.55
Sweet sour fish & 1 veg.		1.50
Ham, rice, green bean casserole		1.45
Hot Deli-Sandwich steak, NY style	(on bread)	1.50
	(on roll)	1.60

Arrivals & Departures

Arrivals

Rabindranath Bandy.....Nuclear Energy
Annette M. Gremme.....Medical
Patrick J. McGauley.....Energy & Env.
Walter J. Morrison.....Accelerator
Alexander F. Richardson, Jr......Dir. Ofc.
Edward T.L. Robson.....Biology
Joseph P. Sullivan.....Central Shops
Kevin D. Wyman.....Energy & Env.

Departures

Marshall H. Bull.....Ph. & Gr. Arts
Michael A. Chambers.....Accelerator
Peter D. Chouinard.....Central Shops
Albert G. Holtz.....Energy & Env.
William Lee.....Plant Engrg.
Yani Pavlidis.....Plant Engrg.
Frank P. Welch.....Ph. & Gr. Arts

The Fall Gardener

You can still reap the benefits of a fall vegetable garden by planting now. According to the Cooperative Extension, there are about ten weeks of good growing weather left. Plant long-season vegetables that start slowly and produce slow growth during the cool month of September. The seed of broccoli, early varieties of cabbage, collards, kale, kohlrabi, and purple top turnips can be sown directly in beds (seedlings can be thinned later if they come up too thick) for later harvest. Transplants of other cabbage-related crops that take longer to mature (90+days) may still be available at your local garden center. Check to see if they have transplants of Brussels sprouts, califlower, and certain main-season varieties of cabbage. Certain other vegetables can also be sown from now. They include Swiss chard, bush-type snap beans, beets, carrots, endive, peas, radishes, spinach, and the leaf type and the Boston type of lettuce. In fact, the last three vegetables can be sown up to the first week of September. For all fall vegetable gardening, it's pretty safe to assume that freezes in our area do not occur before the third or fourth week in October, and even a light frost can be tolerated by most of these crops.

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.

The determination of the best-qualified candidate for available positions will be based upon education, experience and other job-related criteria. Such factors will be evaluated and measured against the demonstrable requirements of the available vacancy, as well as the Laboratory's Affirmative Action objectives.

The Laboratory is committed to a policy of Equal Opportunity in its selection and placement of personnel. Its objective is equality of opportunity in employment, training, and promotion without regard to race, color, religion, national origin, sex, age or handicap.

Each week, the Personnel Office lists new personnel placement requisitions. The purpose of these listings is, first, to provide open placement information on all nonscientific 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, as indicated below. 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: Opportunity, for present Laboratory employees.

1438. CLERICAL POSITION - Requires excellent secretarial skills. Working knowledge of word processing systems is essential. Will primarily be responsible for organizing and processing technical reports. Department of Energy and Environment.

OPEN RECRUITMENT: Opportunity for present Laboratory employees and outside applicants.

1439. FACILITIES ENGINEER (HVAC Designer) - Requires BSME or equivalent and a minimum of three years experience in developing designs, specifications, drawings and estimates for HVAC systems, power and process piping systems, control systems and instrumentation, and all associated ancillary equipment. Professional engineering license is highly desirable. Plant Engineering Division.

1440. EXPERIMENTAL MACHINIST - Requires experience in job print interpretation, layout, and machine set-up. Candidates must demonstrate ability and imagination in all phases of machine work. Will function as all-round machinist for non-production work in research and development shop. Project assignments range from raw material work in research to final assembly. Central Shops Division.

1441. STANDARDS INSPECTOR - Requires experience in all phases of mechanical inspection. Proficiency with use of inspection equipment and a basic knowledge of metals, machining, welding, and sheet metal fabrication is essential. Will perform all phases of in-process and acceptance inspection of purchased and Laboratory fabricated parts and equipment. Central Shops Division.

1442. EXPERIMENTAL METAL WORKER - Requires experience in all phases of shop work. Candidates must be skilled in the use of sheet metal fabrication, tooling and machining. Ability to work to close tolerances from blueprints on sheet metal, tubing and structural shapes required. Central Shops Division.

1443. SECRETARIAL POSITION (temporary/four months) - Requires excellent typing and communication skills to assist in the preparation of technical reports and perfrom standardized clerical functions. Will provide general assistance to other secretaries within the group. Department of Nuclear Energy.

Autos & Auto Supplies

68 OLDS - Cutlass, 2 dr, some body damage, runs good, new tires, battery. $150. 399-4243 after 6.

75 BUICK - Station wagon, excel cond, a/c, a/t, best offer, Ext. 4881.

CAR BATTERY - 12V, Delco energizer, hardly used, excel cond. Model Y59-2350 Watts. $25. Ext. 4487.

73 - AMC - Sportabout, high mi., a/t, a/c, reg. gas, good tires. $500. 286-8517 after 4:30 p.m.

RIMS - (4) wide 15" x 8 fit Ford & Jeep, like new. $70. Jerry, Ext. 3894.

HAVE FIRST OPTION - on a 4 dr. Mazda 626 which I will not use. Anyone interested? Paul, Ext. 2447.

69 CHEV. - Caprice, good cond, am/fm stereo, a/c, cruis-amatic, new tires, very dependable. $425. Steve, 286-1378.

MOTORCYCLE BATTERY - Wisco roughrider RB-9, new still in carton, 6½"Hx5¼"Lx3½"W. D. Vail, Ext. 7167 or 924-4058.

70 TOYOTA - land cruiser, excel cond. 325-0673 after 5.

70 TORINO - excel running cond, clean, some body damage, p/s, p/b, a/c, am/fm stereo. $300. Alison, Ext. 2381 or 475-7263.

1973 COLEMAN CAMPER - Popup, Somerset model, sleeps 5, Porta potty, heater. $900. 273-5409.

SNOW TIRES - A78-13, 3000 miles, buy now & save. 2 for $30. Rau, Ext. 3830.

76 GRANADA - Excel cond, std trans, 24-28 MPG economical. $2,350. Lou, Ext. 4615.

70 BUICK - Skylark, not pretty, good student transp., new starter, battery, tuned. $400. Firm. Don, Ext. 7658.

HUBCAP - Camaro Rallye, $5. Frank, Ext. 3898.

TIRES - 155-13, new WW, $15; (2) ea. 155-13 snows on rims, Chevette, 1 season. $70. Richie, Ext. 4254 or 734-7342.

70 MAVERICK - 3 spd std, high mi., runs good. $195. Bill, Ext. 3355 or 472-4684 after 6 pm & weekends.

71 VEGA - auto trans, 4 cyl, running good cond. Best offer over $150. Steve, Ext. 4297.

78 YAMAHA - 400SX, low mi., excel. $1,195. Ext. 7672 or 878-4383.

76 HONDA - CJ360, new battery, helmet, low mi., good cond., extras $700. Kathy, Ext. 4615.

75 VW RABBIT - 4 cyl, a/c, excel in & out, 27 MPG. $3,000. Gary, 661-6721.

76 DODGE - 20' Winnie motor home, 360 auto, loaded, very good, new tires. 588-5688.

78 HONDA - 750K, 2000 mi, excel cond, extras. $2,150. Ext. 4597 or 286-1074 after 5 pm Dave.

64 CHEVY - 3 spd, not running, body fair, interior good, extra engine, rims. $250. Bill, 289-0687.

72 PONTIAC - Lamans, p/s, p/b, p/w, a/c, cassette deck, digital clock, good running cond. $750. Jean, Ext. 7169 or 286-9121 after 5 pm.

76 PLYMOUTH - Volare, Sta. wgn. 6 cyl, new tires, new shocks, excel cond. $1,800. Hans, Ext. 3927 or 345-3193.

CAMPER - Ford, gas stove & heat, fold down bed, porta-potti, sink w/10 gal. water, alarmed, 6 cyl, auto, $1,500. 281-0360.

78 MOTORCYCLE - Honda Cafe racer, 100% chrome two modified engines. $6,000. invested, best offer over $3,500. 928-0158 after 6 pm.

65 PONTIAC - Tempest, 326 cu. in. reliable transp. $200. Bill Stars, Ext. 4278 or 298-9648 eves.

69 ECONOLINE CAMPER - recent tires, starter, die hard, brakes, exhaust system, & transmission, 6 cyl. $1,500. 281-0360.

77 BMW - 320 i, good cond, no reasonable offer refused. Tong, Ext. 2364.

75 CHEVY - Malibu, 4 dr, a/t, a/c, 90,000, good car. $2,000. 286-8517 after 5:45.

65 DODGE - Dart, 3 spd, runs well. 18-19 MPG. $200. 878-8847.

78 TRANS AM - 400 V8, auto, a/c, full power, am/fm 8 trk, radials, 14,400 mi. mint cond. $5,800. 325-0579.

70 FORD FAIRLANE - 6 cyl 250, a/t, (4) new tires, good running cond., good gas mi., $700. Robert 821-0695.

77 CHEVY - Monte Carlo, AC-stereo, 305 cu. in., new tires/brakes. Cliff, Ext. 3322.

72 BONNEVILLE PONTIAC - Brown, radio, a/c, heater, 59,000 mi, new tires & muffler, $1,200. HR3-2523.

VW PARTS - Bumpers, doors, fenders, hoods, glass, etc. From 68-69. Augie, Ext. 4220.

VOLVO TIRES - size C-78-15, 2 snow tires, good $30. 4 regular tires, good $15 ea.; Trailer hitch, Class II from '68 Chrysler, like new, ball & wiring, $30; 17' Boat Trailer, $100., Joe, 475-8440.

Boats & Marine Supplies

66' O'DAY TEMPEST - 3 sails, fin keel, 6 HP outbd motor, 23' sleeps 2. 734-5392 eves.

17' CLAMBOAT - Garvey, 65 HP Merc., w/controls, must sell. $600. 286-8869 or Ext. 2062.

28' JERSEY SKIFF - brand new 350 Chevy engine, rebuilt. trans, 2 fighting chairs, flying bridge. $3,600 878-4152.

21' LUHRS - Lapstrake Skiff, hull good, inboard, engine needs work, best offer. Ed, Ext. 7943.

15' ALUM - Starcraft, 25 HP Johnson, center console, trailer, extras. $1,700. Ext. 4597 or 286-1074 after 5. Dave.

17' LYMAN - Runabout, 1960 w/50 HP Evinrude full canvas, excel cond. Many extras. $1,000. 878-8847.

Yard Sales

YARD SALE - Aug. 23 & 24th - 842 Ostrander Ave. Riverhead. Furniture, clothes, baby items, hanging lights, etc. 727-4859.

GARAGE SALE - Aug 23 & 24th - 14 Fairway Dr., Middle Island. 10 to 4 pm.

MOVING SALE - almost new clothing, costs, shoes, records, kitchenware, kromex diningware, silver, crystal. Best offer. 744-0262.

Miscellaneous

CARPET - 15'x12', bright orange. Usha, Ext. 3922 or 924-6720.

TAPE RECORDER - stereo, V-M tape-o-matic model 734, $45; Organ-Hammond console, model M-111, excel. cond, $1,150. HR 3-2523 after 8 pm.

HARVARD - King size frame & head board, any reasonable offer. 929-4068 or 212-348-7958 collect.

LAWN SPRINKLER - Melnor walking type, takes up to 150' of hose, new cond. $27. 724-2923.

WINEMAKERS! - Organize for grape purchase, 1980 Vintage. Tom, Ext. 4674 or 286-2505.

DESK - large metal, $25; bike, girls 24", $30. 581-7656.

MICROSCOPE - American Optical, $500. Ext. 2115 or 744-0146.

ANTIQUE DRESSER - laminated front, 48" long, w/ wall mirror, excel cond. $85. Pat, Ext. 2452.

GUITAR - Yamaha folk guitar, excel for a beginner, $25. Frank, Ext. 4709 or 281-4607.

FREEZER - 15.9 cu. ft., $200; 12' round screen house, brand new in box. $200. Tom, 325-1913.

KEROSENE LANTERN - and extra red globe, $10. Ext. 4259 or 736-2534 after 6.

SOFA - vinyl covered, $20; chrome vinyl covered director's chair, $30; Hedstrom tricycle, $20; 16" bicycle, $5. George, Ext. 4460.

ORGAN - electric Orcoa, 37 keys, 50 chords, maple, $35. 727-4884 after 6.

POOL TABLE - ¾ slate, must be dism., you haul, must be seen. 543-0079.

UTILITY TRAILER - steel frame w/leaf springs, good for motorcycle transport. $150. Rip Bowman, Ext. 4672.

BOOKS - Photography, Time/Life Series complete set & index. $65. Fred, Ext. 4407.

TWIN BED - boxspring & mattress w/frame. $40. Peter, Ext. 4367.

LOVELY MAPLE TV CONSOLE - 23" B&W, has voice, distorted picture, excel cond. reasonable. Olsen, 286-0376.

DEEP WELL - Pumps compl. overhauled 1 HP, 3 stage Jacuzzi, $95; ½ HP single, $75. 924-3565.

TABLE - Maple butterfly dropleaf w/two leaves, 27" unopened, 83" w/leaves, like new. $100. Ext. 3058.

BIKE - Schwinn Sting-Ray, boy's, excel cond. $45. 744-3744.

TABLE - round oak, modified claw legs, 48". $150. 878-4268 after 5:30.

REI FRAME BACKPACK - large 5 zippered pockets, v.g. $35; Mountain boots, heavy duty Galibier Desmaison, good cond, size 10½ M, $30. Rau, Ext. 3830.

COLOR TV - Zenith 19" table model, $95; Chandeliers, beautiful crystal; GE trash compactor. Ext. 4532 or 277-4091.

GAS HEATER - for use in big rooms, good cond. $225. Can convert to natural gas. 588-6417.

CLARINET - new cond. $75. Firm. Paid $150. nice leather case. Ext. 2529.

SKIN DIVING FINS - $10. Size 10 Nemrod by seamless, non cramping. Ext. 3362 or 924-4097.

PIANO - Wurlitzer spinet, v.g. cond. $800. Ext. 3701 or 751-8128 eves.

MATTRESSES - (2) twin size, v.g. cond. $20. ea. 924-4058 after 5 pm.

BABY ITEMS - carriage, $25; high chair, $8; play pen, $12; toys. 399-5568.

PACHYSANDRA PLANTS - healthy & thriving. 25 plants for $2. Jean, 929-4522.

BASSETT - Comtemporary style couch & arm chair, $110; Mediterranean style, slate top coffee & end table. $100. 281-0804 eves.

SHUTTERS - (2) pair w/hardware, for 2' wide window, urethane finish. $20. Gil, Ext. 4043.

COLOR TV - Philco 19", almost new, $250. Ext. 3134 or 2432.

FRANKLIN FIREPLACE - w/hydro hearth grate, $150. Frank Rumph, Ext. 4581 or 588-3565.

TABLE - 48" round w/four chairs, $65; 7-drawer kneehole desk, light wood, formica top, matching chair, $60. 878-1471 or Ext. 3771.

ARTIST CANVASES - 7 x9, 60¢ ea; 7.50-14 tire w/rim, $10; hairdryer port, $5. Sue, Ext. 4207.

SHOP VAC - excel cond, $15; golden book encyclopedia, excel cond, 16 Vol. $16. Carl, Ext. 4680.

MAPLE TABLE - w/4 chairs, round. Paul, Ext. 4662 or 727-4859.

LAWN MOWER - new blade, needs tune up, $30. Ext. 2616 or 751-5868 after 6.

ROTOTILLER - in good mech. cond., ideal for small garden, $85. Stan, Ext. 3284 or 286-1062.

WOOD STOVE - f/use in H.W. heating system, coal adapter available, heat shields, excel cond. $500. Ext. 3992.

WELL PUMP - ½ H.P. Burk's shallow pump, A-1 cond. $75. Dinos, 4666.

WOOD BURNING STOVE - Fisher, used three weeks, excel cond. $350. Larry, 734-5234.

BICYCLE - 16" girls, like new, $40. Roman, Ext. 3751 or 399-3659.

POP UP TRAILER - in top cond, must see to appreciate. Fred, 289-1085 after 5.

WOOD - full cord 4'x4'x8' cut & split, small for stove mixed hard woods, some pine. $150. Pete, 281-7379.

AIR TIGHT STOVE - Gabraltar, II, used 1 season, lg. cooking surface, brick lined firebox. 475-6938 after 6.

CHIPPENDALE COUCH - rocker, pair Queen Ann chairs, Victorian loveseat, matching chair, wardrobe. Best offer. 744-0262.

SCHWINN - Deluxe stingray boys bike, mint cond, glossy blk. $69. 929-8577.

REGENTS - & other review books, seven different subjects, store price $3. Sell for $2. 744-2947 after 6.

BIKE - boys 10 spd, $35; 20 gal. aquarium hood & stand, $25; 9x12 wood braided rug. $85. 732-1298.

COLOR TV - Zenith 19", 1½ yrs. old, hardly used. $325. Rich, Ext. 2826.

CLASSICAL GUITAR - $40; also Penske timing light, $20. Ext. 2437 or 924-7909

TORO - Snowblower mower; 25" Zenith Color TV stereo; small GE Refrig, many other useful items. 744-2332.

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

MASTIC BEACH - 3 bdrm, panelled L/R, w/new w/w carpet, eik, outdoor & indoor front porches, complete insulation, elect heat, new asphalt driveway, ¼ acre, treehouse, taxes $550. $25,000. Chris, 281-7379.

ROCKY POINT - 9 miles from Lab. M/D, custom built, practically maintenance free, nicely landscaped, storms screens, oil BB heat, many extras, excel cond, priv. ent. 744-2332.

MANORVILLE - 3 bdrm ranch, 1 acre, 32' country kit, cathedral ceiling, 1¼ baths, appl, bsmt, gar., assumable mtg. at negotiable rate. $43,000. Pete, Ext. 3868 or 4574 or 878-1225.

SHOREHAM - 4 bdrms, 2½ bath colonial, wooded ⅓ acre lot on quiet street, 2 car garage, eik, fam, rm w/ fp, excel school dist., low taxes, no. of 25A, $67,900. 744-4787.

WADING RIVER - Property for Sale, No. of 25A, exclusive area, lovely wooded building plot, slightly under two acres. Owner asking $18,000. 928-0158 NO BROKERS.

NORTH SHIRLEY - 2 mi. from Lab, 5 yrs. old, 3 bdrm ranch, ½ acre, fenced backyard, wood burning stove, full bsmt, dishwasher, refrig, w/d, storms & screens. $34,000. Joe, Ext. 3498 or 744-1255.

SO. CAROLINA - 2.5 acres on stocked pond in very secluded priv. subdivision near Santee. $7,500. 286-0795.

CENTRAL ISLIP NO. - 1 acre, hi-ranch, 8 rms, 1½ baths, 24x28 sunken patio, possible M/D, many extras. Yani, Ext. 2514 or 234-8564.

MASTIC BEACH - 3 bdrm ranch, corner lot, roofed patio, pleasant location near water. Low 30's. 281-7531.

ISLIP TERRACE - legal M/D ranch, 2 bdrm apt.; 1 bdrm apt side by side, fenced, fp, full bsmt, 8 car prof. parking, 2-zone heat, assume 7¼% mort, desirable location, extras. $45,00. Ext. 2077 or 581-3913 eves.

For Rent

WADING RIVER - Historic 3 bdrm house, 2 baths, fp, $395/mo. No brokers. 929-4068 or 212-348-7958 collect.

YAPHANK - German Gardens, 3rm. sm. bungalow, ideal for single. $190/mo. incl. elect. & hot water. 924-3946.

FOUR MILES - from Lab, studio apt., priv. ent., $200/mo. incl. util. Don Schuette, Ext. 3082.

SHIRLEY - 4 bdrm house, 2 baths, garage, near bay & bridge, available Sept. $350/mo. J. Carroll. Ext. 3284.

SELDEN - furnished rm. w/priv. ent, priv. bath, and kitchen privileges. Owner on premises. $175/mo. 732-3243.

FLORIDA - Seminole, 2 bdrm furnished house in retirement area, winter or yr. round rental. 475-0002 after 6.

WADING RIVER - cliff house w/panoramic water view, furn, stone fp, sleeping loft & bdrm, D/W, wash and dry, $325/mo. plus util. Sept.-June. Ext. 2440 or 929-8165.

CORAM - 2 bdrm apt., wooded view, balcony, 3 appli, central a/c, w/w, $405/mo. incl. util. w/free clubhouse facilities. Ext. 2065 or 981-1327 eves.

PATCHOGUE - 370 S. Ocean Ave; 2 bdrm apt. $325/mo. includes heat. 1 bdrm apt. $210/mo. includes heat. Security required 475-5031.

Wanted

TRUMPET -for aspiring 9 yr. old, reasonable. Bill Sanchez, Ext. 3848 or 698-3145.

HOUSEMATE - for 4 bdrm, 3 bathrm house in Coram, sundeck, laundry, dishwasher & yard. $155/mo. and share util. Ext. 2521 or 928-8379.

BIKES - want to get rid of any old bikes or parts? Dan, 744-3744.

MOTORCYCLES - Mopeds bent/broken, any age or cond. Kevin, 281-8031.

TRAILER TIRE AND RIM - 4 lug, 5.70/5.00-8, Bill, Ext. 7772 or 281-0557.

SMALL BAND SAW - reasonable. Leon, Ext. 2350.

APARTMENT - urgently needed, one bdrm for Senior Citizen widow, Sound Beach area. 744-3069.

HOME - for gentle thoroughbred german short-haired pointer, male, well-trained, good w/children. Lois, Ext. 2959 or 751-1131.

BABY CARRIAGE - stoller, car bed, 3 in 1 comb. reasonable. Dennis, Ext. 4259 or 736-2534 after 6 pm.

Car Pools

HUNTINGTON - S. Hunt. Desperately wants to join or start car pool. Possible surrounding vicinity OK. Gerry, Ext. 4471 or 4460.

CORAM - Want to start or join existing car pool. near 25 (Bonne Vie apts). Mike, Ext. 4345, 736-1647.

QUEENS BLVD - near Macy's, forming or joining 8:30 to 5:00. Jaime, Ext. 2538 or 212-651-1946.

SMITHTOWN/KINGS PARK AREA - Driver, L. Belkin, Ext. 3268.

PATCHOGUE - via E. Patchogue, Bellport has opening for paying rider. On Time. Daly, Ext. 2902.

VANPOOL - from Miller Pl., Sound Beach, Rocky Pt., to BNL. Don, Ext. 3284.

QUEENS/NASSAU - looking for 5th member. LIE # 25 (Utopia PKY) or LIE #36 (Shelter Rock Rd.) Richard Horwitz, Ext. 4134.

Lost & Found

LOST - Blk. rimmed sunglasses in Bldg. 911B E.P.&S mens rm. at 1:00 on Aug. 7th. John, Ext. 4615.

LOST - Green Macaw bird, red head & tail, answers to name "Charlie"; Sound Beach/Miller Place/Rocky Pt. area, Ext. 2345 or 744-2069.

Services

BABYSITTING - experienced mother (RN) will sit for your children in my home in Shoreham beginning Sept. Mary, 744-7542.

BABYSIT - infant to playpen age, my home Sound Beach or pre-schooler in your home. 744-3069.

Ads left out of this issue due to lack of space need not be re-submitted to appear in next week's issue. Please note that ads may not be more than 15 words long and must be received in the Bulletin office by 4:30 p.m. Friday, for inclusion in the following week's Bulletin.