

BNL's Quiet Jackhammer Wins *Discover* Magazine Award

Pictured with their prize-winning device are **RAPTOR** researchers (from left) Jim Higgins, Gaby Ciccarelli, Mano Subudhi, and Louis Gerlach.



Roger Stoutenburgh

Smashing concrete — but quietly. That's the main advantage of RAPTOR, short for rapid cutter of concrete, a unique device that has won a 2000 *Discover* Award for Technological Innovation. Developed by researchers in BNL's Energy Sciences & Technology Department (ES&T), the winning invention is a quieter, safer,

more efficient and environmentally friendly alternative to the conventional jackhammer.

Gaby Ciccarelli and Mano Subudhi, both from ES&T and both major contributors to the RAPTOR technology, attended an awards gala at the Epcot Center at the Walt Disney World Resort in Florida, on June 24, where 19

technological visionaries were honored for their innovations in eight categories: aerospace, communications, computing, energy, entertainment, health, humanitarian, and transportation — the category in which RAPTOR won.

The awards ceremony followed a two-day "Media Expo" at Disney's

Lab-Wide RHIC Fest

BNL Director John Marburger and Associate Laboratory Director for RHIC Satoshi Ozaki invite one and all to celebrate the first collisions achieved at Brookhaven's Relativistic Heavy Ion Collider (RHIC)!

**Friday, July 14
3 to 6:30 p.m.
in front of Berkner Hall**

All BNL and DOE Brookhaven Group staff, collaborators and visitors are welcome. There will be food, wine, beer, soft drinks and entertainment by The Isotope Stompers, a New Orleans style jazz band founded originally at BNL. This party should be a smashing success!
Brookhaven Lecture

On July 19, Erik Johnson, National Synchrotron Light Source Department, will give the 356th Brookhaven Lecture, "Wedding Lasers and Accelerators; the BNL DUV-FEL," at 4 p.m. in Berkner Hall.

Epcot, featuring a dozen of the most ingenious and creative innovations, including RAPTOR. Subhudi was on hand at the expo to answer questions from interested viewers, while

... a quieter, safer, more efficient and environmentally friendly alternative to the conventional jackhammer.

Ciccarelli fielded questions from the media. Several hundred people stopped at the RAPTOR exhibit, and their reactions were positive. Some typical comments: "A quiet jackhammer? I can't wait!" and "You should make a smaller one for home use," and "Wow, it's amazing!"

The awards dinner and ceremony, sponsored by the Christopher Columbus Fellowship Foundation and held at the Universe of Energy exhibit hall at Epcot, featured a huge screen on which the winners were projected as each of them accepted the award — a

"You are helping to expand our horizons and to empower future generations with new discoveries ..."

handsome, engraved glass sculpture. The approximately 500 guests had braved a severe thunderstorm to attend the ceremony.

Disney's CEO Michael Eisner congratulated the *Discover* award winners and finalists at the start of the ceremony, and President Clinton sent a congratulatory message, which said, in part, "I commend this year's honorees and the men and women of *Discover* magazine and the Christopher Columbus Foundation for the important role you play in helping us learn more about ourselves and the world around us. You are helping to expand our horizons and to empower future generations with new discoveries and insights that will help guide them in their own quest for knowledge."

As the primary innovator of RAPTOR, Ciccarelli accepted the award. In his brief remarks to the audience, Ciccarelli thanked Subudhi for his contributions to the technology; Darlene Cavalier, the producer/director of the *Discover* Magazine Awards Program;

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BNL Grout Formula Revives NJ Heat Pump Industry, Wins Award

Marita Berndt and A.J. Philippacopoulos display specimens of pipe embedded in new grout and, on the screen, a computer model of thermally induced stresses.



Roger Stoutenburgh

BNL Materials Engineer Marita Berndt, together with her team in the Energy Sciences and Technology (ES&T) Department, has received an award for a three-year research program credited with reviving the geothermal heat pump industry in northern New Jersey.

The award, from the Eastern Heating and Cooling Council, recognizes BNL's success in developing a grout formula that meets New Jersey's strict environmental standards while increasing the efficiency of this technology.

The main advantages of geothermal heat pumps are that they efficiently and cost-effectively heat and cool buildings while simultaneously decreasing fossil fuel consumption.

"... a great example of scientists and engineers working together with industry and environmental regulators to solve a real world problem."

Furnaces and air conditioners are not required with geothermal heat pumps. Unlike conventional heat pumps, geothermal systems use the ground as a heat source or heat sink, rather than outside air. Water or antifreeze-filled pipes draw heat from or dump heat into the ground 200 to 300 feet below the surface.

The pipes, or "loop," are located in a borehole, which is filled with grout to provide heat transfer and to protect underground water supplies from contamination. If the

The new grout has already been used successfully in several residential and commercial projects throughout the U.S.

grout surrounding the loop cracks or shrinks, however, surface runoff contaminants can be channeled directly into groundwater, or flow between different aquifers may occur. This concern and the poor performance of conventional grouts led the New Jersey Department of Environmental Protection (NJDEP) to ban their use in consolidated formations in 1998.

"The whole industry came to a grinding halt," says Berndt, who was contacted by the New Jersey Heat Pump Council for help. BNL was already working on grouts with increased thermal conductivity to reduce bore length requirements. These grouts also had advantages in terms of sealing capability, reduced shrinkage, and improved crack resistance. So BNL performed more tests to ensure that their formulation would meet the NJDEP requirements.

"This is a great example of scientists and engineers

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74 BNLe rs Earn \$200 Perfect-Attendance Bond



Congratulations to the 74 full-time employees who have each earned BNL's 1999 Perfect Attendance Awards and a \$200 savings bond. Pictured above are some of the winners. Particular kudos go to Paula Jean Pozzoli, Administrative Support Division, and Phyllis Tinsley-Smith, Biology Department, for leading the group with their record-breaking nine and eight consecutive years of perfect attendance, respectively.

This year is the second in which members of the Suffolk County Security Police Association in the Safe-guards & Security Division have been among those eligible for this prize. The award was first given in 1992, when 15 full-time weekly employees on the technical and clerical schedules were recognized for their perfect atten-dance during 1991. In 1995, these employees and those from the then Oil, Chemical & Atomic Workers Interna-tional — now known as the Paper, Allied-Industrial, Chemical & Energy Workers International — were joined in being eligible for the award by BNL employees repre-sented by the International Brotherhood of Electrical Workers.

As usual, the list of this year's winners highlights how many times an employee has previously won this award. However, employees who became eligible for it after its inception have often served BNL with additional years of perfect attendance that are on record elsewhere.

- **Administrative Support Division:** Samuel Cortes³, Ulises Feliciano², Lamar Gardner, Dhruva Ghimiray², Thomas Johnson, Brian Mayo⁴, Joseph Modjeska⁵, Jerome Quigley⁵, Charles Whiting², Clarence Wilkins, and Shelby Williams⁵;
- **Biology Department:** Christine Metz and Phyllis Tinsley-Smith⁸;

- **Collider-Accelerator Department:** Walter Lamar and John Stehle²;
- **Central Shops Division:** William Dalton, Gerald Greenidge⁵, Christine King³, Louis Pergola, Richard Ryder⁵, Randolph Seibel⁵, and John Walsh²;
- **Emergency Services Division:** Roy Barone⁵, John Foley³⁺, and Michael Hickey;
- **Environment, Safety, Health & Quality Office:** Sherry Johnson;
- **Finance & Administration Office:** Regina Paquette²;
- **Information Services Division:** Jerry Gaeta, Kevin Hester, Cornelius Jackson⁵, and Alex Reben⁵;
- **National Synchrotron Light Source Department:** Joan Marshall³ and John Vaughn²;
- **Occupational Medicine Clinic:** Janet Sikora⁴;
- **Plant Engineering Division:** Stephen Barcelo, Kerry Botts²⁺, John Brady², Robert Browngardt², Herman Butts⁵, James Callihan³⁺, Robert Callister, Victor Cassella²⁺, Gary Connell, Thomas Crews⁴, Frank De Rosa, Susan Evans⁵, Frank Gaetan⁴, Hubbard Harris, Jerry Hobson³⁺, Chris Luoni, Richard Lutz⁵, Lisa Metz, Stephen O'Kula³⁺, Thomas Pope, Jeffrey Raynor³⁺, Brian Rohena⁵, William Schmidt⁵, Franklin Snell³⁺, James Sorohan, Gregory Stawski, and Min-Hsiung Yang³⁺;
- **Safeguards & Security Division:** Christopher Congemi², Tracey Fountaine, Matthias Harrington, Lawrence Musso, Mark Opisso², Victor Pineiro, and Lisa Smith²;
- **Staff Services Division:** Selestine Brown⁴, Stanley Hanlon, Paula Pozzoli⁹, and Veronica Varlack⁵;
- **Superconducting Magnet Division:** Paul Philipsberg² and James Stolfi².

² two consecutive years
³ three consecutive years
⁴ four consecutive years
⁵ five consecutive years
⁷ seven consecutive years
⁸ eight consecutive years
⁹ nine consecutive years
+ nonconsecutive years

New Grout Wins (cont'd)

working together with industry and environmental regulators to solve a real world problem," Berndt says.

The new grout formula, called Mix 111, is composed of cement, water, silica sand, and small amounts of superplasticizer and bentonite. BNL does not manufacture the grout, but rather, has made the formula avail-able to the industry.

"The objective was to come up with something people in the geothermal heat pump industry could easily use. They can buy the ingredients and mix the grout themselves to keep the cost down," Berndt says.

Experimental tests have shown that Mix 111 has a lower infiltration rate, bonds more firmly to pipes, and is much more resistant to shrinkage and failure than conventional grouts are. Numerical analysis was performed by A.J. Philippacopoulos, also of ES&T, to examine heat transfer characteris-tics and thermal stresses developed in the grout under operational conditions. Furthermore, when field tested in two different climates and geological ar-eas, Mix 111 was 29 to 35 percent more efficient at heat transfer than traditional grout is.

The field tests were conducted in collaboration with Sandia National Laboratory and Oklahoma State Uni-versity. Cost analysis and thermal-re-sistance tests were performed by the University of Alabama.

"By combining experimental work, numerical modeling, field verification and economic studies, we were able to present a comprehensive view of the material to regulators and end users," Berndt says.

Mix 111 is now approved for use in New Jersey. It has already been used successfully in several residential and commercial projects throughout the U.S., and has proven to be cost-effec-tive. Several companies overseas have also expressed interest in the material.

The research was sponsored by the DOE's Office of Geothermal and Wind Technologies. — Karen McNulty

In Memoriam John Schlichtcroll

John Schlichtcroll, a carpenter in the Plant Engineering Division, died on May 3 after suffering com-plications following heart bypass surgery. He was 47.

Schlich-tcroll joined BNL's Plant Engineering Division in 1989 and worked as a carpenter for the next 11 years. His supervisor, Peter Stelmas-chuk, remembers him as "always trying to do the best he could at whatever job he was assigned to do." Co-workers regarded him as a devoted family man who will be missed at the Lab.

A resident of Mount Sinai, Schlichtcroll is survived by his wife Joan and three children: Kristen, Janelle, and Michael.



Research Institute (GRI) of Chicago under a Cooperative Research and Development Agreement. Until ear-lier this year, the RAPTOR project had been managed by Robert Hall, who submitted the winning applica-tion to *Discover*.

GRI holds the license to the tech-nology, which the company plans to commercialize within a year. Other sponsors for the development of RAP-TOR are Keyspan Energy Company, Consolidated Edison Company of New York, and Southern California Gas

Quiet Jackhammer Wins *Discover* Award

and his son, explaining that he was wearing his 12-year-old son's pants because his own trousers got soaked in the torrential rain. Ciccarelli showed off his somewhat too short pants on the big screen, gaining laughter and applause from the audience.

One of Five DOE Winners

Five DOE inventions were among the 19 *Discover* award winners and finalists. Energy Secretary Bill Richardson commented specifically on RAPTOR, "This *Discover* Award is a measure of the science and technology leadership of our National Laborato-ries. Brookhaven Laboratory and its industrial partners are improving people's lives by developing technology that not only is quieter, safer and more environmentally friendly, but can revo-lutionize the construction industry."

Ciccarelli commented, "Because RAPTOR will be relatively quiet com-pared to a jackhammer, it can be used at night, resulting in decreased traffic congestion. It will also be fast and efficient — its operator can roll the device down the concrete pavement while firing its projectiles at the rate of six shots per minute, breaking up a

standard three foot by three foot open-ing in just under ten minutes."

Entries for the 2000 *Discover* Awards exemplified the vast prolif-eration of technology in virtually ev-ery area of life. The winner and final-ist named in each category were chosen from thousands of noteworthy inno-vations by *Discover's* editorial panel and an outside panel of evaluators. All of the winners and finalists are pro-filed in the July issue of *Discover* maga-zine.

RAPTOR Technique

The revolutionary RAPTOR tech-nology uses a helium-driven gas gun to accelerate projectiles such as steel nails to about 5,000 feet per second. The gas gun uses a free-moving piston within a tube to compress helium from between 30 and 50 pounds per square inch (psi) to 15,000 psi and over 1,000 degrees Fahrenheit in a fraction of a second. This rapidly compressed he-lium drives the projectiles. The 6.5-foot long, 265-pound device can break up six-inch-thick concrete. Research-ers are confident that the device can be scaled up for even thicker concrete demolition.

Besides decreasing noise and traf-fic congestion, RAPTOR's advantages over the conventional jackhammer include reducing energy use, air pollu-tion, worker injury and operating costs. Conventional jackhammers run on air supplied by a compressor, which uses gasoline or diesel fuel, while the new device runs on environmentally ben-ign compressed air and helium.

In addition to using RAPTOR for resurfacing roads and bridge decks, the technology may eventually be used in underground mining and in search and rescue missions.

Origin, Development

James Powell, a retired nuclear engineer from BNL, conceived the original idea for breaking concrete with high-speed projectiles. Ciccarelli came up with the concept of using a free-piston gas gun for accelerating the projectiles, resulting in a more practi-cal and less costly device, while Subudhi was the principal investiga-tor on the project.

Since 1996, Ciccarelli and Subudhi, along with Jim Higgins and Louis Gerlach, both from ES&T, have been developing the device with the Gas

(cont'd)

2000 BNL Water Quality Consumer Confidence Report

This special supplement to the Brookhaven Bulletin is the Lab's second annual Consumer Confidence Report, which provides an overview of the water quality during calendar year 1999. Because the Lab is a drinking-water supplier, BNL is required by the federal Safe Drinking Water Act (SDWA) of 1976, as amended in 1996 to produce an annual report on the quality of its drinking water.

Last year, as in the past, BNL's tap water met all state drinking-water quality standards. The Lab's Plant Engineering (PE) Division, which is responsible for the Lab's drinking water, is proud to report that BNL's water system has never violated a maximum contaminant level or any other water-quality standard.

The report's purpose is to inform drinking-water consumers where their water comes from, what analytical tests are conducted to ensure its safety, what those tests reveal about the water, and how those results compare to regulatory standards.

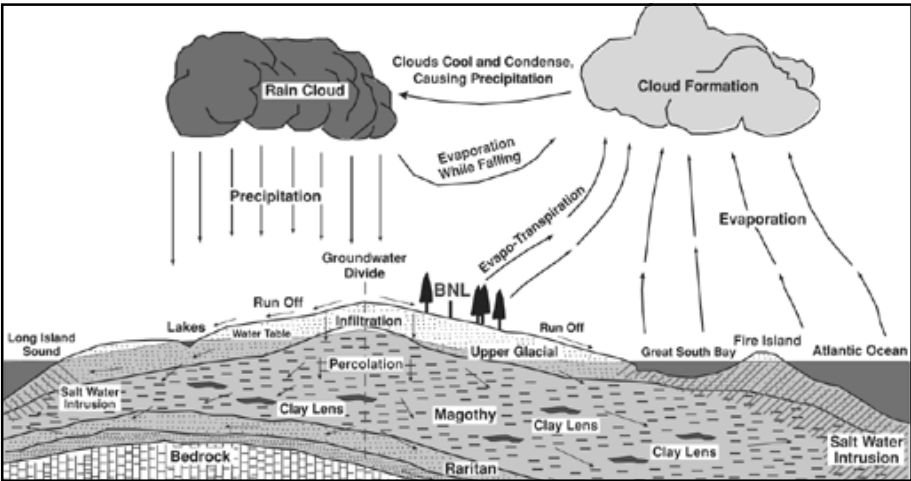
In addition, the report reminds water consumers of the importance and need to protect drinking-water sources.

Among its other responsibilities, PE is committed to providing all employees, facility-users, guests, residents, and other visitors with a safe and reliable drinking-water supply while they are on site. To do so, PE regularly tests BNL's drinking water using approved independent laboratories and in-house testing, thereby ensuring that the Lab's drinking water meets all local, state and federal standards for drinking-water quality. In addition, PE works with BNL's Environmental Restoration Division and the Environmental Services Division to ensure that the Lab's potable water supply is not impacted by groundwater contamination on site.

For additional information and/or copies of the complete analysis of 1999 drinking-water samples, contact: Ed Murphy, PE Division Manager, Ext. 3466 or etmurphy@bnl.gov; William Chaloupka, PE Assistant Manager of Operations & Environment, Ext. 7136 or chaloupka@bnl.gov; Bob Lee, Deputy Manager of the Environment Services Division, Ext. 3148 or blee@bnl.gov; or the Suffolk County Department of Health Services, (631) 853-2251.

Where Does Brookhaven Lab's Drinking Water Come From?

All of the water supplied to BNL comes from beneath the ground and, hence, is referred to as groundwater. The water is stored beneath the ground in a sandy, geological formation known as an aquifer. Water in the aquifer originates as precipitation that slowly percolates down through the soil into the aquifer. Hydrogeologists estimate that Long Island's aquifer system contains 70 to 90 trillion gallons of water, much of which is thousands of years old and entirely free of contamination. This is enough water to supply Long Island's population for centuries, even if it never rained or snowed again. The depth of Long Island's aquifer system varies: at a depth of approxi-



mately 2,000 feet, it is at its deepest along the south shore. Along the north shore, the aquifer is at its most shallow at 600 feet.

The Long Island aquifer system is made up of three primary formations which lie one on top of the other. At BNL, from the shallowest to the deepest, these aquifer layers are:

- **Glacial:** From the surface to about 150 feet down, the Glacial formation contains the youngest or newest water in the groundwater system. Virtually all private wells on Long Island draw their water from this portion of the aquifer, as do all six of the Lab's drinking-water wells.
- **Magothy:** From about 150 feet to a depth of 1,000 feet, the Magothy formation is the largest of the three layers and holds the most water, much of which is hundreds of years old. The Suffolk County Water Authority draws water from here.
- **Lloyd:** From 1,000 to about 1,450 feet, the Lloyd formation is largely untapped. It contains the oldest water, some of which is more than five thousand years old.

How Does BNL Supply Its Drinking Water? The Supply System Described

The Lab's drinking-water supply system is the only source of what is called potable water for the on-site transient and resident population of approximately 3,500 people. In 1999, the amount of potable water produced was 784 million gallons, which equals, on average, 65 million gallons per month or 2.2 million gallons per day. Due to demand, flow varies from 45 million gallons per month, which is 1.5 million gallons per day, to over 97 million gallons per month, or 3.2 million gallons per day. In addition to being consumed by the people on site, potable water is used within cooling towers and for cooling various pieces of on-site equipment, such as the main-magnet heat exchangers for the Alternating Gradient Synchrotron. To produce this water, the Lab employs a drinking-water supply system, the centerpiece of which is the Water Treatment Facility (WTF). It is located on Upton Road in Bldg. 624.

Designed to remove iron and manganese from the Lab's source water, the WTF was constructed in 1963 and has undergone a series of upgrades over the years. The most recent upgrade came in 1995-96, when the aeration tower and a new clear well were added (see following list). The Lab's drinking-water supply system is made up of the following:

Potable-Water Supply Wells

There are six drinking-water wells on site: Wells numbered 4, 6 and 7 are located west of Upton Road and supply water to the WTF. Wells numbered 10, 11 and 12 are located along East

Fifth Avenue, are equipped with activated carbon filters, and, because they pump water that is low in iron, supply water directly to the system. Water is drawn using electrically driven, vertical turbine deep-well pumps, each having an auxiliary drive engine and a design rating of 1,000 gallons per minute (gpm).

Water Treatment Facility (WTF)

The Lab's WTF employs the following components to perform the functions described:

- **Aeration tank:** reduces carbon dioxide gas and aids in oxidation.
- **Rapid-mix tank:** mixes treatment chemicals that are added to the water.
- **Retention tank:** holds the water long enough to allow chemicals enough time to react and form "floc." Flocculation is a process by which very small hydroxide particles stick together to form larger, more easily settled particles called floc.
- **Slow-mix tank:** mixes gently to aid in the formation of floc.
- **Rapid-sand filter:** removes iron floc by pass-

ing water through eight filter cells containing sand and anthracite.

- **Wet well with lift pumps:** stores filtered water before it is pumped into the aeration towers.
- **Aeration towers:** remove any volatile organic compounds (VOCs) by spraying the water down over whiffle ball-like fill while air flows upward through the water spray.
- **Clear well:** stores the finished water, before final chlorination and distribution.

Water-Treatment Chemicals

- **Sodium hypochlorite:** kills bacteria and oxidizes iron. Iron removal by oxidation and filtration reduces the water's iron concentration from groundwater's 3-4 milligrams per liter (mg/l) to the "finished" water's 0.03 mg/l. To accomplish this, the ferrous iron that is dissolved in groundwater is readily oxidized to form insoluble ferric hydroxides which flocculate and settle.
- **Lime:** raises the water's pH and softens the water.
- **Polymer:** aids in the flocculation process.

Water Storage Tanks

- **300,000-gallon tank:** was built by Pittsburgh-Des Moines Steel for the U.S. Army in 1941, when the site was Camp Upton. Located on Upton Road next to Police Headquarters, Bldg.

50, this tank is 124 feet to the high-water level, and its bowl is 40 feet in diameter.

- **1,000,000-gallon tank:** was built by Chicago Bridge & Iron in 1985 and is located by the intersection of Cornell and North Sixth Street. The bottom of the tank is 126 feet above land surface, and the bowl is 75.5 feet in diameter.

Carbon Filters

To remove VOCs, carbon adsorption filters are installed on wells numbered 10, 11 and 12, the three wells that discharge directly to the drinking-water distribution system.

Distribution Piping

The site has approximately 45 miles of drinking-water distribution pipe. The piping is a mix of cast iron dating from the site's World War II Camp Upton days, transite, plastic, and cement-lined ductile iron. When drinking-water distribution pipe is added or replaced, cement-lined, ductile-iron pipe is used.

Lead in Pipes

All in-service drinking-water fountains on site produce water that does not exceed the drinking-water standard for lead. However, some of BNL's drinking-water fountains were taken out of service and remain out of service because what comes out of the spout exceeds the drinking-water standard for lead. This is *not* because the Lab's potable water contains lead. This is as a result of the past practice of using solder containing lead to join copper pipe, such as the cooling coil, within the fountain. Regardless, if you are concerned about lead in your drinking water, then let the tap run for at least two minutes before consuming the water.

BNL's Water System Statistics		
Owned by the U.S. Department of Energy and overseen the DOE's Brookhaven Group, Bldg. 464, BNL's water system serves a population of approximately 3,500 people and is identified as federal public water system no. 5111891.		
facility	English units	metric units
• Water Treatment Facility	6,000,000 gal./day	22,710,000 l/day
• Each of the six wells	1,200 gal./min.	76 l/s
• Storage tank #1	300,000 gal.	1,152,160 l
• Storage tank #2	1,000,000 gal.	3,790,00 l
• Activated carbon filters on wells #10, 11, & 12		
carbon flow	40,000 lbs.	18,144 kg
flow	1,000 gpm	63 l/s
• Air stripping using 2 packed towers		
water flow	2,400 gal./min.	151 l/s
air flow	11,250 scfm	5,309 m³/sec.
• Clear well	250,000 gal.	947,500 l
• Distribution system	45 mi.	72 km
• Pressure	55 to 70 psi	379 to 483 kPa

BNL's Commitment to Its Drinking-Water Consumers: Safe, Reliable Drinking Water

BNL’s Drinking Water Is in Full Compliance With All Regulations

In 1999, BNL’s drinking water was in full compliance with all county, state and federal regulations.

To ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (EPA) and the New York State Department of Health Services (NYSDHS) have prescribed regulations that limit the amounts of certain contaminants in water provided by public water systems, such as BNL’s. To provide the same protection to those who drink bottled water, the U.S. Food & Drug Administration and NYSDHS have established regulations to limit contaminants in bottled water.

Each drinking-water contaminant has an allowable maximum contaminant level (MCL). Drinking water that exceeds MCLs for one or more compounds is in violation of the law.

No MCLs were reached or exceeded by BNL’s drinking water in 1999, and there were no violations of any government regulations. Of the more than 80 drinking water contaminants for which testing is required, only the nine compounds listed in the table (center, below) were detected in the Lab’s drinking water in 1999.

Understanding Water Contents

While Long Island draws its drinking water from wells tapping into the aquifer (see “Where Does Brookhaven Lab’s Drinking Water Come From?” on page 1), other sources of tap and bottled drinking water include rivers, lakes, streams, ponds, reservoirs, and

springs. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals, and, in some cases, radioactive material. And, water can pick up substances resulting from human activity or the presence of animals.

Contaminants that may be present in water include:

- **Microbial contaminants:** bacteria and viruses, which may come from sewage, livestock operations, and wildlife.
- **Inorganic chemical contaminants:** dissolved salts and metals, which can occur naturally or result from: storm-water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, and/or farming.
- **Pesticides & herbicides:** substances for eliminating problem insects and plants, respectively; may come from a variety of sources, such as agricultural operations, storm-water runoff, and/or residential uses.
- **Organic chemical contaminants:** natural and synthetic compounds, including what are called volatile organic compounds (VOCs); these chemicals are by-products of industrial processes and petroleum production, and can also come from gas stations, storm-water runoff, and septic systems.
- **Radioactive contaminants:** can be naturally-occurring, or from oil and gas production, mining activities, nuclear facilities, etc.

As a result, water from any source

is often “finished,” or treated to remove substances or reduce their concentration, before that water is fit for human consumption (see “How Does BNL Supply Its Drinking Water?” on page 1). Regardless, drinking water, including bottled water, may reasonably be expected to contain at least small amounts of contaminants. The presence of contaminants, however, does not necessarily indicate that the water poses a health risk.

Some people may be more vulnerable to disease-causing microorganisms or pathogens in drinking water than others. People whose immune systems are compromised may be particularly at risk of infections. Those people include: cancer patients who are undergoing chemotherapy, people who have undergone organ transplants, persons with HIV/AIDS or other immune system disorders, and some elderly people and infants.

These people should seek advice from their health-care providers about drinking water. Guidelines from the EPA and the U.S. Centers for Disease Control on ways to lessen the risk of

infection by cryptosporidium, giardia, and other microbial pathogens is available from the EPA’s Safe Drinking Water Hotline, (800) 426-4791.

More information about drinking-water contaminants, potential health effects, etc. can be obtained from the EPA at www.epa.gov/safewater on the World Wide Web; or from the NYSDHS at www.health.state.ny.us.

Definitions of Terms

- **Maximum contaminant level (MCL):** The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to what is called the maximum contamination level goal (MCLG) as possible.
- **Maximum contamination level goal (MCLG):** The level of a contaminant in drinking water below which there is no known or expected risk of health. MCLGs allow for a margin of safety.
- **Treatment technique:** A required process intended to reduce the level of a contaminant in drinking water.
- **Action level (AL):** The concentration of a contaminant which, if exceeded, then triggers treatment or other requirements that a drinking-water supplier must follow.
- **Milligrams per liter (mg/l):** Equals one part of liquid per million parts of liquid, or parts per million (ppm).
- **Micrograms per liter (µg/l):** Equals one part of liquid per billion parts of liquid, or parts per billion (ppb).
- **Picocuries per liter (pCi/L):** A measure of radioactivity in water.
- **Millirems per year (mrem/yr):** A measure of radiation absorbed by the body.
- **Million fibers per liter (MFL):** A measure of the presence of asbestos fibers longer than 10 micrometers.
- **Nephelometric turbidity unit (NTU):** A measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.
- **90th percentile value:** A percentile is a value on a scale of 100 that indicates the percent of a distribution that is equal to or below it. The 90th percentile is equal to or greater than 90 percent of the lead and copper values detected at your water system. The values reported for copper and lead represent the 90th percentile.

<i>Analytical Data</i> Organic Compounds, Micro-Extractables		
<i>With one exception noted below and discussed (table, right), the following were not detected (ND) in the finished water distributed from the Water Treatment Facility, or in carbon-filtered water drawn from BNL wells number 10, 11 and 12.</i>		
compound	level	µg/l
Dichlorodifluoromethane	ND	5
Chloromethane	ND	5
Vinyl Chloride	ND	2
Bromomethane	ND	5
Chloroethane	ND	5
Fluorotrichloromethane	ND	5
1,1-dichloroethene	ND	5
Dichloromethane	ND	5
trans-1,2-dichloroethene	ND	5
1,1-dichloroethane	ND	5
cis-1,2-dichloroethene	ND	5
2,2-dichloropropane	ND	5
Bromochloromethane	ND	5
1,1,1-trichloroethane	0.5	5
Carbon Tetrachloride	ND	5
1,1-dichloropropene	ND	5
1,2-dichloroethane	ND	5
1,1,2-trichloroethane	ND	5
1,2-dichloropropane	ND	5
Dibromomethane	ND	5
trans-1,3-dichloropropene	ND	5
cis-1,3-dichloropropene	ND	5
1,1,2-trichloroethane	ND	5
Trihalomethanes	ND	100
1,1,2,2-tetrachloroethane	ND	5
1,3-dichloropropane	ND	5
Chlorobenzene	ND	5
1,1,1,2-tetrachloroethane	ND	5
Bromobenzene	ND	5
1,1,2,2-tetrachloroethane	ND	5
1,2,3-trichloropropane	ND	5
2-chlorotoluene	ND	5
4-chlorotoluene	ND	5
1,3-dichlorobenzene	ND	5
1,4-dichlorobenzene	ND	5
1,2-dichlorobenzene	ND	5
1,2,4-trichlorobenzene	ND	5
Hexachlorobutadiene	ND	5
1,2,3-trichlorobenzene	ND	5
Benzene	ND	5
Toluene	ND	5
Ethylbenzene	ND	5
m-xylene	ND	5
p-xylene	ND	5
o-xylene	ND	5
Styrene	ND	5
Isopropylbenzene	ND	5
n-propylbenzene	ND	5
1,3,5-trimethylbenzene	ND	5
tert-butylbenzene	ND	5
1,2,4-trimethylbenzene	ND	5
sec-butylbenzene	ND	5
p-isopropyltoluene	ND	5
n-butylbenzene	ND	5
methyl tert. butylether	ND	50

The Nine Compounds Detected In BNL’s Drinking Water in 1999

<i>Inorganic contaminants regulated in the drinking-water distribution system</i>			
substance	MCLG	MCL	BNL water
• nitrates	10 mg/l	100 mg/l	0.25-0.59 mg/l
<i>major sources in drinking water:</i> Runoff from fertilizer use; leaching from septic tanks, and/or sewage; erosion of natural deposits.			
<i>possible health effects:</i> Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, then may die. Symptoms include shortness of breath and blue baby syndrome.			

<i>Organic contaminants regulated in the drinking-water distribution system</i>			
substance	MCLG	MCL	BNL water
• 1,1 trichloroethane			
U.S. EPA	200 µg/l	200 µg/l	0.5 µg/l
NYSDOH	5 µg/l	5 µg/l	0.5 µg/l
<i>major sources in drinking water:</i> Discharge from metal degreasing sites and other factories.			
<i>possible health effects:</i> Some people who drink water containing 1,1,1 trichloroethane in excess of the MCL over many years could experience problems with their liver, nervous system, or circulatory system.			

<i>Radioactive contaminants</i>			
substance	MCLG	MCL	BNL water
• beta/photon emitters	0 pCi/l	50* pCi/l	2.6-7.9 pCi/l
<i>major sources in drinking water:</i> Decay of natural and man-made deposits.			
<i>possible health effects:</i> Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta and photon emitters in excess of the MCL over many years may have an increased risk of getting cancer.			

*Note: The U.S. EPA and New York State consider 50 pCi/l to be of concern for beta particles.

<i>Unregulated contaminants</i>			
substance	MCLG	MCL	BNL water
• chlorides	—	250 mg/l	12.6-21.4 mg/l
<i>major sources in drinking water:</i> Naturally occurring or indicative of road-salt contamination.			
<i>possible health effects:</i> No health effects. The MCL for chloride is the level above which the taste of water may become objectionable. In addition to the adverse taste effects, high chloride concentrations in water contribute to the deterioration of domestic plumbing and water heaters. Elevated chloride concentrations may also be associated with the presence of sodium in drinking water.			
• iron	—	300 µg/l	30-50 µg/l
<i>major sources in drinking water:</i> Naturally occurring.			
<i>possible health effects:</i> Iron has no health effects. When iron reaches 1,000 µg/l, a substantial number of people will notice the bitter astringent taste of iron. At this concentration, it also imparts a brownish color to laundered clothing and stains plumbing fixtures with a characteristic rust color. Staining can result at levels of 50 µg/l, which is lower than those detectable to taste buds. Therefore, MCL of 300 µg/l represents a reasonable compromise, as, at this level, adverse aesthetic effects are minimized. Many multivitamins contain 3,000-4,000 µg/l of iron per capsule.			
• sodium	—	—	9.6-14.0 mg/l
<i>major sources in drinking water:</i> Naturally occurring, or due to road salt, water softeners, and/or animal waste.			
<i>possible health effects:</i> Water containing more than 20 mg/l of sodium should not be used for drinking by people on severely restricted sodium diets. Water containing more than 270 mg/l of sodium should not be used for drinking by people on moderately restricted sodium diets.			
• sulfates	—	250 mg/l	7.8-13.0 mg/l
<i>major sources in drinking water:</i> Naturally occurring.			
<i>possible health effects:</i> High concentrations of sulfate in drinking water can have three effects: first, water containing appreciable amounts of sulfate tends to form hard scales in boilers and heat exchangers; second, sulfates affect the taste of water; and, third, sulfates can act as a laxative if intake is excessive. The laxative effect of sulfates is usually observed in transient users of a water supply, as people who are accustomed to high sulfate levels in drinking water do not respond adversely. Diarrhea may result from sulfate levels greater than 500 mg/l, but, typically, from levels nearer 750 mg/l.			

<i>Contaminants regulated at the drinking-water consumers’ tap**</i>				
substance	MCLG	at 90th percentile	# BNL samples exceeding AL	value at 90th percentile
• copper	0 mg/l	1.3 mg/l	0 out of 20	0.05 mg/l
<i>major sources in drinking water:</i> Corrosion of household plumbing.				
<i>possible health effects:</i> Copper is an essential nutrient, but some people who drink water containing it in excess of the action level over a relatively short time could experience gastrointestinal distress. Some people who drink water containing copper in excess of the action level (AL) over many years could suffer liver or kidney damage. People with Wilson’s disease should consult their personal physician.				
• lead	0 µg/l	15 µg/l	0 out of 20	1.8 µg/l
<i>major sources in drinking water:</i> Corrosion of household plumbing.				
<i>possible health effects:</i> Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight defects in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.				

**Note: Sampling was done in 1997 and will be repeated in July 2000.

<i>Analytical Data</i> Inorganic Chemicals, Bacteria, Radiation		
<i>The following are the average values detected in the finished water distributed from the Water Treatment Facility or in carbon-filtered water drawn from BNL wells number 10, 11 and 12.</i>		
compound	average	standard
<i>Water-Quality Indicators</i>		
Tot. coliform	ND	ND
Color	< 5 units	15 units
Odor	0 units	3 units
Cyanide	<10 µg/l	NS
Conductivity	236 µmhos	NS
Chlorides	16.8 mg/l	250 mg/l
Sulfates	9.1 mg/l	250 mg/l
Nitrates	0.40 mg/l	10 mg/l
Ammonia	<0.02 mg/l	NS
pH	8.1-8.5 SU	NS
Methylene blue active substances		
	<0.04 mg/l	NS
<i>Metals</i>		
Antimony	<5.9 µg/l	6 µg/l
Arsenic	<3.0 µg/l	50 µg/l
Barium	<0.2 mg/l	2 mg/l
Beryllium	<3.0 µg/l	4 µg/l
Cadmium	<5.0 mg/l	5 mg/l
Chromium	<0.01 mg/l	0.1 mg/l
Fluoride	<0.1 mg/l	2.2 mg/l
Iron	0.03 mg/l	0.3 mg/l
Lead	<1.0 µg/l	15 µg/l
Manganese	<0.01 mg/l	0.3 mg/l
Mercury	<0.2 µg/l	2 µg/l
Nickel	<0.04 mg/l	0.1 mg/l
Selenium	<5.0 µg/l	50 µg/l
Sodium	10.7 mg/l	NS
Thallium	<1.9 µg/l	2 µg/l
Zinc	<0.02 mg/l	5 mg/l
<i>Radioactivity</i>		
Gross alpha	<0.86 pCi/l	15 pCi/l
beta	<3.27 pCi/l	50 pCi/l
tritium	<339 pCi/l	20,000 pCi/l
strontium-90	<2.12 pCi/l	8 pCi/l
<i>Other</i>		
Asbestos	< 0.42 M.fibers/l	7 M.fibers/l
Calcium	11.6 mg/l	NS
Alkalinity	60.3 mg/l	NS
<: less than the detection limit. NS: drinking-water standard not specified. ANR: analysis not required. ND: not detected. SU: standard units.		

Russian Music, 7/12

Cellist Katie Schlaikjer and pianist Oksana Ezhokina will perform music for cello and piano by Prokofiev and Shostakovich, in the next noon recital in Berkner Hall.

Schlaikjer has performed extensively as a member of the Avalon String Quartet, which was awarded the Concert Artist's Guild's grand prize in 1999. She also participated in the Ravinia festival and Isaac Stern's Chamber Music Encounters both in Jerusalem and at Carnegie Hall. Schlaikjer left the quartet in October of 1999 to focus on cello studies with Timothy Eddy.

Ezhokina performed at BNL as a soloist last year and with the Stony Brook Trio this spring. Born in Russia, she came to the U.S. in 1993 to study with Leonard Richter. She received a master's degree from North Illinois University and in 1999 joined the doctoral program at SUNY Stony Brook.

Lunch may be taken into the auditorium for this free noon recital.

BERA Events

Buy tickets for BERA events in the BERA Sales Office in Berkner Hall, weekdays, 9 a.m.-3 p.m. For more information, call Andrea Dehler, Ext. 3347, or M. Kay Dellimore, Ext. 2873.

Book Fair Today

Drop in to the Book Fair in Berkner Hall today, June 30th, between 10 a.m. and 3:00 p.m. The books are fun reading: children's stories, cookbooks, and *The New York Times* best sellers. Some gift items are available. Credit cards and checks will be accepted.

L.I. Balloon Festival Tickets

Buy reduced-rate tickets to the Waldbaum's Balloon & Music Festival, August 18-20, at Calabro Airport, Shirley. Adults save \$6, children, \$5.

Afraid to Drink the Water?

Don't be, as the Lab's drinking water is in full compliance with all county, state and federal regulations. To find out more about the quality of BNL's drinking water, look for the 2000 BNL Water Quality Consumer Confidence Report, which is a special edition of the Bulletin delivered along with this Friday's issue.

Benefits Office Opens New Website

The Benefits Office in the Human Resources Division now has its own web page with information relating to insurance coverage, retirement benefits, and much more that is of use to both active and retired employees. This site can be found from the Human Resources Directory web page or directly at :<http://www.bnl.gov/PERSONNEL/Benefits/benefit1.html>.

BROOKHAVEN BULLETIN

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On the World Wide Web, the Brookhaven Bulletin is located at www.pubaf.bnl.gov/bulletin.html. A Weekly Calendar listing scientific and technical seminars and lectures is found at www.pubaf.bnl.gov/calendar.html.

Indian Classical Sitar Concert Tomorrow

The BERA Indo-American Association (IAA) is sponsoring an Indian Sitar Music Concert on Saturday, July 1, at 7 p.m. in Berkner Hall. Featured will be music by the distinguished sitarist Krishna Mohan Bhatt, accompanied by Samir Chatterjee, a leading tabla (drum) player.

Tickets are \$12 for adults, \$10 for IAA members, and \$8 for students. Anyone 6 and under will be admitted at no charge. For tickets or more information, contact Achyut Topé at Ext. 5672, or at 345-2677. Tickets may also be purchased at the door.

July 4th Barbecue

On Tuesday, July 4, at 5 p.m., the Hospitality Committee invites all families living on site to a BBQ in the apartment area. Bring salad or desert dishes to serve eight people. For details, call Mimi Luccio, 821-1435, or Shashi Somani, Ext. 1056.

Science Museum Open

Starting on Thursday, July 13, and continuing through August 31, the Science Museum will be open from 1 to 2 p.m. to all BNL employees, retirees, guests, users, subcontractors, and their families. Children 14 and under must be accompanied by a parent or guardian.

Arrivals & Departures

Arrivals

Ping He Coll.-Accel.
Jennifer L. Higbie Env. Restor.
Randall J. McNally Biology
Wonho Oh Env. Sciences
Timothy B. Onasch Env. Sciences
Andrei R. Studenov Medical

Departures

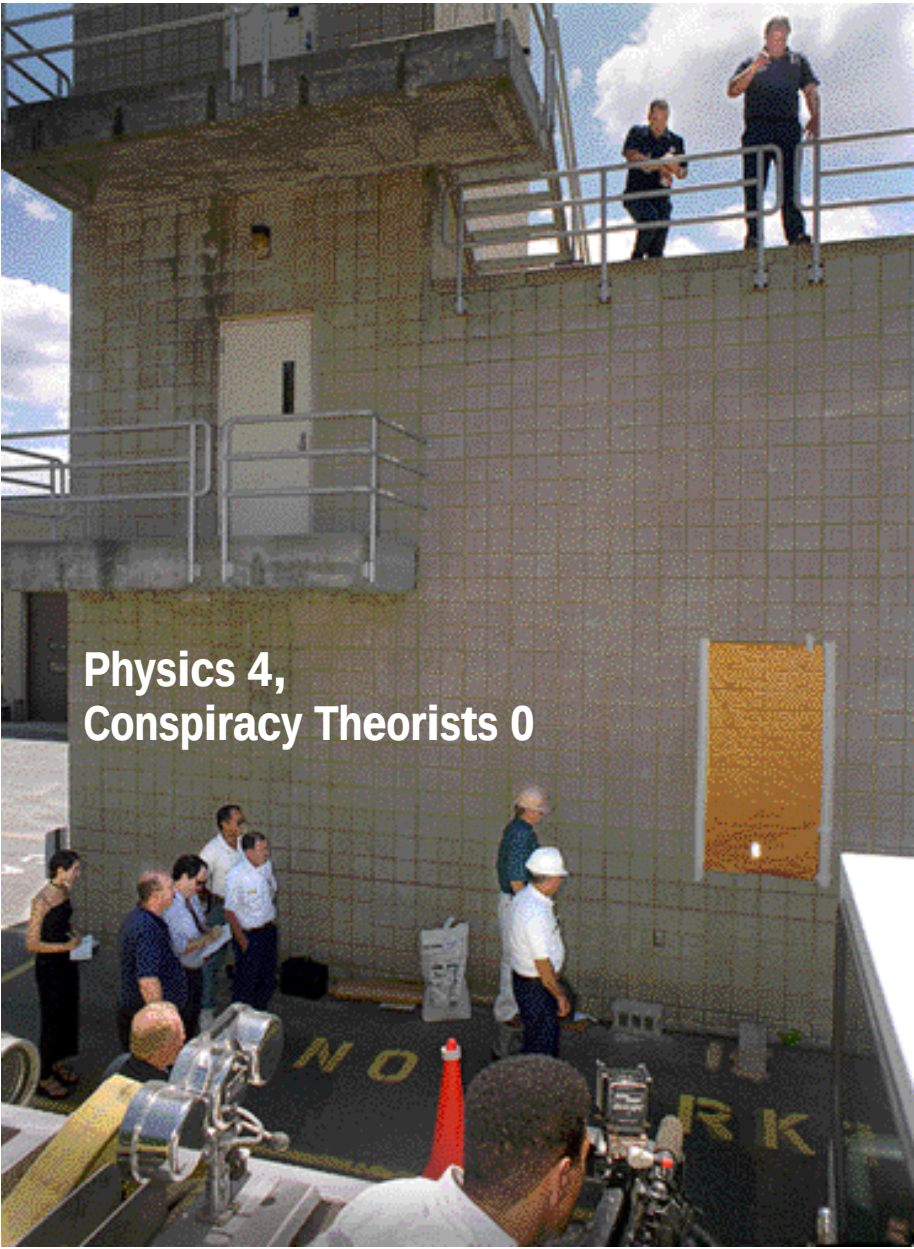
Donna M. Le Doux ... Business Systems
Stephen K. Sprengel Waste Mgmt.
Kathleen R. Turner Physics

Holiday Notes

In observance of Independence Day, the Lab will be closed on Monday and Tuesday, July 3 & 4. As a result, the following schedules will be in effect:

- **Brookhaven Bulletin** — There will be no Bulletin next week; the next issue will be published on Friday, July 14. The classified ad deadline for that issue is noon on Friday, July 7.
- **Credit Union** — The Teachers Federal Credit Union on site will be open on Monday, July 3, and will be closed on Tuesday, July 4.
- **Food Service** — The Cafeteria will be open from 7:30 a.m. until 2 p.m. on Saturday through Tuesday, July 1-4. The Brookhaven Center Club will be closed for dinner on Saturday through Monday, July 1-3, and will reopen on Tuesday evening, July 4, from 5 p.m. to 9 p.m.
- **Gym, Pool, Omega Leisure Travel Office, Recreation Hall, & Library** — Will all be closed on Saturday through Tuesday, July 1-4. Summer hours for the pool will begin on Wednesday, July 5, the pool will be open for Lab employees and visitors from 11 a.m. to 2 p.m., and for family and guests from 3:30 to 8:30 p.m.
- **U.S. Post Office** — The service window at the Upton Branch of the U.S. Postal Service will be closed as usual over the July 4th weekend, it will be open on Monday, July 3, until noon, and closed on Tuesday, July 4.

Dosimetry badges will be exchanged today, Friday, June 30. Therefore, please place your badge in its assigned rack space before leaving work today.



Physics 4, Conspiracy Theorists 0

This summer, serious baseball fans may rest easy over one tricky question that was resolved last season. Last summer, while all eyes were glued on super-sluggers Mark McGwire and Slammin' Sammy Sosa as they once again challenged major league home run records, the baseball media busily chased down answers at, of all places, BNL.

Twice last summer, Richard Larsen, retired from BNL's Physics Department, was called upon to answer a question for the ages – why are so many more home runs being hit now than in previous years?

Many players and baseball enthusiasts think there is one simple answer – the balls are “juiced up,” allowing them to jump off the bat and out of the park at an astonishing rate. Larsen had tested this theory twice before with physicist Robert Adair, his friend and former BNL Associate Director for High Energy and Nuclear Physics. In 1987 they tested balls at the request of baseball commissioner Bart Giamatti, and in 1994, repeated the test for *USA Today*. Last summer, as the juiced ball theory again gained momentum, WOR-TV Channel 9 News (the “I-Team”) and ESPN both did extended stories taped at BNL, which featured Larsen.

The testing method, as shown above at the BNL firehouse, was simple but effective. Larsen dropped old and new official major league baseballs from a height of 25 feet and measured the height of their bounce. His theory – if the newer balls were indeed juiced, they would bounce higher than older balls.

The result? In all four tests (the last was filmed at the STAR detector at RHIC) the bounce difference between the old and new balls was negligible, as Larsen expected. He attributes the additional “big flies” to smaller ballparks, watered-down pitching, and stronger players, not modifications to the ball.

“If the balls are being manipulated, it's the best-kept secret in the world,” he said. — Pete Genzer

Watch Your Step — Sidewalk Construction To Resume

On or about Thursday, July 6, the next phase of work will begin on the sidewalk which is under construction between Brookhaven Avenue and Princeton Avenue.

Water Aerobics

Six weeks of in-water stretching and aerobics classes will again be offered to employees, facility users, and their spouses at the Lab pool, Bldg. 478, from 5:20 to 6:20 p.m., on Wednesdays. Classes will begin on July 12.

Sponsored by the Health Promotion Program of the Occupational Medicine Clinic, water aerobics classes are free. However, participants must pay the daily pool fee of \$2 or must own a season pool pass.

Registration for water aerobics is a must. To sign up, call Health Promotion Specialist Mary Wood, Ext. 5923.

Skin Cancer Seminar

On Tuesday, July 11, at noon in Berkner Hall, a Skin Cancer Awareness Seminar will be presented by Vytra Health Plans in coordination with the Benefits Office, Human Resources Division. All are welcome.

Kickboxing Class

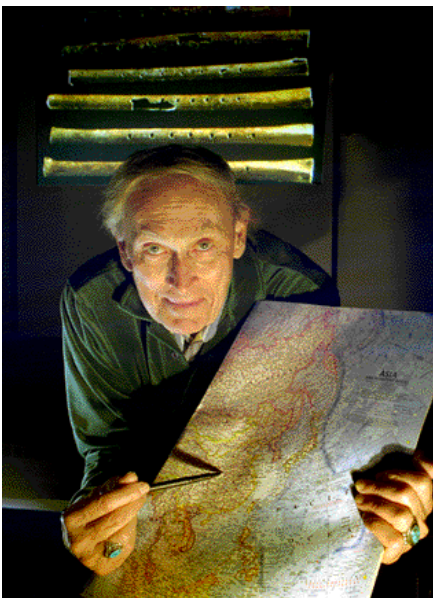
Cardio kickboxing classes will continue to be given on Mondays and Thursdays, from noon to 1 p.m., in the North Room of the Brookhaven Center. Classes will run for two months starting July 10 and 13, respectively.

Evening classes will be offered on Thursdays only, from 5:15 to 6:15 p.m., starting July 13. The Thursday evening class will also be held in the Brookhaven Center North Room.

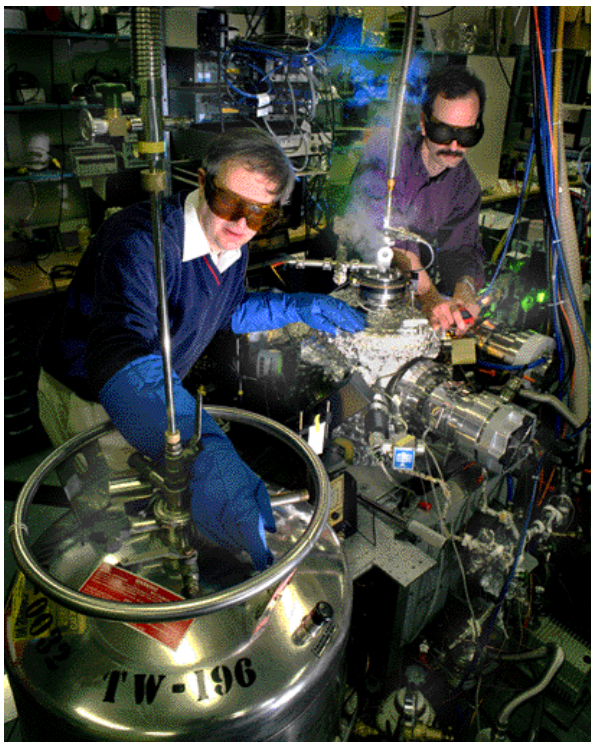
Each class costs \$5 per participant, payable at the class. Participants may sign up for one or both days of class, but registration is required. Contact Health Promotion Specialist Mary Wood, Ext. 5923 or wood2@bnl.gov.

Free Summer Sunday Tours Begin July 9th and Continue Through August 27th

Bring Your Friends to Get Chemical Reactions



Garman Harbottle, a specialist in carbon-14 and other dating techniques, collaborated in carbon-dating 7,000-to-9,000-year-old flutes found in China last year.



Photos by Roger Stoutenburgh

Yu-Shin Ding develops new compounds to use as radiotracers in Positron Emission Tomography (PET) brain chemistry studies.

Robert Beuhler, Michael White use liquid helium to cool a crystal for surface studies at low temperatures.

Visitors can also partake in the other offerings of BNL's Summer Sundays: a guided bus trip around site, the Whiz Bang Science Show, and the Camp Upton Historical Collection.

Fun for children of all ages, the Whiz Bang Science Show is a lively interactive demonstration of basic scientific principles presented continuously between 10 a.m. and 3 p.m.

Housed in a Camp Upton chapel, the Camp Upton Historical Collection contains the history of the site during its pre-Lab days as a U.S. Army camp during World Wars I and II.

Organized by BNL's Museum Programs of the Community Relations Office, Summer Sundays are free and open to all through August 27. No reservations are required. The Sunday program runs from 10 a.m. to 3 p.m., but visitors must arrive before 3 p.m.

How do chemical reactions govern the body, brain, environment, and world?

All are invited to find out on Sunday, July 9, by exploring the research into nuclei, atoms, and molecules going on within the Lab's Chemistry Department. The Department's staff carry out a wide range of studies, including work on nuclear and radiation chemistry, radiopharmaceutical research and development, catalysis — and more.

Chemistry is home to a electron accelerator, which is used for research into picosecond-pulse radiolysis, high-pressure radiation chemistry, and combined radiolysis-laser photolysis, which allows chemists to explore very rapid reactions during catalysis, and during energy conversion and storage.

Away from their home in Bldg. 555, Chemistry staffers perform research at BNL's National Syn-

chrotron Light Source, and use other sources of photons and neutrons for their studies. In addition, chemists are part of the PHOBOS collaboration at BNL's Relativistic Heavy Ion Collider.

They will study the consequences of the collision of gold ions, looking for nuclear matter to undergo a phase transition to form what is called quark-gluon plasma.

The Lab's chemists also collaborate with members of the Medical Department in interdisciplinary studies involving medical imaging techniques called PET, for positron emission tomography, and magnetic resonance imaging, or MRI.

In addition to learning about this department, visitors will have a chance to watch as a glass blower performs the delicate technique of shaping glass into instruments suitable for use in the laboratory.

Future Tours Include:

July 16 - Biology Department

Learn about the fascinating things our scientists do with genes, proteins, and big machines. You'll also have an opportunity to visit the greenhouse.

July 23 - National Weather Service

Visit the National Weather Service forecast office where day-to-day forecasts and warnings are issued. See the Doppler radar, the weather balloon site, and the computer technology that makes this possible.

July 30 - National Synchrotron Light Source

See the light! Discover how infrared, ultraviolet, and x-ray "light" produced in the NSLS is used for scientific research in Physics, Chemistry, Biology, Medicine, and many other fields, even criminal investigations.



LABORATORY RECRUITMENT – Opportunities for Laboratory Employees Only.

DD7222. SECRETARIAL POSITION - Requires an AAS degree in secretarial science or equivalent experience, good communication skills, knowledge of Laboratory policies and procedures and proficiency with Microsoft Word, Access and Outlook. Experience with Web Reqs and IPAP travel system is desired. Involves extensive interaction with Lab employees and the public. Will provide support to the Museum Program Office (50%), including handling of telephones, web reqs, travel, mailings, museum bookings, and database entry associated with various programs, contests, tours, fairs and festivals. Will provide clerical support to the remainder of the CIGPA Directorate (50%), including telephones, meeting coordination, mailings and file maintenance. Community Involvement, Government and Public Affairs Directorate.

DD8670. ADMINISTRATIVE POSITION - Requires an AAS in business or other relevant field or equivalent, a basic knowledge of office procedures including MS Office software, WordPerfect and web design. Knowledge of Laboratory policies, practices and procedures and strong organizational and interpersonal skills are also required. Will perform duties of the user administrator for the Biology Department's Macromolecular Crystallography Program. Primary responsibilities include the scheduling of users, tracking of beam usage, assembling scientific progress reports, responding to internal and external requests for data, tracking of commitments, coordinating of data-collection courses and other program related courses and conferences. Biology Department.

OPEN RECRUITMENT - Opportunities for Laboratory Employees and Outside Candidates.

MK7984. POSTDOCTORAL RESEARCH ASSOCIATE – Requires a Ph.D. in experimental chemical physics/physical chemistry with experience in laser/molecular beam methods in chemical reaction dynamics. Experience with instrument control, data acquisition and image analysis software, vacuum technique, and tunable pulsed laser systems desirable. Will participate in a new program using velocity mapped ion imaging of bimolecular reactive scattering, radical photodissociation and photoionization dynamics. Under the direction of G. Hall. Chemistry Department.

NS2421. LICENSING ASSOCIATE POSITION – Requires a Ph.D. in chemistry/chemical engineering, or

the equivalent, research experience in the development and testing of new materials, and excellent verbal and written communication skills. Experience in the evaluation of the commercial applicability of new materials is highly desirable. Responsibilities will include evaluating the commercial potential of technologies developed at BNL in the fields of chemical processes, catalysis, and new materials, and licensing of BSA-owned technologies to industry to foster commercial development. Economic Development and Technology Transfer Office.

DD8770. CONTRACTS SPECIALIST POSITION – Requires a BS in business or equivalent experience. Must be well-versed in all aspects of procurement including drafting RFPs, proposal evaluation, cost and price analysis, negotiation, preparation of contract modifications, and Davis-Bacon Labor requirements. Additional requirements include previous administration, coordination and control of contracts for construction, and contract labor contracts. Experience in environmental and architect/engineering contracts is desired. Will be responsible for obtaining desired services through contractual agreements. Procurement and Property Management Division.

DD8769. BUYER POSITION – Requires a BA degree or equivalent experience and ADPE procurement experience. In addition, procurement experience in the following commodities is desirable: chemicals, pharmaceuticals, and laboratory equipment. Under general supervision, will be responsible for the economical and efficient procurement of a variety of materials, supplies, and equipment. Coordinates the computer procurement function from requisition to delivery in accordance with Standard Procurement and Property Management Operating Procedures. Procurement and Property Management Division.

DD8627. TECHNICAL POSITION (Term Appointment) - To work on the DUV-FEL. Experience with operation, installation and modification of hardware associated with photocathode RF electron guns and electron linacs is highly desirable. Must be able to design and construct modest experimental apparatus with minimal direction and become a fully qualified operator of the accelerator. Will be assigned through the NSLS Experimental Systems Group. National Synchrotron Light Source Department.