

## Promising New Method to Clean Cadmium From Soil

*Method combines chemical treatment, 'pollutant-busting' bacteria*

Yesterday, at a morning session of the 220th national meeting of the American Chemical Society in Washington, D.C., Murthy A. Vairavamurthy, Environmental Sciences (ES) Department, presented data on a promising method for combining chemical treatment with "pollutant-busting" bacteria to remove cadmium from contaminated soil.

"Environmental contamination by heavy metals such as cadmium is a serious and growing concern," says Vairavamurthy. He has been looking for ways to improve cadmium cleanup, together with Pramod Sharma and Yujun Yin, both formerly of ES; Anatoly Frenkel, a research collaborator in ES from the University of Illinois; David Balkwill, Florida State

*Cadmium: highly toxic, carcinogenic, used in metal plating, nickel-cadmium batteries, pigments, plastic stabilizers, pesticides, and more.*

University; and Jan Kieleczawa, formerly of BNL's Biology Department.

Papers coauthored by Sharma, Balkwill, Frenkel, and Vairavamurthy appeared in recent issues of *Applied and Environmental Microbiology* and *Marine Chemistry* describing their findings.

Cadmium is a highly toxic and carcinogenic metal used in metal plating, nickel-cadmium batteries, pigments, plastic stabilizers, pesticides, and more. It is most toxic in its free (ionic)

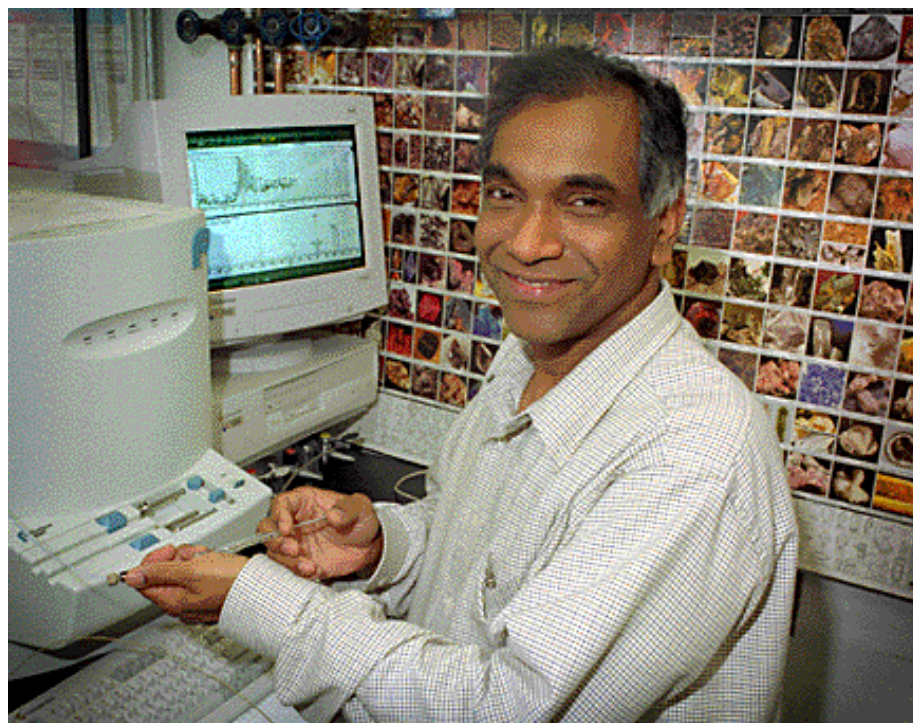
*To find ways to treat cadmium-contaminated soil, the team at BNL looked for clues from nature.*

form, which easily dissolves and moves through water, threatening groundwater supplies.

There are two basic ways to deal with soil contaminated with such toxic heavy metals, Vairavamurthy says. One is to mobilize the metals so they can be extracted from the soil and treated. The other is to convert the metals to a stable form that will not migrate into groundwater. To find ways to achieve one or the other, the team at BNL looked for clues from nature.

"Many organisms use thiols — organic sulfhydryl compounds — to detoxify metals in the body," Vairavamurthy says. Many thiols form soluble complexes with toxic metals, which can then be excreted. "We thought these might work in soil as well."

The team was also intrigued by the natural ability of many microbes to detoxify contaminants. "Bacteria have versatile biochemical mechanisms, which we thought we might be able to exploit intelligently," Vairavamurthy explains.



Roger Stoutenburg CN8-270-00

Murthy Vairavamurthy, Environmental Sciences Department, injects a sample into a mass spectrometer to determine the types of cadmium complexes present.

In the end, the team has proposed a method that combines both approaches: First, thiosulfate, an inorganic compound with a sulfhydryl group, is injected into the subsurface soil. Thiosulfate has an affinity for and forms highly soluble complexes with cadmium. Then, when water is pumped out of the soil, the dissolved cadmium thiosulfate should come along for the ride.

The extracted water then can be treated with a new form of bacteria, the Cd-1 strain of *Klebsiella planticola*,

which was recently isolated by Sharma from coastal salt marshes on Shelter Island in New York. Through its normal metabolic process, the bacterium converts dissolved cadmium thiosulfate to cadmium sulfide, an insoluble form, which precipitates out of the solution.

Alternatively, the bacteria could also be injected directly into the soil following thiosulfate injection to complete the process *in situ*. This would leave insoluble cadmium sulfide in

*(continued on page 2)*



Joseph Rubino CN8-271-00

At an informal celebration held at the Brookhaven Center last week with Laboratory Director John Marburger (center, front) are some of the 60 BNL employees recently recognized by DOE for their contributions to pollution prevention.

On Wednesday, August 16, more than 60 BNL employees working on five environmental projects were recognized for their dedication and leadership in contributing to DOE's mission to prevent pollution in BNL's operations, processes, and programs. All participants received certificates of appreciation signed by Secretary of Energy Bill Richardson.

At a wine and cheese party held at the Brookhaven Center to celebrate the occasion, Laboratory Director John Marburger offered his congratulations

to the five project representatives and their teams.

"I am tremendously impressed with the amount of activity that has taken place over the last two years in the areas of environmental protection, pollution prevention, waste management, and a number of other environmental issues," he said. "Initially, I thought we were going to have problems addressing these issues, but we are privileged to have so many people working so hard to make these difficult jobs easier."

George Goode, BNL's Pollution Prevention Coordinator, presented the DOE certificates to participants in the following projects: BNL Recycling; Hot Cell Redesign; Low-Flow, Low-Purge Well Sampling; Preventing Pollution: Past, Present, and Future; and the RHIC Environmental Management System Implementation.

The BNL Recycling Team was cited for recycling everything from cans, bottles, cardboard, and metals to batteries, tires, and oil. BNL, the Town of Brookhaven, and several local ven-

dors have formed a symbiotic recycling partnership, saving the Lab hundreds of thousands of dollars per year in potential disposal costs. Recent additions to BNL's recycling program include spray cans, construction waste, and even demolition material.

Certificates were awarded to the team that redesigned the Waste Management Division's "Hot Cell," which provides the site with a state-of-the-art means of managing high activity wastes. The redesign incorporated

*(continued on page 2)*

## First Apheresis Blood Drive at BNL



Roger Stoutenburg CB-169-00

Diana Teich of the Procurement and Property Management Division has her arm prepped for the apheresis blood donation.

BNL's first apheresis blood drive was "a great success, thanks to the 30 BNL employees who volunteered their time, as well as their blood platelets for this worthy cause," said Susan Foster, Human Resources Division, who organized the drive. BNL is the second company on Long Island to sponsor an apheresis blood drive, which was held at the Brookhaven Center on Wednesday and Thursday, August 9 and 10.

Apheresis is a unique type of blood donation. Instead of whole blood, donors give only a certain blood component, usually platelets or plasma. The blood is taken from one arm and channeled through a sterile, disposable kit housed in a special machine. The needed component — platelets or plasma — is taken out, and the rest of the blood is returned to the donor, usually through the other arm.

Platelets are essential to normal blood clotting, and are used to treat cancer, leukemia, and other diseases. Plasma is used to treat clotting disorders, burn victims, and shock.

Apheresis donor plasma provides a more concentrated product in a larger volume than is possible from one whole-blood donation.

### Whole blood also needed

Whole blood is also greatly needed, however. BNL's next whole-blood drive is scheduled for September 14. For information on BNL's blood drives contact Foster, Ext. 2888 or foster2@bnl.gov. — John Galvin

## In Memoriam

### Karl Swyler, Educational Programs' Manager

Karl Swyler, Manager of BNL's Office of Educational Programs (OEP) in the Community Involvement, Government & Public Affairs Division, died on Wednesday, August 2. He was 59.

Students, teachers, BNL colleagues, staff from colleges, institutions, other national labs, and DOE have sent many messages of sympathy and tributes to Swyler, some of which follow:

*"He was a grand gentleman and scientist who really cared about science and education."*

*"I am grateful for Karl's encouragement through the tough times and his passion for education and dedication to the students and teachers . . . a real gentleman . . . our friend as well as colleague; we will miss you."*

*"I will always think of his love of science and dedication to sharing his knowledge with teachers and children."*

*"His honesty, integrity, sense of humor and his bigness will be sorely missed."*

*"A very good man and a dedicated educator."*

*"We'll miss his unwavering commitment to high-quality education . . . and his friendship."*

*"I really admired him and his dedication towards students like myself."*

*"I respected his devotion to the students."*

Swyler joined BNL Physics Department in 1974, a year after earning his Ph.D. from the University of Rochester's Institute of Optics. As an assistant physicist, he performed basic studies in radiation damage.

In 1976, he transferred to the then Department of Applied Science, being promoted to associate physicist in 1977. In 1980, he was named Physicist, moving to the then Department of Nuclear Energy, and in 1982, he received a continuing appointment.

As a physicist, Swyler often acted as a mentor for students from both the

Brookhaven Semester Program, which gave opportunities to minority students, and the Honors Students Program.

Then, three years after OEP had been established under Donald Metz in 1985, Swyler joined the staff there as a scientist. He specialized in programs that encouraged interacting with science teachers, particularly programs that brought teachers into research positions.

Swyler also served as a volunteer in the Introduction to Computers course offered by BNL in partnership with several local school districts and community organizations, with emphasis given to minority students.

In October 1993, Swyler was appointed OEP Manager, following his five-month service as Acting Manager after Metz's retirement. OEP, in collaboration with other BNL organizations, provided educational services to about 4,000 people annually through more than 20 science education programs for students and teachers, from elementary to postgraduate levels.

Swyler's enthusiasm for improving the way science and math is taught and learned led him to create innovative ways of sharing the excitement and interest he felt should always be part of science education. He is credited with starting up BNL's very popular "Whiz Bang Science Show," now a key attraction of the Lab's Summer Sunday visits for thousands of children and adults.

Another of Swyler's initiatives was to assist Hofstra with a Maglev competition started by the University (see Maglev story, page 3). The Maglev contest became an annual event at BNL, bringing many science teachers and students on site.

A resident of Sound Beach, Karl Swyler is survived by his wife Patricia and daughters Karen and Erica.

— Liz Seubert



Mort Rosen 8-474-84

Friends of Karl Swyler remember his performances as a member of the BNL Theater Group, which included talented banjo playing, often in accompaniment to a funny, satirical song he had written.

## Pollution Prevention Projects

(cont'd)

radiologically contaminated and/or activated lead bricks into two of its walls. This design change reduced the potential environmental liability and the cost of managing inventories resulting from on-site lead stockpiles. BNL thereby saved over \$300,000 in disposal-related costs.

The Low-Flow, Low-Purge Well Sampling project team earned DOE recognition for implementing new technology for sampling monitoring wells. The process significantly reduces the waste generated by purging wells, with no reduction in test result quality. The new method reduced contaminated purge water volume by over 135,000 gallons in 1999, saving more than \$150,000 a year in waste management costs, and more than \$100,000 in labor costs.

The Preventing Pollution: Past, Present, and Future recognized three recent BNL environmental projects. Cited were the Facility Review Project, the Process Evaluation Project, and the Environmental Management System Improvement Project. These three projects address vulnerabilities from past practices, assess the environmental aspects and

impacts of current operations, and develop an Environmental Management System to plan for, minimize, and control environmental impacts in the future. Goode emphasized that implementing these projects has provided BNL with an unprecedented degree of knowledge about site operations and their impact on the environment.

The Relativistic Heavy Ion Collider's (RHIC) Environmental Management System (EMS) Implementation was also credited by the DOE for its commitment to pollution prevention. The RHIC EMS provides a systematic frame-

work for ensuring that BNL manages its RHIC programs in a manner that protects public health and the ecosystem. RHIC was the first DOE Office of Science program and the first Long Island-based organization in New York to achieve the ISO 14001 standard (Brookhaven Bulletin, October 15, 1999).

As Goode concluded, "Through teamwork, these projects have resulted in significant cost savings and improved environmental performance for the Laboratory." — John Galvin

## Cleaning Cadmium From Soil

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place of the original toxic metal. "Cadmium sulfide is fairly stable and will not move into the groundwater as long as the conditions remain anaerobic," or without oxygen, Vairavamurthy says.

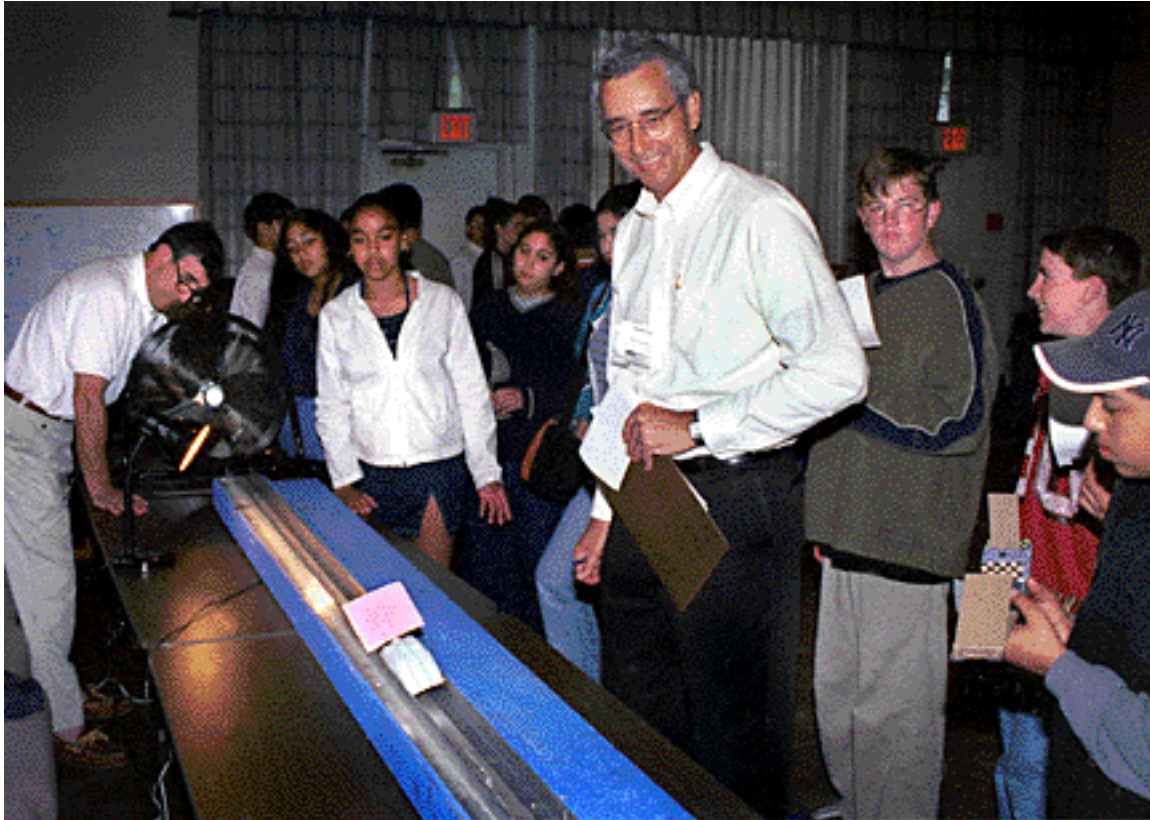
This *in situ* technique would potentially be less costly than digging up contaminated soil for treatment elsewhere, and even less costly than the water-pumping method described above. Also, because these bacteria can grow in oxygen-rich as well as

oxygen-poor environments, they can be grown in large quantity under normal aerobic conditions in the laboratory, and still survive the oxygen-poor environment below the soil surface.

The same technique might also work for treating soil contaminated with some other metals, such as arsenic and cobalt, Vairavamurthy says.

This research was funded by DOE's Natural and Accelerated Bioremediation Program. — Karen McNulty

# Annual Middle School Maglev Contest Held at BNL



Bill Gunther (center), one of the BNL volunteer Maglev contest judges, and participating students watch prototype vehicles competing at the annual Maglev contest.

Roger Stoutenburgh CN5-247-00

This past May at BNL, 250 middle school technology students representing 16 school districts from Nassau and Suffolk Counties, raced their custom-made Magnetic Levitation (Maglev) vehicles against the clock.

This year's contest, organized and run by BNL's Office of Educational Programs, was sponsored by BNL, Hofstra University Center for Technology Education, the Long Island Technology Association, the Nassau Technology Association, and the Suffolk Technology Education Association.

The aim of this contest is to integrate math, science, and technology into a project that encourages students to design and build a vehicle based on Maglev technology.

The Maglev concept is the suspension, guidance, and propulsion of vehicles by magnetic forces. It was the 1968 brain child of BNL scientists Gordon Danby and James Powell, who patented the world's first practical, electrodynamic, magnetically levitated train and have won several honors for their idea, including the 2000 Benjamin Franklin Medal in Engineering. Levitated trains operate in Europe and Japan in excess of 300 miles per hour.

To enter the competition, students design and construct their model Maglev vehicles according to engineering speci-

fications, with a goal of designing the fastest vehicle with the fewest magnets.

Students present judges with "design briefs," which include ideas as well as the successes and failures of their vehicle's design. Judges evaluate the Maglev vehicle's performance on the day of the contest as well as the design briefs presented by each student engineer. Entries are judged for speed, efficiency, and appearance.

First, second, and third place trophy winners were selected in six categories: wind power, gravity driven, self propelled, electrified track, futuristic appearance, and scale appearance.

BNL volunteer judges who evaluated the design concepts and the vehicle's performance on the day of the contest were: Melvyn Cowgill, Bill Gunther, Terri Kneitel, Bruce Lein, Arnold Moodenbaugh, Robert Sabatini, Richard Scheidet, Loralie Smart, and Peter Soo.

Representatives from Hofstra University, employees from the Lab's Fire-Rescue Group and from the Community Involvement, Government, and Public Affairs Office also volunteered their time to make the event a success.

— John Galvin

## 7th Walk for Beauty, 9/24 Fight Breast Cancer

On Sunday, September 24, the entire Lab community — employees, facility users, families, guests, retirees — is invited to join the BNL team that will participate in the 7th Annual Walk for Beauty. The proceeds from this charitable walk will benefit breast cancer research at the University Hospital and Medical Center at Stony Brook.

Last year, more than 60 members of the BNL community walked. Members of BNL's Women's Program Advisory Committee are coordinating this year's Lab effort, and they hope to sponsor a record number of participants from BNL. Join in! For information and registration forms, call Ext. 2720.

## BERA Events

### For All the Lab Community

These upcoming BERA Events are open to all employees, retirees, facility users, BNL visitors, and their immediate families. Tickets for these events can be purchased from the BERA Sales Office in Berkner Hall, Monday through Friday, from 9 a.m. to 3 p.m. Tickets are sold on a first-come basis. All departures are from the Brookhaven Center promptly at the times listed below. For additional information contact Andrea Dehler, Ext. 3347, or M. Kay Dellimore, Ext. 2873.

#### Atlantic City Bus Trip \$24

Saturday, September 9  
Resorts/Casino on Boardwalk  
Atlantic City, NJ  
Receive coin bonus return  
Depart from BNL at 8 a.m.  
Leave for BNL at 10:30 p.m.

#### Wine Tour & Tasting \$23

Saturday, September 23  
Bus trip to Paumanok, Jamesport, Pugliese, and Pindar Vineyards. Free time in Greenport for shopping or dinner from 4:30 to 7 p.m.  
Depart from BNL at 11 a.m.  
Return to BNL at 8 p.m.

#### New York City \$19

Saturday, October 14  
Do your own thing or visit the Hayden Planetarium or the American Museum of Natural History. Two stops will be made: north side of the Museum, West 81st St.; and Rockefeller Center area for shopping and dining.  
Depart from BNL at 11 a.m.  
Leave for BNL at 7 p.m.

#### Radio City Christmas Show \$89

Saturday, December 9  
2 p.m. matinee at Radio City Music Hall. Orchestra/front mezzanine seats. Free time in Rockefeller Center area.  
Depart from BNL at 9 a.m.  
Leave for BNL at 7 p.m.

## Softball Party, 9/29

All Softball League players, their families, and friends are invited to the BERA Softball League Party. The party will be held at the Brookhaven Center on Friday, September 29th, starting at 5:30 p.m. Tickets are \$10 per person which will include a DJ and a buffet dinner with two drink coupons for beer, wine, or soda. There will be a cash bar.

Everyone must have a ticket! To buy tickets, bring cash to Andrea Epple, Bldg. 51M, by Friday, September 15. No tickets will be sold at the door. For more information e-mail softball@bnl.gov.

## Defensive Driving

The training group of the Safety & Health Services Division will offer a six-hour defensive driving course on Saturday, September 23, 9 a.m.-3:30 p.m., in Berkner Hall, Room B.

The course is open to BNL, BSA, and DOE employees, BNL facility-users, and their families, at \$23 per person. Completing the course entitles participants to a 10-percent discount on liability and collision insurance for three years. In addition, MetLife now offers a 5 percent discount on auto and home insurance to all the BNL community. For more information on the discount, call 952-3436.

To register for the driving course, send a check made out to Empire Safety Council, in care of Scott Zambelli, P.O. Box 670, Mount Sinai, NY 11766. All checks must be received by Monday, September 18. Include your phone number on the check in case you need to be contacted.

## Arrivals & Departures

### Arrivals -none- Departures

Galen Hon ..... Env. Sci.  
Douglas Hunter ..... Medical

## No Bulletin, 9/8

In observance of Labor Day, the Lab will be closed on Monday, September 4. So there will be no Bulletin published that Friday, September 8.

## Call for Bowlers

### Mixed League

It's time to "think bowling" again. All the BNL community — employees, facility users, retirees, family, and friends — is welcome to join. You do not have to be a great bowler, just a willing one!

Applications for the Thursday night mixed league that meets in Shirley are available now. All team registrations are due by August 31. For applications and more information, contact Debbie Keating, Ext. 3888.

### Men's Money League

The BERA Men's Money Bowling League is open to BNL workers, facility users, and their families and friends. Beginning on September 5, the league will meet on Tuesday nights, with a 6:30 p.m. start. For more information contact John McCaffrey, Ext. 2075; Ron Mulderig, Ext. 3084; or Ken Kobel, Ext. 7351.

## Vacuum Seminar

Varian Vacuum Technologies will offer a four-hour vacuum course, 8:30 a.m.-12:30 p.m., on two days: Tuesday and Wednesday, August 29 and 30, in Room B, Berkner Hall.

From skilled practitioners to those with minimum experience, those interested in vacuum science will benefit from this seminar in high and ultra-high vacuum. Topics will include HV/UHV introduction, materials selection, gas load, system pumping speed, vacuum gauges, system operation and troubleshooting, and a question and answer session.

Advanced registration is required, so call 516-795-3320 or e-mail jim.primm@varianinc.com. Include your name, affiliation, phone number, and specify which date you will be attending.

## Equipment Demo, 9/29

### Voicestream/Omnipoint

On Tuesday, August 29, 10 a.m.-2:30 p.m. in Berkner Hall, Voicestream/Omnipoint Communications will discuss special rates for BNLers on digital PCS wireless services on their GSM network.

Service plans include free caller ID, voice mail, SMS messaging, and more. Service plans include \$19.99 per month for 75 minutes, and \$39.99 per month for 500 minutes with the first incoming minute free, and weekend calling free, with a one year contract. A new family plan for two phones, international calling, and roaming options are available.

For more information contact Richard Goll, 516-343-5900.

## BROOKHAVEN BULLETIN

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