the Bulletin

BROOKHAVEN NATIONAL LABORATORY

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ALL-EMPLOYEE MEETING
SAVE THE DATE
July 11 • 10 a.m. • Berkner Hall

Joseph Rubino D1710612

Ivan Bozovic Wins Matthias Prize For Superconducting Materials

Ivan Bozovic, a physicist in BNL's Condensed Matter Physics & Materials Science Department, has been honored as a co-recipient of the 2012 Bernd T. Matthias Prize for Superconducting Materials. Recipients are selected by an international jury to recognize innovative contributions to the material aspects of superconductivity. Superconducting materials are considered to be an important component for solutions to the nation's energy challenges, because they can conduct electricity without any electrical resistance or energy wasted. However, most become superconducting only when cooled to very low temperatures near absolute zero (-273 degrees Celsius).

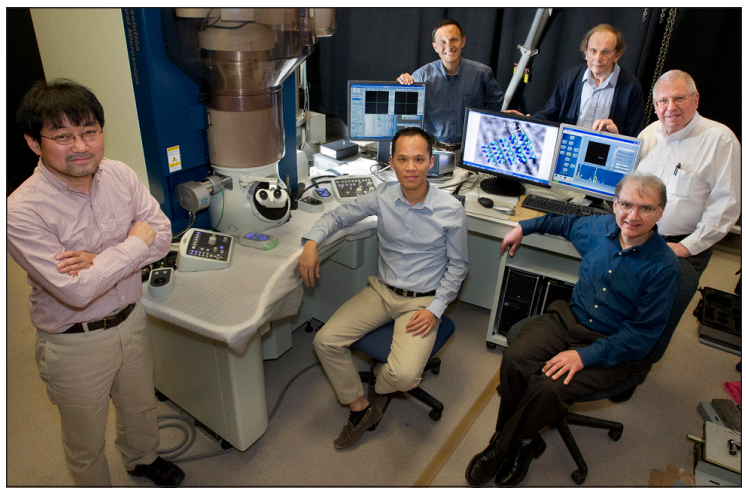
Bozovic will share this prize with James N. Eckstein of the University of Illinois at Urbana-Champaign and Dirk Johrendt of Ludwig-Maximilians-Universitat Munchen in Germany. At the 2012 Materials and Mechanisms of Superconductivity (M2S) Conference to be held July 29 through August 3 in Washington, D.C., the laureates will receive a monetary award of $5,000 funded by the Texas Center for Superconductivity at the University of Houston and a framed certificate designed by the Kamerlingh Onnes Laboratory in the Netherlands. Bozovic and Eckstein are cited for their "pioneering and sustained contributions to the novel synthesis and engineering of superconducting materials."

"More frequently, awards are given for a single important discovery," Bozovic said. "My research on superconducting materials is characterized by several decades of patience and methodical work to slowly but steadily improve techniques and sample quality. It's not very glamorous, so I was pleasantly surprised to learn that I received this prestigious honor."

See ***Bozovic Honored*** *on p. 3*

Nanosheet Catalyst Discovered to Split Hydrogen From Water — Sustainably

Low-cost, non-noble electrocatalyst efficiently generates hydrogen gas for fuel



Roger Stoutenburgh D3270412

Collaborators on this new electrocatalyst included: (front, from left) Kotaro Sasaki, Wei-Fu Chen, and Nebojsa Marinkovic; (back, from left) Yimei Zhu, Radoslav Adzic, and James Muckerman, seen in front of a transmission electron microscope (TEM) capable of capturing nanoscale structures.

Hydrogen gas offers one of the most promising sustainable energy alternatives to limited fossil fuels. But traditional methods of producing pure hydrogen face significant challenges in unlocking its full potential, either by releasing harmful carbon dioxide into the atmosphere or requiring rare and expensive chemical elements such as platinum.

Now, scientists at BNL have developed a new electrocatalyst that addresses one of these problems by generating hydrogen gas from water cleanly and with much more affordable materials. The novel form of catalytic nickel-molybdenum-nitride — described in a paper published online May 8, 2012, in the journal *Angewandte Chemie International Edition* — surprised scientists with its high-performing nanosheet structure, introducing a new model for effective hydrogen catalysis.

"We wanted to design an optimal catalyst with high activity and low costs that could generate hydrogen as a high-density, clean energy source," said Kotaro Sasaki of the Chemistry Department, who first conceived the idea for this research. "We discovered this exciting compound that actually outperformed our expectations."

Goldilocks Chemistry

Water provides an ideal source of pure hydrogen — abundant and free of harmful greenhouse gas byproducts. The electrolysis of water, or splitting water (H_2O) into oxygen (O_2) and hydrogen (H_2), requires external electricity and an efficient catalyst to break chemical bonds while shifting around protons and electrons. To justify the effort, the amount of energy put into the reaction must be as small as possible while still exceeding the minimum required by thermodynamics, a figure associated with what is called overpotential.

For a catalyst to facilitate an efficient reaction, it must combine high durability, high catalytic activity, and high surface area. The strength of an element's bond to hydrogen determines its reaction level — too weak, and there's no activity; too strong, and the initial activity poisons the catalyst.

"We needed to create high, stable activity by combining one non-noble element that binds hydrogen too weakly with another that binds too strongly," said James Muckerman, also of Chemistry, who led the project. "The result becomes this well-balanced Goldilocks compound — just right."

Unfortunately, the strongest traditional candidate for an electrocatlytic Goldilocks comes with a prohibitive price tag.

Problems With Platinum

Platinum is the gold standard for electrocatalysis, combining low overpotential with high activity for the chemical reactions in water-splitting. But with rapidly rising costs — already hovering around $50,000 per kilogram — platinum and other noble metals discourage widespread investment.

"People love platinum, but the limited global supply not only drives up price, but casts…

See ***Nanosheet Catalyst*** *on p. 2*

Fermilab Experiment Announces World's Best Measurement of Key Property of Neutrinos

The following news release on the MINOS experiment was issued on June 8 by Fermi National Accelerator Laboratory. BNL scientists have played key roles in MINOS. Mary Bishai and Brett Viren developed the software to record important beam parameters such as the intensity of each neutrino pulse. Zeynep Isvan studied the difference between neutrinos and anti-neutrinos to find evidence of new physics. David Jaffe was involved in the earlier measurements of the anti-neutrino disappearance at MINOS and has led the analysis effort at the Daya Bay reactor neutrino experiment. Milind Diwan and Brett Viren developed the initial techniques used to search for evidence of key neutrino oscillation parameters in MINOS.

The techniques developed by the MINOS experiment are being used to develop the next generation of neutrino accelerator experiments such as the proposed Long Baseline Neutrino Experiment (LBNE), which could help determine the matter/anti-matter asymmetry in the universe.

This work builds upon a legacy of breakthrough neutrino research by BNL that has resulted in two Nobel Prizes in Physics.

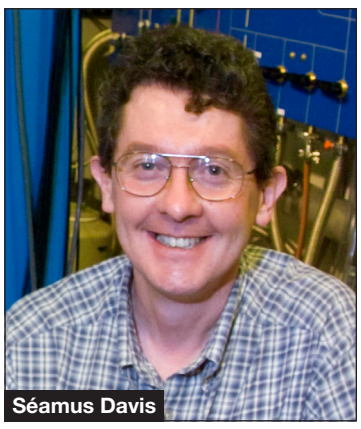
Scientists from the MINOS experiment at Fermi National Accelerator Laboratory have revealed the world's most precise measurement of a key parameter that governs the transformation of one type of neutrino to another. The results confirm that neutrinos and their antimatter counterparts, antineutrinos, have similar masses as predicted by most commonly accepted theories that explain how the subatomic world works.

MINOS caused a jolt in the physics world in 2010 when it announced that a measurement of this parameter, called delta m squared, showed a surprisingly large difference between the masses of neutrinos and antineutrinos. A subsequent 2011 measurement with increased statistics appeared to bring the neutrino and antineutrino masses closer in sync. With twice as much antineutrino data collected since…

See ***Neutrinos*** *on p. 3*

Atomic-scale Visualization Of Electron Pairing In Iron Superconductors

Findings support magnetic pairing theory that could lead to new improved superconductors



Séamus Davis

By measuring how strongly electrons are bound together to form Cooper pairs in an iron-based superconductor, scientists at BNL, Cornell University, St. Andrews University, and collaborators provide direct evidence supporting theories in which magnetism holds the key to this material's ability to carry current with no resistance. Because the measurements take into account the electronic bands and directions in which the electrons are traveling, which was central to testing the theoretical predictions, this research strengthens confidence that this type of theory may one day be used to identify or design new materials with improved properties — namely, superconductors operating at temperatures far higher than today's. The findings are published in the May 4, 2012 issue of *Science*.

"In the best possible world you would be able to take this theory and plug in different chemical elements until you find a combination that should work as a superconductor at higher temperatures," said team leader Séamus Davis, Director of the Center for Emergent Superconductivity at BNL and the J.G. White Distinguished Professor of Physical Sciences at Cornell University. Such materials could be used for real world, energy-saving technologies, such as zero-loss power transmission lines, without the need for expensive coolants.

Scientists have been trying to understand the mechanism underlying so-called "high-temperature" (high-Tc) superconductivity ever since discovering materials that could carry current with no resistance at temperatures somewhat above the operating realm of conventional superconductors, which must be chilled to near absolute zero (0 kelvin, or -273° Celsius). Though still mighty chilly, these high-Tc materials' operating temperatures — some as high as 145K (-130° C) — offer hope that such materials could one day be designed to operate at room temperature.

One key to superconductivity is the formation of electron pairs. Scientists hypothesized that if these negatively charged particles have their magnetic moments pointing in opposite directions, they could overcome their mutual repulsion to join forces in so-called Cooper pairs — carrying current with no loss.

In 2008, when iron-based superconductors were discovered, the idea that magnetism plays a role in high-Tc superconductivity was revived. But determining that role was a very complex problem.

Theorists Dung-Hai Lee of the University of California at Berkeley, Peter Hirschfeld of the…

See ***Superconductors*** *on p. 2*

Informational Meeting and Consults on Worker Health Programs, 7/17

As a service to former Department of Energy (DOE) workers, Brookhaven Lab employees and retirees, contractors, subcontractors, and their families, agencies and programs that provide health monitoring and compensation services will hold an informational town hall-style meeting on the Energy Employees Occupational Illness Compensation Program Act (EEOICPA) and the Former Worker Medical Screening Program. The meeting, one of several scheduled at DOE sites across the country, will be held Tuesday, July 17, 2012, at 6 p.m. in Berkner Hall auditorium. All are welcome.

In addition, claims examiners from the Department of Labor (DOL) Resource Center will be available for individual consultation on questions regarding EEOICPA claims and the new Special Exposure Cohort (SEC) status for BNL, which is expected to be officially announced by the U.S. Department of Health and Human Services at some point before the meeting. The new SEC class is expected to cover the time period from January 1, 1980, through December 31, 1993. This will be an addition to the existing class, which covers the time period from January 1, 1947, to December 31, 1979. Claims examiners will be available from 9 a.m. to 1 p.m. in Brookhaven Center's South Room and again from 5 p.m. to 8 p.m. outside Berkner Hall Auditorium before and after the meeting.

The 6 p.m. presentation will last approximately 45 minutes and be followed by Q&A. Presentations will be made by the agencies listed below:

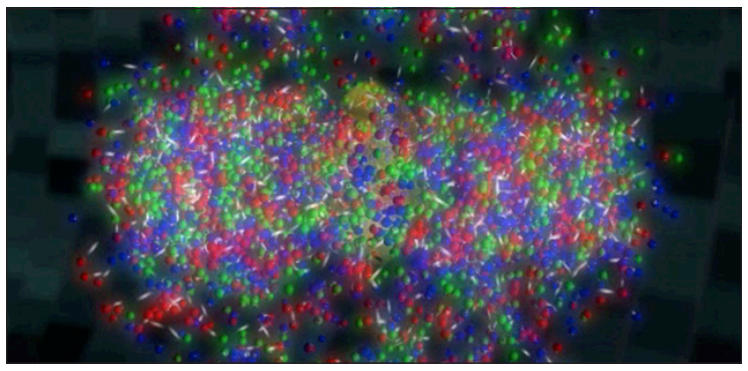
- The DOL Resource Center
- The Worker Health Protection Program and the Building Trades National Medical Screening Program, which provide medical screening for former DOE workers
- The Ombudsman's Office for DOL
- DOE Headquarters
- The National Institute for Occupational Safety and Health

Employees and retirees may receive information from these programs via phone or mail prior to the meeting. For more information on EEOICPA or the Former Worker Medical Screening Program, visit *www.dol.gov/owcp/energy* or *www.hss.energy.gov/healthsafety/fwsp/formerworkermed*.

Brewing the World's Hottest Guinness

RHIC smashes atoms and a Guinness World Record by achieving the hottest man-made temperature ever

The positive and sometimes unexpected impact of particle physics is well documented, from physicists inventing the World Wide Web to engineering the technology underlying life-saving magnetic resonance imaging (MRI) devices. But sometimes the raw power of huge experiments and scientific ambition draw the recognition of those seeking only the most extreme achievements on Earth.



Quark-gluon plasma, the ultra-hot perfect liquid created at RHIC

Brookhaven National Laboratory's Relativistic Heavy Ion Collider (RHIC) smashes particles together to re-create the incredible conditions that only existed at the dawn of time. The 2.4-mile underground atomic "racetrack" at RHIC produces fundamental insights about the laws underlying all visible matter. But along the way, its particles also smashed a world record.

Guinness World Records, no longer encumbered by "book of," recognized Brookhaven Lab for achieving the "Highest Man-Made Temperature." When RHIC collides gold ions at nearly the speed of light, the impact energy becomes so intense that the neutrons and protons inside the gold nuclei "melt," releasing fundamental quarks and gluons that then form a nearly friction-free primordial plasma that only existed in Nature about a millionth of one second after the Big Bang. RHIC discovered this primordial, liquid-like quark-gluon plasma and measured its temperature at around 4 trillion degrees Celsius — that's 250,000 times hotter than the center of the sun.

"There are many cool things about this ultra-hot matter," said physicist Steven Vigdor, who leads Brookhaven's nuclear and particle physics program. "We expected to reach these temperatures — that is, after all, why RHIC was built — but we did not at all anticipate the nearly perfect liquid behavior."

As it turns out, this surprising phenomenon occurs at both extremes of the temperature spectrum.

"Other physicists have now observed quite similar liquid behavior in trapped atom samples at temperatures near absolute zero, ten million trillion times colder than the quark-gluon plasma we create at RHIC," Vigdor said. "This is just one among many unexpected connections we've found between RHIC physics and other scientific forefronts. The unity of physics is a beautiful thing!"

Speaking of unity in physics, a much larger collider is also probing quark-gluon plasma and generating sun-shaming temperatures. The 17-mile Large Hadron Collider (LHC) at Europe's CERN laboratory smashes lead ions together in its own super-hot recreations of the Big Bang. And the LHC's ALICE (A Large Ion Collider Experiment) may be positioned to trump RHIC's record.

"The energy density at the LHC is a factor of three higher than at RHIC," said CERN physicist Despina Hatzifotiadou. "This translates to a 30 percent increase in absolute temperature compared to the value achieved by RHIC. So I would say that ALICE has the record!"

But despite ALICE's prowess, the collaboration has not published an official temperature measurement of its quark-gluon plasma, and the Guinness team is nothing if not official. For the time being, RHIC reigns, having driven physics forward by creating that revelatory multi-trillion degree matter many billions of times. But as with all records, RHIC's Guinness is destined to be broken.

— Justin Eure

Superconductors *from p. 1*

...University of Florida, and Andrey Chubukov of the University of Wisconsin, among others, had developed different versions of a theory that predicts what certain measurements would be if magnetism were the mechanism for superconductivity.

"It was our job to test those predictions," Davis said. But at first, the techniques didn't exist to make the measurements. "We had to invent them," Davis said.

Two scientists working with Davis, Milan P. Allan of Brookhaven and Cornell, and Andreas W. Rost of Cornell and the University of Saint Andrews (where Davis also teaches) — the lead authors on the paper — figured out how to do the experiments and identified an iron-based material (lithium iron arsenide) in which to test the predictions.

Their method, multi-band Bogoliubov quasiparticle scattering interference, found the "signature" predicted by the theorists.

The next step is to use the same technique to determine whether the theory holds true for other iron superconductors. "We and others are working on that now," Davis said.

This research was supported as part of the Center for Emergent Superconductivity, an Energy Frontier Research Center funded by the DOE Office of Science; the U.K. Engineering and Physical Sciences Research Council; the U.S. National Science Foundation; the Japan Society for the Promotion of Science; the Academia Sinica Research Program on Nanoscience & Nanotechnology; and a Royal Society Wolfson Research Merit Award.

For more information, go to *www.bnl.gov/bnlweb/pubaf/pr/PR_display.asp?prID=1410*.

— Karen McNulty Walsh

Arrivals & Departures

— Arrivals —

Babak Andi ..... Photon Scis
Jiajun Wang ..... Photon Scis

— Departures —

Jiajun Chen .....Sus. Energy Tech

Nanosheet Catalyst *from p. 1*

...doubts on its long-term viability," Muckerman said. "There may not be enough of it to support a global hydrogen economy."

In contrast, the principal metals in the new compound developed by the BNL team are both abundant and cheap: $20 per kilogram for nickel and $32 per kilogram for molybdenum. Combined, that's 1,000 times less expensive than platinum. But with energy sources, performance is often a more important consideration than price.

Turning Nickel Into Platinum

In this new catalyst, nickel takes the reactive place of platinum, but it lacks a comparable electron density. The scientists needed to identify complementary elements to make nickel a viable substitute, and they introduced metallic molybdenum to enhance its reactivity. While effective, it still couldn't match the performance levels of platinum.

"We needed to introduce another element to alter the electronic states of the nickel-molybdenum, and we knew that nitrogen had been used for bulk materials, or objects larger than one micrometer," said research associate Wei-Fu Chen of Chemistry, the paper's lead author. "But this was difficult for nanoscale materials, with dimensions measuring billionths of a meter."

The scientists expected the applied nitrogen to modify the structure of the nickel-molybdenum, producing discrete, sphere-like nanoparticles. But they discovered something else.

Roger Stoutenburgh D3280412

Wei-Fu Chen, lead author of the paper and research associate in the Chemistry Department, examines the atomic structure of the platinum-alternative electrocatalyst.

Subjecting the compound to a high-temperature ammonia environment infused the nickel-molybdenum with nitrogen, but it also transformed the particles into unexpected two-dimensional nanosheets. The nanosheet structures offer highly accessible reactive sites — consider the surface area difference between bed sheets laid out flat and those crumpled up into balls — and therefore more reaction potential.

Using a high-resolution transmission microscope in BNL's Condensed Matter Physics and Materials Science Department, as well as x-ray probes at the National Synchrotron Light Source, the scientists determined the material's 2D structure and probed its local electronic configurations.

"Despite the fact that metal nitrides have been extensively used, this is the first example of one forming a nanosheet," Chen said. "Nitrogen made a huge difference — it expanded the lattice of nickel-molybdenum, increased its electron density, made an electronic structure approaching that of noble metals, and prevented corrosion."

Hydrogen Future

The new catalyst performs nearly as well as platinum, achieving electrocatalytic activity and stability unmatched by any other non-noble metal compounds. "The production process is both simple and scalable," Muckerman said, "making nickel-molybdenum-nitride appropriate for wide industrial applications."

While this catalyst does not represent a complete solution to the challenge of creating affordable hydrogen gas, it does offer a major reduction in the cost of essential equipment. The team emphasized that the breakthrough emerged through fundamental exploration, which allowed for the surprising discovery of the nanosheet structure.

"BNL has a very active fuel cell and electrocatalysis group," Muckerman said. "We needed to figure out fundamental approaches that could potentially be game-changing, and that's the spirit in which we're doing this work. It's about coming up with a new paradigm that will guide future research."

Additional collaborators on this research were: Anatoly Frenkel of Yeshiva University, Nebojsa Marinkovic of the University of Delaware, and Chao Ma, Yimei Zhu, and Radoslav Adzic of BNL.

The research was funded by BNL's Laboratory Directed Research and Development (LDRD) Program. The National Sychrotron Light Source and other Brookhaven user facilities are supported by the DOE Office of Science.

DOE's Office of Science is the single largest supporter of basic research in the physical sciences in the United States, and is working to address some of the most pressing challenges of our time. For more information, please visit *science.energy.gov*.

— Justin Eure

Student Luran He Knows What Counts

Roger Stoutenburgh D0970612

Luran He (center), with BNL's Deputy Director for Science & Technology Doon Gibbs (right); Ken White, Manager of the BNL Office of Educational Programs (standing, left), Luran He's parents, Agnes (standing, second from right) and Duanfeng (standing, right); his sister Yiran (standing, second from left); and middle school math teacher Kevin Sihler (sitting, left)

Luran He is a 10th grader at Ward Melville High School and for the past few years, he has been an active participant in the Lab's middle and high school math scholar program administered by the Museum of Mathematics. The young man recently took the top spot for New York in the American Mathematics Contest 10 (10 refers to 10th grade). He also became the first student in Suffolk County to qualify for the USA Junior Math Olympiad, sponsored by the Mathematics Association of America. The primary purpose of the competitions is to spur interest and strengthen the mathematical capabilities of the Nation's youth by recognizing, identifying, and rewarding excellence in mathematics.

Luran, who will be attending math camp at Boston University this summer, came to BNL on June 4 to accept a plaque for his outstanding accomplishment, presented by Doon Gibbs, BNL's Deputy Director for Science & Technology.

"Luran is obviously a gifted young man and I strongly encourage him to pursue a career in science or math," said Gibbs.

After the presentation, Gibbs gave a brief overview of the Lab's history and scientific research and discoveries. Before the guests departed, Gibbs shook the young man's hand and told him, "Perhaps some day you will become part of the BNL team and help us continue to make the world a better place through the science that we do." — Jane Koropsak

Bozovic Honored *from p. 1*

At Brookhaven, Bozovic is working to understand the properties of known materials that become superconducting at temperatures higher than absolute zero to develop superconducting wires and devices that are more practical for everyday applications. To do this, Bozovic studies superconducting thin films that he engineers and fabricates a single atomic layer at a time using a one-of-a-kind molecular-beam epitaxy (MBE) machine that he built and continues to improve.

"The effects I am studying in high temperature superconductors can be masked by impurities and defects in sample materials," Bozovic explained. "As we continue to make thin films that are better and better, our experiments yield improved results and we can see intrinsic behavior that hasn't been seen before.

"The machine I built is extremely productive as well," Bozovic added. "With almost 100 percent uptime, we have produced more than 1,400 thin-film samples in less than seven years to conduct about 200 experiments each year."

Bozovic's research is also important for the Center for Emergent Superconductivity (CES) that the DOE Office of Science established as an Energy Frontier Research Center (EFRC) at BNL, Argonne National Laboratory, and the University of Illinois at Urbana-Champaign in 2009. The CES is one of 46 EFRCs nationwide where scientists are working to make renewable and alternative energy viable as replacements for fossil fuels. Bozovic's work at the CES contributes toward improving the critical properties of known superconductors and accelerating the search for new superconducting materials to improve the capacity, efficiency, and reliability of the electrical grid, particularly as solar and wind-powered sources are integrated into the system.

Bozovic earned a Ph.D. in physics from the University of Belgrade in Yugoslavia in 1975. He remained there until 1985 and served as a professor and the Head of the Physics Department. From 1986 until 1988, he worked at the Applied Physics Department at Stanford University. He was a senior research scientist at Varian Research Center in Palo Alto, California, 1989 to 1998, and the chief technical officer and principal scientist for Oxxel GmbH in Germany 1998 to 2002. He joined Brookhaven as a senior scientist and the leader of the Molecular Beam Epitaxy group in 2003.

Bozovic's results have been published in more than 200 research papers — many in *Nature*, *Science*, and *Physical Review Letters* — and cited more than 5,000 times.

DOE's Office of Science is the single largest supporter of basic research in the physical sciences in the United States, and is working to address some of the most pressing challenges of our time. For more information, visit *science.energy.gov*. — Joe Gettler

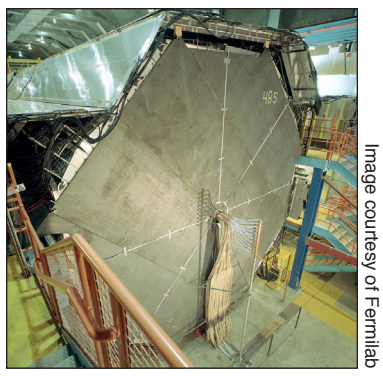


Image courtesy of Fermilab

The MINOS far detector is located in a cavern half a mile underground in the Soudan Underground Laboratory, Minnesota. The 100-foot-long MINOS far detector consists of 486 massive octagonal planes, lined up like the slices of a loaf of bread. Each plane consists of a sheet of steel about 25 feet high and one inch thick, with the last one visible in the photo. The whole detector weighs 6,000 tons. Since March 2005, the far detector has recorded neutrinos from a beam produced at Fermilab. The MINOS collaboration records about 1,000 neutrinos per year.

Neutrinos *from p. 1*

…its 2011 result, scientists confirm that the gap has closed. This upholds predictions and provides crucial information for many other neutrino experiments around the globe.

The new measurement is one of several announced this week by the MINOS experiment at the Neutrino 2012 conference in Kyoto, Japan. These are the final results from the first phase of the MINOS experiment.

"At the end of its initial seven-year run, MINOS has proven that it has been an incredibly successful long-baseline neutrino experiment," said Fermilab's Rob Plunkett, MINOS co-spokesperson. "We look forward to the next phase, when we will search for a new type of neutrino."

MINOS scientists also announced this week their latest measurement of the search for a rare phenomenon, the transformation of muon neutrinos into electron neutrinos. The Daya Bay experiment in China and the RENO experiment in Korea made headlines earlier this year with their measurements of the transformation of electron antineutrinos, observed in neutrinos generated by nuclear reactors. Reactor measurements indicate that MINOS should expect two percent of muon neutrinos to transform into electron neutrinos.

In 2013, the upgraded Fermilab accelerator complex will send an even more intense and higher-energy beam of muon neutrinos to two experiments in Northern Minnesota: the brand-new NOvA experiment and the second phase of MINOS. In its next phase, MINOS will focus on the hunt for a fourth type of neutrino. Hints of a fourth type have been observed in two previous experiments.

The MINOS experiment involves more than 140 scientists, engineers, technical specialists, and students from 30 institutions, including universities and national laboratories, in five countries. A list of funding agencies, which include DOE's Office of Science, and more information are available in the full press release at *www.bnl.gov/bnlweb/pubaf/pr/PR_display.asp?prID=1421*.

Calendar

— WEEK OF 7/2 —

Wednesday, 7/4

Independence Day. Lab Holiday.
No Bulletin this week.

Friday, 7/6

On-site Service Station Closed

— WEEK OF 7/9 —

Wednesday, 7/11

All-Employee Meeting
10 a.m. Berkner Hall. All employees are invited to attend a meeting to be held by Lab Director Sam Aronson.

Sunday, 7/15

***Summer Sundays: Family Science**
10 a.m.-3 p.m. Berkner Hall and the Science Learning Center. All are invited to this free program, open to the public.Visitors to the Lab of 16 and older must carry a photo I.D. See p.4.

— WEEK OF 7/16 —

Sunday, 7/22

***Summer Sundays: Dazzling Light**
10 a.m.-3 p.m. Berkner Hall and the National Synchrotron Light Source II (NSLS-II). All are invited to this free program, open to the public. Visitors to the Lab of 16 and older must carry a photo I.D. See p.4.

— WEEK OF 7/23 —

Tuesday, 7/24

IBEW Meeting
6 p.m. Centereach Knights of Columbus Hall, 41 Horseblock Rd., Centereach. A meeting for shift workers will be held at 3 p.m. in the union office. The agenda includes regular business, committee reports, and the president's report.

Wednesday, 7/25

BSA Noon Recital: Pianofest
Noon. Berkner Hall. All are welcome to this free public piano concert, sponsored by Brookhaven Science Associates. Visitors to the Lab of 16 and older must carry a photo ID. For a 2-minute video of selections from Pianofest 2011, go to *www.bnl.gov/bnlweb/pubaf/pr/PR_display.asp?prID=1420*.

Volunteers Wanted For Summer Sunday Program, 7/15

Volunteers are needed for Family Exploration Day on Sunday, July 15, 9 a.m.-4:30 p.m. at the Science Learning Center, Bldg. 935, as part of the Summer Sunday program. You will help engage the public in fun science activities and exhibits, many related to BNL research. Lunch and a golf shirt to wear will be provided. Please contact Menzel Smith-Jones, Ext. 4495 or *mjones@bnl.gov*.

Attention TIAA-CREF and Vanguard Fund Participants

TIAA-CREF and Vanguard fund participants began receiving information by email and regular mail recently regarding a change to their mutual fund investments. The mutual fund investment menu was moved from a retirement share class to an institutional share class with the same investment funds but with lower expense ratios for participants. A separate email or letter was distributed for each fund affected, so participants would have received more than one notification if they are investing in more than one mutual fund.

The Benefits Office received a number of inquiries from participants concerned that this might be a 'phishing' attack, but these notifications were valid.

TIAA-CREF One-on-One Retirement Counseling

A TIAA-CREF consultant will visit BNL on July 2, 10, 16, 24, and 26 to answer employees' questions about their financial matters. The consultant will help you: understand the importance of protecting your assets against inflation, find the right allocation mix, learn about TIAA-CREF retirement income flexibility, and compare lifetime income vs. cash withdrawal options. For an appointment, please call 1-800-732-8353 or go online at *www.tiaa-cref.org/bnl* and select "set up a meeting."

Fidelity Investments One-on-One Meetings

A representative from Fidelity Investments will visit BNL on July 20 and August 3 to answer employees' questions about financial matters. To schedule an appointment, please call 1-800-642-7131 or go online at *www.Fidelity.com/atwork/reservations*.

BERA Trips

Do-As-You-Please Trip to Brooklyn Flea Market: Sunday, July 8. Flea market with hundreds of vendors and the Brooklyn Brewery nearby. Leave Brookhaven Center at 9 a.m. and leave to return at 4 p.m. $15 per person, children under age two are free.

Horseback Riding in Montauk: Saturday, July 14. 1.5-hour trail and beach ride, picnic at park (BYOF: Bring Your Own Food), then to ocean. Leave Brookhaven Center at 8:30 a.m. and leave Montauk at 4 p.m. Not recommended for children under 10 years old. $85 per person.

Professional Soccer: Saturday, July 21. See the N.Y. Red Bulls take on the Philadelphia Union at Red Bull Arena in N.J. Leave BNL at noon and leave after the game around 5 p.m. Seats in Section 224, $40 per person.

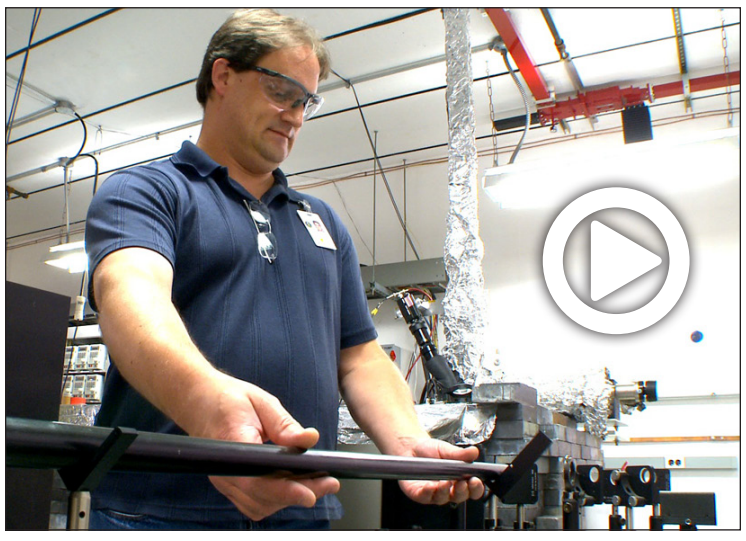
Additional trips are listed at *http://1.usa.gov/MxTxGG*.

Wanna Join In?
Purchase tickets for BERA trips at the BERA Store in Berkner (Bldg. 488), which is open from Monday to Friday, 9 a.m. – 3 p.m.

Blood Donor Addessi Wins Jets vs. Giants Tickets

Congratulations to John Addessi of the Collider-Accelerator Department. He won four tickets to the Jets versus Giants football game. Addessi was one of 170 blood donors to enter a raffle for the tickets during the Lab's blood drive held on June 19 and 20. The tickets were generously donated by John Pagano of the Laboratory Protection Division.

Andy Cook Helped Improve Safety at BNL



Alex Reben V0030612

Laser Beam Between Tables Makes Moving Around the Lab Tough

Andy Cook of the Chemistry Department works in a lab where laser beams are directed from one table to another. Because researchers have to walk through the beam area, Andy implemented a novel solution to address this safety concern. Watch the video to see what it was: *http://1.usa.gov/Mn4b42*.

Safety makes science possible at Brookhaven National Laboratory

summer sundays

July 15 – August 5, 2012

On several Sundays during the summer every year, Brookhaven Lab welcomes members of the public to its site. These "Open House" days include visits to BNL's facilities, opportunities to speak with researchers, special activities for adults and children, and much more — and it's all free! Details: *www.bnl.gov/community/summer_sunday.asp*.

Summer Sundays are free, no reservations are needed. Gates are open from 10 a.m. to 3 p.m. All activities are first-come, first-served. Visitors age 16 and over must bring a photo ID. Handicapped accessible. "Like" Summer Sundays on Facebook for the latest information: *http://on.fb.me/LzGGDV*.

July 15: Family Exploration Day
An exciting day of hands-on family fun! Visit the Science Learning Center to discover basic scientific theory using magnets, mirrors, and more. See the Environmental Extravaganza. Play a part in the Super Scientific Circus. Be enthralled by the "Phenomenal Physics of Mr. Fish" show.

July 22: Dazzling Light, Astounding Discoveries
Tour the National Synchrotron Light Source II, which upon completion will be one of the world's most advanced light sources — a giant x-ray microscope. Master the synchrotron quiz while visiting exciting exhibits and win prizes including a special tour of Long Island's brightest light. Be captivated by the "Science Laser Spectacular."

July 29: Nano, Nano
Visit the Center for Functional Nanomaterials, where Brookhaven scientists probe structures as tiny as a billionth of a meter. Play with exciting new hands-on activities in the Nano-Toy-Zone. Learn to sing the "Nanosong." Be amazed by the "Fantastic Forces" show.

August 5: Atom-Smashing Fun*
Tour the Relativistic Heavy Ion Collider, a world-class particle accelerator where physicists re-create the conditions of the universe as it is believed to have existed microseconds after the Big Bang. See particle detectors as big as a house! Try to stump a physicist. Be mesmerized by the "Magic of Science" show.

*Recommended for ages 10 and over

Classified Advertisements

Current job openings and a statement of job placement policy at BNL are available on the homepage at *www.bnl.gov/HR/careers/*. To apply for a position, go to *www.bnl.gov* and select "Search Job List." For more information, call Ext. 2882.

Motor Vehicles & Supplies

09 TOYOTA CAMRY – 75K mi. gray, 4-cyl, 2.4 ltr, a/c, 5 spd, a/t, abs, am/fm/cd, well maintd, v/gd cond. $12,000 neg. Ext. 8379, ofan@bnl.gov.

08 FORD 150 XLT – 65K mi. 2wd, 4.6V8, towing pkg, mint cond. $13,800.,344-5227.

05 SUZUKI GSXR 1000 – 10.9K mi. Exhaust, LEDs, more. Visual Cond: 8/10, Mech: 10/10. Neg. based on parts you want. $6,000 neg. Jeffrey, Ext. 8162, 816-3554.

02 CHEVY CAVALIER – 78K mi. red, sedan 4dr, 4-cyl, 2.2 liter, a/c, a/t, abs, am/fm/cd. $3,200 neg. Ext. 2988, htding@bnl.gov.

00 FORD EXPLORER XLT – 135.00 mi. blk, 4wd, a/c, clean, runs well. $3,599 neg. 924-6234.

99 BUICK CENTURY – 139K mi. ltd, 6 cyl, p/s, p/w, CD, leather, NO a/c, new tires, new batt. $2,600 neg. Chuyu, Ext. 4431.

99 ISUZU RODEO SUV – 152K mi. manual trany, gd running cond, call or txt. $2,200. Argyrios, 398-3203.

99 FORD ESCORT SE – 120K mi. 4-Cyl, 2 Ltr, ABS, a/t, a/c, all pwr, dual air bags, new t. belt/batt/brake,>30mpg. $2,300 neg. Lu, Ext. 2458 or clu@bnl.gov.

98 HONDA CR-V – 197K mi. a/t, a/c, awd, abs, c/c, p/b, p/l/ p/w, rf-rack, am/fm, cd, cass, orig. owner, well maintd, $2,500 neg. Igor, Ext. 5706 or pinayev@bnl.gov.

TRAILER HITCH – Class 2 hitch, fits full size Blazer or Suburban, incls draw bar, $25. Lynda, Ext. 7235 or fitz@bnl.gov.

VAN RACKS – 2, E200 series, almost new $600. Paul, 368-8530.

Boats & Marine Supplies

21' CHESAPEAKE 1994 STEIGER CRAFT – '08-150HP Suziki 4-Strke-Otbrd/56-hrs. '06 Trailer w/Tandem wheels, 2 Taterstate batt, 1000 amps/ea,more, $20,000 neg. 281-5505.

20' WELLCRAFT CENTER CONSOLE – 200hp Mercury motor, depth finder, fish finder, trailer incld. $5,300. 978-6008.

19' CRUISE CRAFT OLD – no trailer or eng, will help load onto your trailer, needs cleaning, pics avail, $60. Lynda, Ext. 7235, 286-1018 or fitz@bnl.gov.

23 ODAY CONVERTIBLE – Shoal Keel/C/B 2'/5'draft, 9.9 E'rude O/B, VHF, OB, Roller Furling, Sails, porta-potti, stove, cust storage cradle, more. $2300/obo. Ext. 5055.

Furnishings & Appliances

COMMERCIAL FREEZER - $450 – Heavy Duty-20.7 cu ft, 70h x27.5w x30d, pwr on light, slide out baskt, sec lock, light, adj, shelf, defrost drain, pics avail. Ext. 2826.

DESK & CHAIR – full size, L-shaped, beige metal desk w/wood venier top, 4/ drawers, rolling chr incl/$55. 525-1286.

DINING ROOM TABLE – Modern-style, Mica finish, ivory color. 42"w x 60" l x 30" h. 2 sm chips on one edge; looks new, pics avail, $70. Ext. 5669, harringt@bnl.gov.

END TABLE/TABLE LAMPS – Cherry wood round w/glass top, ask/$50, 2 lamps w/blk base, ask/$40, all excel. wwilliams@bnl.gov.

HEADBOARDS – (+ 1 ftbrd) all like new, white w/gold details. Full sz, 54"wx42"t, $30; Twin has footbrd, both 39"w, head:50"t, foot:28"t. Ext. 5669 or harringt@bnl.gov.

IKEA DINING TABLE – w/extra leaf, seats 4-8, store leaf under top, surface w/clear lacq., ask $60, pic at http://tinyurl.com/6uvytdx. Ying, Ext. 5360, ylou@bnl.gov.

KITCHEN CHAIRS – 3, identical, wood, padded cloth w/metal frames, casters, gd cond, $15/ea, 3/$35, pics. Ext. 5669.

RATTAN COUCH – w/cushion, glass top coffee table, excel cond/$150; table w/4 cushion chairs, 42" glass top, light color, all in excel cond/$200. 878-0354.

SIMMONS TWIN MATTRESS BOX – Have two, gd cond. Yue, Ext. 3694.

SLEIGH BED – all wood q/size head/foot/board/$150. pic avail, Sam, Ext. 8967 or sretenski@bnl.gov.

Audio, Video & Computers

61 KEYBOARD – Yamaha E203, pwr cord, music rack & stand incld, $80. Anthony, Ext. 4035 or acostantini@bnl.gov.

CAMERA - NIKON 3000 – & charger w/2 batteries & 18mm-55mm lens $250. Anthony, Ext. 4035 or acostantini@bnl.gov.

IPHONE 4 – brand new white iphone 4, in box, never used, ask/$400/neg. Dorothy, Ext. 2585 or dorothyd@bnl.gov.

MACBOOK AIR – 1.8GHz Dual-Core Intel Core i7, 4GB 1333MHz DDR3 SDRAM,256GB Flash Storage OS X Lion 10.7.4. $1400. Renee, Ext. 8278.

MAESTRO GUITAR – new w/case, neck strap, beginner CD, extra strings and care booklet/$85. Mary, 929-0668.

YAMAHA POWERED SPEAKERS – Yamaha KA-10 45 watt spkrs for keybrd or elect guitar, gd shape, $40/pr. shrey@bnl.gov.

Sports, Hobbies & Pets

$300 SAM ASH STORE CREDIT – I have no use for it, will take $250. Jesse, Ext. 2122 or jmontalto@bnl.gov.

BIKE RACK – Receiver Hitch, used 2x, holds 3 bikes, like new, $75. Rich, Ext. 8186.

BIKE RACK, INVISIBLE DOG FENCE – Reese 2" hitch mounted bike rack for 2 bikes/$75. Innotek IUC-4100 brand new in box/$240. Ext. 3970, mwahlert@bnl.gov.

BMX BIKE – v/gd cond, pic avail/$85. Adele, 525-1286.

MOTORHOME – '98 Newmar Kountry Aire, 40' Diesel Pusher, fully equip, 1 slideout, 50K, ask/$25K, Bob, 289-1834.

MTN. BIKE - FULL SUSPENSION – specialized fsr, rock shox judy-c front, fox vanilla rear, rock ring, model yr 2000, $400/neg. Leo, Ext. 3823.

POKER TABLE – brand new Texas Hold-em w/stainless cup holders, suited speed cloth, w/folding table Legs 48"x48"x30"h, dk green -pic, $175. 516-315-6029.

SURF BOARD – "Roxy" 7.5', lt blue w/ pink detail, cushion, non-slip surface, leash incld, excel cond, $300. 219-7196.

WETSUIT – youth sz 12, excel cond, reduced: $50. Lynda, Ext. 7235, fitz@bnl.gov.

Tools, House & Garden

HUSKY WORK BOX – approx 4'Lx3'Wx3'H Rougher shape, has keys/$200/obo. KC, 294-5392.

LAWN MOWERS – several, self-propelled, mulcher, bag, etc, from $35-$65. Joseph, 603-6285.

RADIAL ARM SAW – Craftsman, 10', installed on top of tool cabinet w/rollers/$75. Ext. 7502.

SCYTHES – old, 2/w/wood snaths, $15/ea or $25/all. Robert, Ext. 4637.

Miscellaneous

ELECTRIC GUITAR – excel cond, gd starter, barely used, can send pics, pd/$175, ask/$75. William, Ext. 3644.

GLASS – 2 pieces, from Anderson drs, 22 x 64. Lynda, Ext. 7235, fitz@bnl.gov.

JOE BONAMASSA TICKETS – Tilles Center CW Post, Fri, Nov 23, 8pm, row AA seats 145-146, face value $160/pr. Rich, Ext. 7294 or gambella@bnl.gov.

MEDELA NURSING PUMP – double suction at same time/$150, pics avail. Nina, Ext. 5894, 813-0497 or vbri1@aol.com.

MEMBERS WANTED!! – I would like to begin a BERA Club to help learn about investing and better prepare for retirement. Please join us! No investment experience req'd! We will learn together! Sue Perino, Ext. 2483 or perino@bnl.gov.

MOREY'S PIERS WATERPARK, NJ – 4 passes for 3 Pier Wristband or waterpark admission, no exp date, value/$225, ask/$175, moreyspiers.com. Cindi, Ext. 4000 or biancarosa@bnl.gov.

POOL LADDER – for agp, steps go into the water, hardly used, $50, pics avail. Nina, Ext. 5894, 813-0497 or vbri1@aol.com.

SPLISH SPLASH WATER PARK – 3 tickets valid until 06/30/2012, $25/ea. Hai, 857-544-2333 or haishi@bnl.gov.

STEAM MOP – Shark Light and Easy, new in box, never opened/$65. Joseph, 603-6285.

Yard & Garage Sales

WADING RIVER – Community Sale, Sat, 8/4, 9a-3p. Wildwood Acres Association, 114 Hulse Avenue. Stop at Pavilion, get map of participants, call for info. Lois, 375-7264.

Happenings

VFW POST 6249 GOLF OUTING – 5th Annual Wounded Warrior event, 9/24 @ Calverton Links. Benefits to wounded heros, & provide scholarships in memory of those lost:www.vfw6249.org. vfw6249golf@yahoo.com.

FUNDRAISER FOR BABY JOEY – special auction & spaghetti dinner Sat, June 30, 5p, Ridge Fire Dept HQ, Frances Mooney Dr, $10/person. Judi, Ext. 7430.

PANCAKE BREAKFAST – St Andrew's Episc. Church, E Main St, Yaphank, Sat, Jun 30, 8a.-12n, $8 adults/$5 srs/$4kids 5-12, gd food, fellowship, more. Bring canned food item for LI Cares. info@standrewsyaphank.org.

WARD MEVILLE HS CLASS OF 1972 – 40th reunion: July 21, Hyatt Regency Hotel, Hauppauge, NY. Tickets: $103 ea. See Reunions-Unlimited.com or call 928-5684.

WOODLANDS FOLK FESTIVAL – Family & eco-friendly, grt music, 11:30a-7p, Sat, June 30, 3 stages of great artists in peaceful setting, info, schedule & tickets,. info@woodlandsfolkfest.org.

Free

2 KITTENS-8 WEEKS – Happy beautiful Long haired white cotton ball, Boy & twin sister. Both little spots of black/gray on head. Donna, Donnacar62@aol.com.

IPOD NANO ARMBAND – brand new pink ipod nano 3rd generation armband from Griffin, washable, adjustable. bouet@bnl.gov.

NTDTV AWARD WINNING FILM – "Between Life & Death" documentary by New Tang Dynasty TV. georgewei@bnl.gov.

ROOIBUS TEA – 100 NUMi Organic Tea sent plain rooibus teabags (I ordered r. chai). Anyone want plain rooibus teabags? Stephanie, Ext. 7911 or sbogart@bnl.gov.

STOVE & FURNACE: – 1 Ameri-Therm Model T500 thermally activated flue damper, 5"diam; 1 stove flue pipe catalytic combuster, 8"diam. Ext. 2490 or gmur@bnl.gov.

TOMATO PLANTS – grown from seed outdrs, about 2' tall; I have too many for my garden. Sabine, Ext. 4340.

Wanted

BOXTOPS & CAMPBELL'S UPCS – Please send to Nina, Bldg. 911A. 813-0497.

CABINETS / BUFFET – for kitchenette that hold pots/pans and dishes, etc, Thank You! Rick, Ext. 3005 or rbuono@bnl.gov.

DIGITAL PIANO – seeking used, upright under $500. Sarah, swiley@bnl.gov.

FIREARMS – new or old, will pay fair $$$ depending on cond, we will meet off site for all transactions. Joe, 487-1479.

TOILETRIES – to make hygiene kits for the homeless, needed items: deodorant, soap, shampoo, tissues, combs, toothbrush/past, washcloths, etc. 344-7611.

VOLUNTEERS – to help with visitors on Summer Sunday of July 15. See p. 3.

WOMENS MOUNTAIN BIKE – used/gd cond. ccardone@bnl.gov.

For Rent

CENTEREACH – 2-3 Bdrm split level, deck, Gazebo, 4 car gar, pool, no smokg, No pets,1.25 acre, utils not incl, 2mos sec, pics. $2,800/mo. 516-380-7322.

MANORVILLE – 3 bdrm Town Hse in gated comm, 10 min from BNL, avail immed, 6 mos or full yr. $2,250/mo. 875-6066.

RIDGE – 3 bdrm, 5 min to Lab, Eik, Lg den, 1.5 ba, W/D, Lg yd, No smoking. Water, sewer & lawn maint incl. Yearly lease. $2,100/mo. 504-6143, pjens330@yahoo.com.

RIVERHEAD – 3/bdrm, 2/full ba, ranch, kit, dw, l/r, d/r, gar, new windows, quiet, nr shops, no smkg/pets, refs, credit ck reqd, 1/mo sec+util. $2,150/mo. 512-6470.

SELDEN – 3-4 bdrm, 2 bath ranch, unfurnd, hardwd flrs, huge attic, fend property, w/d incld, cac, MBR has full bath. $2,200/mo. Kim, 516-848-7555.

SHIRLEY – 1 bdrm apt, l/r, full ba, eik, dble closet, priv ent, sep thermostat, off st prkg, new appli, util incl, no smkg/pets, 1/mo rent/sec. $1,100/mo. 772-8529.

SHOREHAM – share a house w/professional. Lge, furn bdrm, cable TV, i/net, no smkg/pets, 7 mi to BNL, cell phone: 631-464-8134. $650/mo. gg19582003@gmail.com.

SHOREHAM – 1 bdrm furnd apt, l/r, d/r, full kit & ba, pvt ent/drvwy, util incl, 1/mth sec, no smkg/pets, 5min to Lab. $1,150/mo. 375-7957, or judyb55@optonline.net.

SOUND BEACH – 1 bdrm apt $850 single; $950 double, utils incld. Marie, 346-5942.

For Rent or Sale

MANORVILLE – 4 bdrms, 2ba, f/p, 2 c/gar, full bsmt, oil/hw heat, lg deck off d/r, 2.25 acres, fenced yd, 2000/ft, living space, low taxes, rent $2.100, sale $349,000. 475-0068.

SPRING HILL, FL – priv ranch on Gulf, 70m Orlando, 45m Tampa, fly Islip direct, near beach/tennis/park, SW architecture, 3/bdrm, 2/bath, d/r, f/p, 2gar, igp in lanai, fruit trees, see review.oktane.net/House-Tour. $450/wk or $120,000 neg. 344-5537.

For Sale

HOLTSVILLE – Birchwood Glen, gated comm, 1 bdrm/1st flr Co-Op, wood flrs, OHW, a/c, Comm. Cntr w/igp, tennis, gym, pets ok, no smkg, MLS# 2488133. $127,000 neg. 589-8222.

N. BABYLON – 1 bdrm/1 bth Condo, Springwood Condo complex, top flr, updated, w/d, balcony, ask/$195K, ~$3,100 taxes, $315/mo condo fee, call for appt. $195,000 neg. 786-1264.

PORT JEFF STATION – 1 lg upper bdrm, 1 bath Co-op, a/c, d/w, eik, applis/windows/pool on site, gated, great location. $91,000. 882-2743.

ROCKY POINT – Freshly Painted 1 Bedroom CO-OP, New Kitchen, Remodeled Rathroom, Near All stores and Restaurants. $85,000. William, 525-3239.

SHIRLEY – lg 4 bdrm 2 ba Ranch In Desirable Tangiers, l/r w/fp, Fr. drs, huge den w/ skylight, sunny dining area bi-level deck w/ agp, igp, accessary apt OSE w/egress win, 2 dr way, $229,000 neg. Joseph, Ext. 2386.

SHOREHAM – 3 bdrm, 1.5 ba Col. on c-de-sac, updated ba & kitch/w ss applis, dn w/fp, gar, bsmt, lrg wood deck, & wood shed, 10 min to Lab. $344,000 neg. Ext. 3347, 744-8793 dreashouse@aol.com.

SMITHTOWN – 4 bdrms, master, 3 full ba, den, high ranch, rm for mom, open great-rm design, attic, gar, bsmt, fpl, laundry rm, cac, last hse on dd end, walk town, park, train, #1 Smithtown schools. $450,000 neg. 516-808-3422.

WADING RIVER – 3 bdrm ranch, lg fam rm, det oversize 2 car gar on bldrs, acre in great neighborhd, north of 25A. $359,000. Carl, 929-5781.

In Appreciation

I wish to thank everyone who attended my retirement party, especially those who helped organize the event. My family and I had a wonderful time, it has been a great 34 yrs and I will miss you all. "Live Long and Prosper." — Paul Ribaudo

I sincerely thank all my friends and colleagues at BNL for their immeasurable generosity with their time, well wishes and prayers. I wish I could thank each of you individually but since I cannot, I hope this note will reach each and every one of you. I hope to be back soon with my BNL family! Thank you again all from the bottom of my heart. — Mary Campbell

Service Station On Site

The service station on site, which is located at the corner of Rochester and Rowland Streets, will be closed on Friday, July 6.

the Bulletin

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Liz Seubert, editor
Joe Gettler, assistant editor
Roger Stoutenburgh, photographer

On the Web, the Bulletin is located at *www.bnl.gov/bnlweb/pubaf/bulletin.asp*. A calendar listing scientific and technical seminars and lectures is found at *www.bnl.gov/bnlweb/pubaf/calendar.asp*.

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