The Daya Bay Neutrino Project, which uses the Guangdong Nuclear Power Plant Group's reactor in southeastern China, is the first to catch antineutrinos, is primed to measure the last piece of the neutrino puzzle. It began taking data from the first of three planned experimental halls earlier this year, and the second hall should be up and running within the next few weeks. The international collaboration of researchers includes strong teams from China and the United States as well as teams from other countries and regions, including Taiwan, Hong Kong, Russia, and the Czech Republic. BNL has made significant contributions to this experiment, the latest step in the saga of neutrino research.

“Brookhaven’s chemistry and physics departments have major leadership roles in the experiment, from designing the detectors all the way through to analysis of the data gathered,” said Steve Kettell of the Physics Department, chief scientist for this project and leader of Brookhaven’s Electronic Detector Group.

Ghostly Neutrinos

Neutrinos are the ghosts of the particle physics world. Most of them pass through anything and everything, even entire planets, without interacting. At a given moment, tens of billions of neutrinos are passing through every square centimeter of the Earth’s surface — including you and me, without our noticing it. This makes detecting them especially problematic. What’s more, they come in three flavors: electron, muon, and tau — and each has its own quirks that necessitate specific detection techniques. Neutrinos are also able to change among these three forms, a process known as “oscillation,” which has been confirmed by experiments around the world.

As Daya Bay gets under way, let’s take a moment to look back on the history of neutrino research and the contributions from BNL.

Neutrinos were first proposed by Wolfgang Pauli as early as the 1930s, but were only detected in the 1960s at nuclear reactors in Washington and South Carolina by Frederick Reines and Clyde Cowan. This earned them a Nobel Prize in 1995. Neutrino’s name, given by Enrico Fermi, means “little neutral one.”

BNL’s first major contribution to neutrino research occurred in 1957, when Maurice Goldhaber performed an experiment that revealed neutrinos to be left-handed.

In 1962, a new type of neutrino, the muon neutrino, was discovered by scientists using the Alternating Gradient Synchrotron at BNL. Lomon Lederman, Mel Schwartz, and Jack Steinberger took home the 1988 Nobel Prize for this work, which established that there was more than one flavor of neutrino.

Neutrinos oscillate between electron, muon, and tau forms, known as “tau forms, known as τ.” As Kettell, as chief scientist for this project and leader of Brookhaven’s Electronic Detector Group, has noted, “In the late 1960s, BNL chemist Ray Davis discovered the solar neutrino problem. At the Homestake Mine in South Dakota, deep underground in order to shield them from any interfering cosmic rays, Davis was the first person able to directly detect the electron neutrinos being produced by the sun. But he only observed about one-third of the expected amount — this deficit would eventually become known as the solar neutrino problem (and the “missing” neutrinos would later turn out to be those that had changed to hadronic decay at Davis’ experiment while en route to Earth).”

From the 1990s through the mid-2000s, BNL Chemistry’s neutrino group played important roles in the GALLEX (Galium Experiment) and SNO (Sudbury Neutrino Observatory) experiments in Italy and Canada, respectively. BNL chemist Richard Hahn and his group were integral to the SNO experiment.

A Ghost-Particle Retrospective

As Dooryhee will explain, a synchrotron is an exceptionally powerful source of “light”...
Benefits Open Enrollment Continues Until 11/18

Open Enrollment for medical and dental benefits, reimbursement accounts (health care, dependent day care, and transit commuter), and dependent coverage ends this Friday, November 18. During this time, eligible employees may add or drop medical and/or dental coverage, change from one medical or dental plan to another, change from one medical or dental plan to a reimbursement account, and/or make changes to the reimbursement account(s) and the vacation buy up. All changes made during the Open Enrollment period are effective January 1, 2012.

To answer questions one-on-one, the BNL Benefits Office will host representatives from CIGNA, Vytra, Delta Dental, PayFlex, TIAA-CREF, and Fidelity from 11 a.m. to 2 p.m. on Thursday, November 10, in the Bldg. 440. Lobby. Literature will be available. For more information, visit http://intranet.bnl.gov/benefits.

Several important experiments in the field...

— K.V.

Ha’s Talk from p. 1...

...that a product of the reaction, amyloid beta peptide, is toxic to neuronal cells and thus directly responsible for causing Alzheimer’s disease. Knowing the atomic structure of presenilin will help to solve this puzzle and to explain the mutations that cause the disease. So far, this has been difficult to achieve experimentally. Ha and his team took an alternative approach. They used x-ray crystallography to determine the atomic structure of FlaK, a protein that is a close relative of presenilin. Knowing FlaK’s atomic structure will help to shed light on presenilin’s shape and function, which in turn could reveal new opportunities to treat or prevent early-onset Alzheimer’s disease.

Ha earned a B.S. in biochemistry from Nanjing University, China, in 1992 and a Ph.D. in biophysics from the University of Minnesota in 1998. He was a postdoctoral fellow at Harvard University from 1998 to 2001, and in 2001 he joined the faculty at Yale University in addition to his position as associate professor. He is the director of the Macromolecular X-ray Crystallographic Facility, Yale University School of Medicine.

— Diane Greenberg

Reminder: BSA Scholarship Entry Deadline Is 11/15

Fifteen scholarships in the amount of $2,500 are offered annually by Brookhaven Science Associates to children of eligible BNL employees. All scholarships are awarded competitively and are renewable for a total of four years of study toward an academic degree. Selection is made by an independent committee appointed by Scholar- ship and Recognition Programs (SRP) of the Educational Service Office. Application forms, from the Human Resources & Occupational Medicine Division Div. 400, are available at http://intranet.bnl.gov/memo/ http://intranet.bnl.gov/memo/58343b34-d284-4485-9b8f-a85d671f6d.948. For more information, call Ext. 2982. Recipients are notified by phone before December 31, 2011.

Tuesday, Wed., Thurs., and Fri.: Tai Chi

5:30 a.m., 85th Floor, Brookhaven Center. First Weds. of month: Tai Chi for Beginners. Open to all, six sessions. Cost is $10 per class. For more information, call Ext. 2873.

Wednesday, Thurs., and Fri.: Postdoc Social Night

5 p.m., Brookhaven Center. First Thurs. of month: Cover art exploration. Join the Bulletin art editor Annie Blazzy as she shows you how to create art in Flash or Photoshop and learn about the possibilities. Open to all. For more information, call Ext. 2873.

Thursday, Tues., and Thurs.: Yoga

5:30–9:30 p.m. in Bldg. 317. General activities handle management of the Liquid Scintillation Counter that fills the mast

Thursday, Tues., and Thurs.: Noon–1 p.m., in gym (Building 29).

Thursday, Tues., and Thurs.: Hospitality Welcome Coffee

10 a.m.–4 p.m., Brookhaven Center. First Thurs. of month: LabVIEW training. Registration required.

Thursday, Thurs., and Fri.: Play Group

5:30–6:30 p.m., Pool (Building 478). Registration required.

Thursday, Thurs., and Fri.: Noon–1 p.m., in gym (Building 29). First Thurs. of month: LabVIEW training. All registration required.

Thursday, Thurs., and Fri.: Noon–1 p.m., in gym (Building 29). First Thurs. of month: LabVIEW training. Registration required.

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How Chris Harris Made BNL Safer

Chris Harris of the Facility Operations Office realized that if a fire broke out, one of the innumerable buildings in Bldg. 490, it might be difficult to put it out. This was because the propane isolation valves were positioned behind the hood and difficult to shut off. He thought of some equipment that has helped prevent hood fires. The BNL S2 Program is designed to seek out health and safety improvements and corrective actions derived from employee suggesstions. The S2 Program is open to all BNL employees, users, and visitors. Selection of projects is made by the S2 Council, which has representation from BNL's science, operations, and support organizations. Members of the S2 Council are a good resource and sounding board in the development of proposals. The Council reviews S2 proposals and awards funding to those projects that best meet the approved criteria.

More ideas have become successful projects, which you can see in the series of videos available at http://intranet.bnl.gov/safety/videos. For more information, see www.bnl.gov/ohs/tools/OHASS/S2homepage.asp.

BNA Noon Recital, 11/9

Orion Weiss and Anna Polonsky to Perform

Pianists Orion Weiss and Anna Polonsky will perform duets by Schubert, Schumann, and Ravel in a concert on Wednesday, November 9, at noon in Berkner Hall. Sponsored by Brookhaven Science Associates, the concert is free and open to the public. All visitors, especially those 16 and older must bring a photo ID.

Orion Weiss was named the 2010 Classical Recording Foundation’s Young Artist of the Year. He is one of the most sought-after duo and chamber music performers of young American musicians. His impressive list of awards includes the Gilmore Young Artist Award, an Avery Fisher Career Grant, the Gini Bachauer Scholarship at the Juilliard School, and the McErylzun Munz Scholarship. Anna Polonsky is widely in demand as a soloist and chamber musician and has performed as venues such as the Amsterdam Law Munz Scholarship. An Avery Fisher Career Grant, the young American musicians. His after soloists in his generation of 2010 Classical Recording Foundation’s Young Artist of the Year.

2011-12 Calendar

Wednesday, 11/9

*Talk on Alzheimer’s Disease*

4 p.m. Berkner Hall. Ha Ya, Yale University, will present “A Closer to Understanding Alzheimer’s Disease.” Free, open to the public. Visitors to the Lab of 16 and older must carry a photo ID.

Thursday, 11/10

*Celebration for Veterans Day*

Noon. Brookhaven Center Building, 80 parking lot. Commorating veterans. All are welcome.

Friday, 11/11

Lab Closed Honoring Veterans Day

No Bulletin this week.
This photo was taken on October 25 while students and instructors from the New York Wildfire and Incident Management Academy (NYWIMA) conducted a prescribed burn in the northeast corner of the Laboratory site. For the past 14 years, the NYWIMA has held classroom and field training on the BNL site. In addition to the important benefits of hands-on training, the prescribed burn also helps to improve conditions for forest re-growth and reduce fuels that support catastrophic wildfires.

Before conducting the burn, many required meetings must be met, including specific weather conditions and safety preparations.