

FEATURE

SLAC scientists recover their systems at ATF

by Rika Takahashi



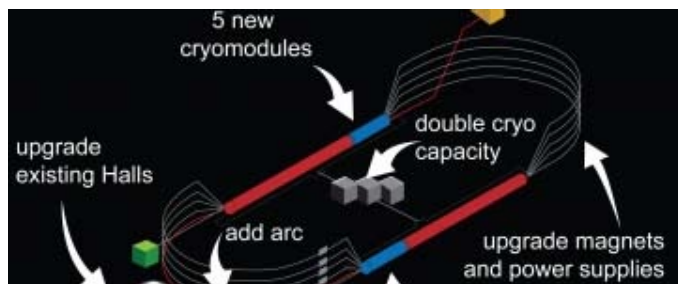
Janice Nelson and Glen White from SLAC National Accelerator Laboratory in the US are the first overseas scientists to visit KEK after the earthquake.

FEATURE

The 12-GeV upgrade of Jefferson Lab's CEBAF accelerator

The US laboratory accelerator is doubling its electron beam energy to address forces at work in protons and neutrons

by Leah Hesla



Last month Jefferson Lab, instrumental in developing SCRF technology for the ILC, took a critical step in a five-year upgrade of its CEBAF accelerator. Once complete, the machine will be able to accelerate electron beams to energies of up to 12 GeV, allowing researchers to chart, with ever greater depth and resolution, the map of the nucleon.

Science Diplomacy

by Barry Barish



To a very large extent, science has no boundaries. The research we perform, the discoveries we make, the collaborations we forge, and even the teaching we do is universal. As a result, science and scientists offer a unique window for understanding and collaboration with each other, advancing both science and what is referred to as science diplomacy.

IMAGE OF THE WEEK



Secretary of Energy Steven Chu speaks at Fermilab

Image: Reidar Hahn

United States Secretary of Energy Steven Chu discusses the importance of fundamental research at a public lecture on 2 June at Fermilab. [Read about his talk.](#)

IN THE NEWS

from ***physicsworld.com***

7 June 2011

[Future is bright for CERN antimatter physicists](#)

Last month physicsworld.com reported that physicists from CERN's ALPHA experiment had trapped 309 atoms of antihydrogen for 1000 s – smashing their previous record of 38 atoms trapped for one-fifth of a second. Now we can reveal that the team's success has brought it extra funding that, in part, will allow two new antimatter experiments to be built, as well as a new source of antiprotons.

from ***BBC News***

6 June 2011

[Antimatter atoms are corralled even longer](#)

Scientists have succeeded in trapping atoms of anti-hydrogen for more than 15 minutes.

from ***New Scientist***

1 June 2011

[Tevatron's mystery signal grows stronger with more data](#)

If physicists weren't jumping up and down with excitement in April at the announcement that an unknown particle had been glimpsed at Fermilab, they are now.

ANNOUNCEMENTS

Correction

In last week's Director's Corner, *ILC NewsLine* misidentified a photo of Pierre Darriulat as André Lagarrigue. *NewsLine* regrets the error.

PREPRINTS

ARXIV PREPRINTS

[1106.0018](#)

Z'tc coupling from $D0-\overline{D0}$ mixing

CALENDAR

UPCOMING EVENTS

[Technology and Instrumentation in Particle Physics 2011 \(TIPP 2011\)](#)

Chicago, IL

09- 14 June 2011

[International Europhysics Conference on High-Energy Physics \(EPS-HEP 2011\)](#)

Grenoble, France

21- 27 July 2011

[15th International Conference on RF Superconductivity \(SRF2011\)](#)

Sheraton Chicago Hotel & Towers, Chicago, IL

25- 29 July 2011

UPCOMING SCHOOLS

[USPAS sponsored by Stony Brook University](#)

Melville, New York

13- 24 June 2011

[View complete calendar](#)

FEATURE

SLAC scientists recover their systems at ATF

Rika Takahashi | 9 June 2011



Janice Nelson at KEK. Image: GDE

KEK's accelerator test facility, ATF, has many components installed on its beamline, many of which come from other laboratories around the world. From 21 May to 6 June, two scientists from the US laboratory SLAC, Janice Nelson and Glen White, came to ATF to check and recover systems that they are responsible for: the cavity beam position monitor (BPM) system (in collaboration with Royal Holloway) and the magnet mover system on the ATF2 beamline.

"There was damage from the earthquake," said Nelson. The ATF2 magnet mover system is equipped with some 90 sensors and six of those were completely broken. They also identified damage to the crate containing electrical devices that monitor and provide controls to the cavity BPM system, the devices capable of measuring the x- and y-axis positions of the electron beam. "We asked our SLAC colleagues to send a crate while we are here in Japan. Once that arrived, and the

bad crate was replaced, the system was brought back online," said Nelson. Thanks to the scientists' dedication, all the recovery work was completed in two weeks.

Nelson and White were the first overseas visitors to see ATF after the March 2011 earthquake. Many of the conferences planned to be held in Japan were cancelled, and some scientists expressed hesitation in even coming to Japan. "I was worried about colleagues here at KEK, and coming to see that everyone is OK was one of the purposes of this visit. I did not worry about the damage to myself," said Nelson. "We very much want to help our Japanese colleagues. Our particular systems are important to the whole system. We wanted to fix them as soon as possible so that they could recover the beam."

Usually, SLAC physicists can remotely monitor the systems at ATF from SLAC, but because of the power shutdown, they could not know what was going on until they actually came to KEK. "It is very difficult for me to understand how big the earthquake was," said Nelson, who noted that she did not know what to expect. "Magnitude 9.0 earthquake – what does it mean?" She saw evidence that very heavy equipment had been moved, shaken and slammed around. But the size of damage to the magnet movers was small enough that they were easy to recover.

"But we came here with more ambitions," Nelson said. They came with a plan to upgrade one of the mover systems, to make it move faster, and will conduct a test on one unit. "With the SLAC systems recovered enough for beam use, we are working hard to begin the upgrade tests. We will be back again to finish the upgrade."

The checkout for the beam at ATF is moving forward. On Friday, 3 June, KEK scientists confirmed a test beam reached the beam dump at the end of ATF2, which was extracted without a significant amount of beam loss. "We still have a lot of things to check: the intensity in the ring, emittance and many beam instruments," said Nobuhiro Terunuma of KEK, a spokesperson for the ATF international collaboration. The hard work will be continued during the planned summer shutdown, during which scientists aim to accomplish as much work as possible.

[EARTHQUAKE](#) | [KEK](#) | [SLAC](#)

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FEATURE

The 12-GeV upgrade of Jefferson Lab's CEBAF accelerator

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Leah Hesla | 9 June 2011

Why don't quarks fly solo?

Scientists have long observed that these particles, like Noah's animals or instances of bad luck, always come in twos or threes. Yet nothing in the Standard Model of physics says quarks have to keep each other company.

Scientists at Jefferson Laboratory in Newport News, US, will soon be uniquely positioned to experimentally probe this curiosity, among others. Their [CEBAF](#) accelerator is getting a boost from six to twelve gigaelectronvolts (GeV) of electron beam energy, giving researchers more to play with as they explore the complex make-up of nucleons: their constituent quarks, the stubbornly strong gluons that hold them together and the resulting shapes of this subatomic assembly.

The [12 GeV Upgrade Project](#) took a critical step on 13 May with the start of CEBAF's first six-month shutdown for installation.



Schematic layout of the required facility modifications to realise the 12 GeV Upgrade. Image: DOE's Jefferson Lab

"It's very exciting," said Allison Lung, deputy project manager of the 12 GeV Upgrade Project. "We'll be the first ones to map out these exotic particles that are rich in glue, really trying to understand why you never see one quark by itself or why they're confined."

CEBAF currently supports three experimental areas that probe the inner dynamics of neutrons and protons. With the 12-GeV upgrade, a fourth experimental hall will be built to house a new experiment, GlueX, aimed at getting to the bottom of [quark confinement](#), which has been cited as one of the most pressing questions in physics today. Two of the existing halls will also get new spectrometer systems.

An addition of ten new superconducting-cavity cryomodules to the existing 40, arranged in two parallel linacs, will give the electron beam its extra 6 GeV. The cryomodules will be installed in what is currently drift space in the CEBAF accelerator, precluding the need to add length

to the accelerator.

"That's nice because it means we didn't have to spend any money on expanding the tunnel," said Leigh Harwood, associate project manager for the accelerator portion of the upgrade.

JLab's pioneering advances in superconducting radiofrequency (SCRF) technology have helped streamline the cavity interface: the new coupling instrumentation carries far less bulk than its predecessors. Researchers can now place a seven-cell cavity in a space that would previously have been occupied by a five-cell structure. With more cells, the cavities' accelerating voltages go up, and the particle beam can efficiently climb to higher energies. In addition, the developments at JLab, some in collaboration with

ILC, led to higher gradients that have further increased the voltages. Once all is in place, CEBAF will house a total of 50 SCRF cryomodules in its linacs.

The new plan allows the electron beam to make up to five-and-a-half passes around its racetrack shape, imparting more energy to the beam with every lap. Scientists can select when during those five passes the electron beam leaves its accelerating orbit for a detector, so tuning how much beam energy to feed to CEBAF's experiments – up to 11 GeV to the three current experimental halls and up to 12 GeV to the future fourth.

"We can pretty much dial it where we want, and then deliver it to three halls at the same time," Lung said. "It's like having three different accelerators."

The construction of Hall D, the fourth experimental hall, will provide more than just another fundamental physics project. In the years leading up to completion of the upgrade, physics students, professors and researchers from collaborating universities will have a rare educational opportunity to actively participate in the design and tests of the detector experiment and equipment, as well as in the detector's commissioning.

"We extensively involve universities in constructing the detectors for this upgrade to the tune of millions of dollars and dozens of institutions across the world," Lung said. "We've really fine-tuned those collaborative relationships."

The 12 GeV Upgrade Project is being funded by the US Department of Energy, with support from the National Science Foundation, which contributes to collaborating US universities, and with collaborative contributions from institutions in Canada, Chile, France and Russia.

"I started working on developing and planning the upgrade to CEBAF in '98," Harwood said. "I'm thrilled to see all the hard work coming to fruition and the transition actually starting."

JLab will complete construction in 2015, and the fully fledged programme will begin in 2016.

"There's so little new facility construction in the world for basic research," Lung said. "To finally see this coming up out of the ground is very exciting."



The Hall D sub-project consists of building a new large acceptance detector for photon beam experiments located in a new experimental hall at the northeast corner of the CEBAF accelerator. Image: DOE's Jefferson Lab

[CEBAF](#) | [JEFFERSON LAB](#) | [JLAB](#)

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DIRECTOR'S CORNER

Science Diplomacy

Barry Barish | 9 June 2011



Norman Neureiter, AAAS Center for Science Diplomacy

During the cold war, some of the most important interchanges and breaking down of barriers between the east and the west came through scientific exchange and collaboration. In recent years, exchange and training of students, global availability of advanced scientific facilities, books and publications have broadened the scientific enterprise and have all contributed to the emergence of developing countries. As science advances around the world we can look more and more towards joint global scientific goals and facilities. In recognition of the importance of this subject, the American Physical Society (APS) sponsored a special session called “Science Diplomacy” during its [April meeting](#) in Anaheim, California, consisting of a panel of Norman Neureiter, Neal Lane and myself.



Pugwash Conferences on Science and World Affairs seeking elimination of nuclear weapons (Nobel Peace Prize 1995)

Nina V. Fedoroff, Science and Technology Adviser to the US Secretary of State and to the Administrator of the US Agency for International Development, has defined [science diplomacy](#) as “the use of scientific collaborations among nations to address the common problems facing 21st century humanity and to build constructive international partnerships.” She goes on to point out that “there are many ways and engineers to use their scientific and technical skills in the service of international diplomacy.” The APS session on science diplomacy illustrated the range of ways science and scientists can play these important roles.

The panel consisted of three speakers and included plenty of time for discussion with a lively interactive audience. The first panelist was Norman Neureiter, who has spent much of his career in hands-on science diplomacy, serving as the first science and technology adviser to the Secretary of State, leading the US’s international science and

technology cooperation efforts under Secretaries Madeleine Albright and Colin Powell and has by his own actions helped define the term ‘science diplomacy’. At the APS meeting, Norman gave a broad sweeping talk, which he entitled “Science Diplomacy in Action.” He gave many concrete examples through his long history of his service from well-known events of his definition of science diplomacy as “the use of science cooperation as a means of active engagement with countries where overall relations are strained or non-existent. And, it is an instrument of a constructive foreign policy aimed at mutually beneficial engagement.” Norman is a living example as to how a single individual scientist can make a difference!

I was the second speaker and I talked on a subject familiar to most of our readers, “Science Diplomacy in Large International Collaborations.” I reviewed the ever-increasing reliance on international collaboration for large-scale science projects, including, of course, the International Linear Collider.



*Neal Lane, Senior
Fellow in science and
technology policy at
the Baker Institute,
Rice University*

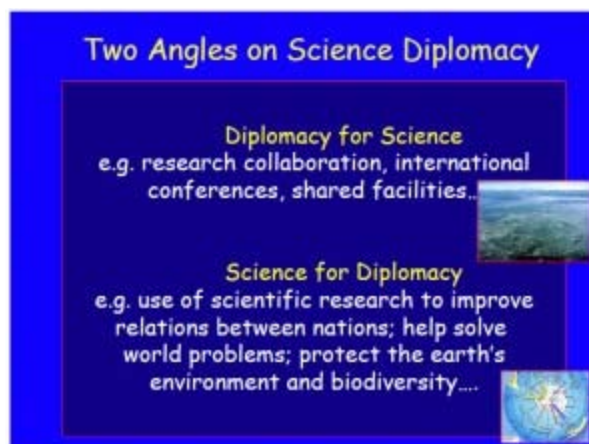
The third speaker was Neal Lane, who among his many roles has served as director of the National Science Foundation, Science Advisor to President Clinton and has been awarded the prestigious Public Welfare Medal by the National Academy of Sciences. He entitled his presentation “A Scientist’s Approach to Diplomacy – First, Listen and Learn.” Unfortunately, Neal’s trip to Anaheim was aborted due to an illness aboard his flight, but he was able to participate long-distance from Houston. In this talk, he emphasised from his many years of experience in the service of science in government that “science is a unique platform to promote cooperation, understanding and shared values among individuals, communities and nations even in difficult times.”

These talks were followed by a spirited question and answer discussion. Clearly, there is much interest by young scientists in participating as scientists in government. There are such opportunities and there is an obvious great need for more scientists to participate in government.

Finally, let me end by again quoting Nina Fedoroff, who so eloquently expressed the

value and importance of scientists finding ways to “become citizens not just of our own nations, but of this world without borders. We need to see, experience, and identify with the peoples and the problems of other nations and to recognise the complexity and interconnections among the challenges facing 21st-century humanity. And perhaps most importantly of all, we need to understand, at a deep gut level, that all our fates are truly intertwined.”

APS



Neal Lane - two angles on science diplomacy