

AROUND THE WORLD

A recovering northeast Japan turns its sights to the ILC

by Rika Takahashi



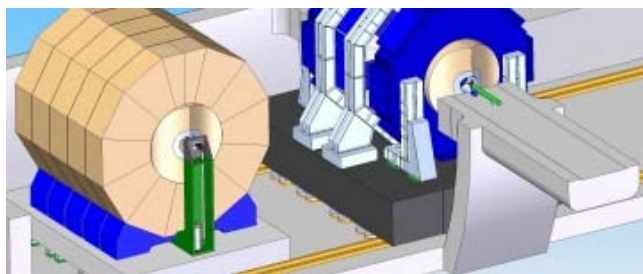
As the region around Tohoku University recovers from the March earthquake and regains its footing, scientists there look forward to rejoining ILC research efforts, and the local government highlights the ways recovery could be facilitated by bringing the ILC to Iwate prefecture.

FEATURE

Concrete plans for a platform

Pushing and pulling a detector on its platform brings technical challenges

by Leah Hesla



Linear collider collaborators are on board with the use of two platforms to move the ILC's two colossal detectors in and out of the particle beamline. Now they work to design them so the detectors' rides are as smooth as possible.

DIRECTOR'S CORNER

A new beginning – and no strings attached

This week's issue features a Director's Corner from Brian Foster, Global Design Effort European Regional Director.

by Brian Foster



Winner of a Humboldt Professorship, Brian Foster has just taken up his work at DESY and University of Hamburg as a joint professor for experimental physics, focusing on accelerators for very high energies. He intends to spend the 5 million Euros for five years to the greatest effect, and the ILC will play a very strong part in his plans.

IMAGE OF THE WEEK



Electron gun placed on KEK electron beam welding machine

Image: Nobu Toge

In Spring 2011, an electron beam welding (EBW) machine was delivered to Japan from a manufacturer in Germany for building a cavity production test plant on the Tsukuba campus of KEK. This picture shows the electron gun, which was recently placed on top of the EBW vacuum vessel with help from a German engineer.

IN THE NEWS

from **Chicago Sun-Times**

20 June 2011

[Fermilab seeks 5 percent staff reduction](#)

Fermilab expects to lose up to 100 employees over the next several months as workers are given an opportunity to take buyouts as part of an effort to avert layoffs.

from **CERN**

17 June 2011

[LHC achieves 2011 data milestone](#)

"When we set ourselves the objective of achieving one inverse femtobarn in 2011, it was for good reason: that amount of data could well give us access to exciting new physics."

from **BBC News**

15 June 2011

[Neutrino particle 'flips to all flavours'](#)

The multinational T2K project in Japan says it has seen indications in its data that these elementary particles can flip to any of their three types.

from **KEK**

15 June 2011

[Indication of Electron Neutrino Appearance at the T2K Experiment](#)

For the first time, it was possible to observe an indication that muon neutrinos are able to transform into electron neutrinos over a distance of 295 km through the quantum mechanical phenomena of neutrino flavor oscillations.

CALENDAR

UPCOMING EVENTS

Damping Ring Baseline Technical Review

INFN, Frascati, Italy

07- 08 July 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](#)

BLOGLINE

19 June 2011

Flip Tanedo

Helicity, Chirality, Mass, and the Higgs

18 June 2011

Discover Magazine

Milestones for the Tevatron and LHC

17 June 2011

Quantum Diaries

Japanese T2K neutrino observation a boon for U.S. physics

AROUND THE WORLD

A recovering northeast Japan turns its sights to the ILC

Rika Takahashi | 23 June 2011



Iwate Prefectural Governor Takuya Tasso. Image: Iwate Prefecture

Three months after the 9.0-magnitude earthquake in early March in northeast area, or Tohoku, of Japan, more than 90 thousand people are yet suffering at the shelters and almost 7,500 people are still missing. But people have kept up the strength to recover, and are slowly but surely working to overcome the disaster.

The devastated area includes Tohoku University, one of the major players of R&D for the International Linear Collider. "Unfortunately, Tohoku University lost two students because of the earthquake, and endured severe damage to the school buildings and facilities. The graduation ceremony scheduled on 25 March was cancelled, and some research departments are suffering from destruction to their key facilities or equipment, which affects their research activities," said Hitoshi Yamamoto, professor at the Tohoku University and Asian regional contact for the ILC Research Directorate. Now almost all lifeline utilities at the university are back to normal, and both academic and research activities are being restored to their usual working order. On 6 May, newly enrolled students celebrated the start of their school life at Tohoku University in a one-month-belated entrance ceremony.

"Our research laboratory, fortunately, suffered less damage," said Yamamoto. "I think the location of the lab, which is at the semi-basement level, saved the day." Generally, underground buildings are known to be much more tolerant to earthquakes than those built on the ground surface, and in this case it was proven true in many places. "The earthquake forced us to suspend ILC-related activities at Tohoku University for one month. But other than that,

our research activities are the same as before," Yamamoto said. He experienced another situation brought on by the earthquake: a few of the students at his lab were almost headhunted by other universities. "I am very happy to see them back in my lab," Yamamoto smiled.

Tohoku University is carefully monitoring the radiation level due to the accident at Fukushima nuclear plant with the university's own measurement system. "The university is some 80 kilometres away from the plant, and we do not observe any abnormal measurement results," reported a university official.

Tohoku also has a stake in the ILC from another point of view.

A month-and-a-half after the devastation in northeast Japan, the Reconstruction Design Council in Response to the Great East Japan Earthquake, an advisory panel set up by the government of Japan, held its second meeting. The Council is engaged in broad discussions towards Japan's recovery and will provide opinions and recommendations to the government

that will be applied to formulate a national blueprint of the reconstruction.

In the meeting, the governors from the three prefectures of Iwate, Fukushima and Miyagi, which were severely affected by the earthquake, reported to the council's members, including Naoto Kan, Prime Minister of Japan, and the Cabinet ministers, on the status of damage and conditions of sufferers in each prefecture, and presented their vision for recovery.



Tohoku recovery logo says: "Let's get together towards Tohoku recovery." Image: Ministry of Land, Infrastructure and Transport

One of those local governments, Iwate prefecture, administrates Kitakami Hill, one of the Asian candidate sites for the International Linear Collider. Takuya Tasso, Iwate prefectural governor, stated at the conference that they requested the government's support to invite the ILC to make its future home in Iwate prefecture as a central infrastructure for its recovery. "To recover from the situation we face, we should have a long-term vision for people in Tohoku to prosper, taking pride in where we live," said Tasso. It is important for people to recover the everyday life they had before earthquake. "But I don't think that is enough. The ILC can provide hope and pride to the people in Tohoku. We can also expect significant impact from the ILC on the economy and employment in the area," he said.

One might question the safety of the site where this scale of earthquake struck. "Most of damage was caused by the tsunami, not by the earthquake itself," said Tasso. The candidate site sits inland of the prefecture, so "there is no possibility for a tsunami to reach that far. Actually, the stability of the site was proven by the earthquake. There is another underground research facility near the site, and it was reported that there was no damage to the tunnel bedrock, facilities or equipment installed in the tunnel," he said.

Since Japan has poor natural resources, science and technology policy is the key for its future. "The Fukushima nuclear plant accident brought the public mistrust in Japan's abilities in science and technology. To work in an all-out effort to realise the ILC can help restore the public and worldwide confidence in Japan, sending a message that we are committed to the science and technology policy which will contribute to the future of mankind," Tasso said, expressing his expectations for the future of the ILC.

EARTHQUAKE | TOHOKU UNIVERSITY

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FEATURE

Concrete plans for a platform

Pushing and pulling a detector on its platform brings technical challenges

Leah Hesla | 23 June 2011

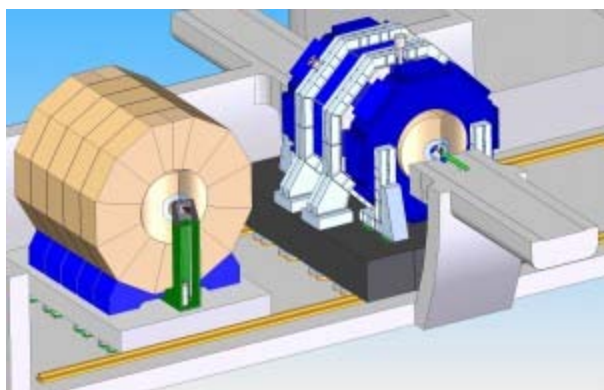
Setting the stage for a particle collision event requires orchestration of Wagnerian proportions.

Part of the production for the International Linear Collider involves perfectly positioning giant, unwieldy detectors in the particle beamline to capture data from electron-positron collisions. Recently ILC collaborators agreed that steel-reinforced concrete platforms would be used to steadily and nimbly move the ILC's two detectors, ILD and SiD, into and out of the beamline.

"We finally established it clearly," said Vic Kuchler, head of the ILC Americas Conventional Facility and Siting (CFS) group and coordinator of the global CFS effort. "That was a big deal."

It was a big deal in more ways than one. The platform decision set the course for designing the detectors' moving mechanisms. It also helped establish domains of oversight in the detector hall, the layout of which requires expertise from separate areas – accelerator science, civil engineering and detector research.

Members of these groups came together in Paris last May for an auxiliary meeting to an ILD (International Large Detector) conference. They established that the CFS group, which manages civil engineering matters for the ILC, would take ownership of the platform design.



Two detectors in the detector hall. ILD, left, is offline. SiD is shown in the beamline.

The ILC scheme calls for two detectors, ILD and SiD (Silicon Detector), each of which takes weeks-long turns in the beamline to get face time with the collisions.

There is no precedent for such regular detector switch-off. Particle colliders often use permanently positioned detectors at the points where particle beams intersect. At the Large Hadron Collider, for example, four detectors are situated around the 27-kilometre ring, one for each interaction point. All take data without interruption.

"The unique thing about the linear collider is there's only one interaction region," said Philip Burrows of the ILC Machine-Detector Interface group. When one detector's turn is up, it's pulled out of the beamline and the other is pushed in. "The push-pull

aspect is new."

Using a platform to push or pull the detector ensures its *in toto* movement whenever it has to make its move.

"The ILD is made up of five modular slices. A platform transport system naturally maintains their relative alignment," said Tom Markiewicz, member of the ILC Machine-Detector Interface group.

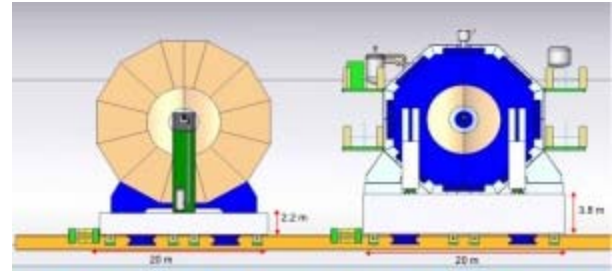
For simplicity, scientists decided both ILC detectors would make use of platforms.

Researchers would be able to draw on LHC experience with similar transport mechanisms.

"We chose the concrete platform because we saw that it worked with CMS," said John Osborne, ILC European leader for CFS, based at CERN. The CMS (Compact Muon Solenoid) detector at the Large Hadron Collider uses a concrete platform to pull it offline.

As a foundation for the detector, tonnes ride on its reliability.

When the detector is online, it must be perfectly axially centred on the beamline to take clear pictures of the collision event. Its platform must act like the world's steadiest tripod, insensible to the slightest vibrations in the earth or in surrounding structures. When it's pushing the detector into the beamline, it has to behave like the world's smoothest, most obedient freight train, coming to a stop to within a millimetre of its mark. For platforms as big across as a humpback whale, that's a tall order.



The difference in size between the ILD and SiD detectors necessitates different designs for a platform.

"Being even a few millimetres off can make a dramatic difference," Osborne said.

A further complication is the two different sizes of the detectors. ILD is heavier and taller than SiD, so a single platform design can't be applied to both.

"Since the detectors are different, it's a challenge to make sure everything fits together," Kuchler said. "In spite of the differences, you have to be able to back one detector out, move the other detector into position and get the collider running again fairly quickly so you can maximise data collection."

The linear collider community invited a UK-based global engineering firm, ARUP, to propose platform schemes that take into account all these concerns. They will also produce a three-dimensional geotechnical model of rock behaviour, initially tailored for CERN molasse rock housing the proposed Compact Linear Collider, but which could be adapted for other ILC regions at a later date. The company is expected to deliver their proposed designs by the end of 2011.

"The idea that you have 10- or 15-thousand-tonne detectors that you roll in and roll out again several times a year, getting them back to where they were within a millimetre – that is, from an engineering perspective, a phenomenally challenging idea," said Burrows. "Still, I don't know of anybody that thinks it can't be done."

[CFS](#) | [DETECTOR R&D](#) | [ILD](#) | [MACHINE DETECTOR INTERFACE](#) | [SID](#)

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DIRECTOR'S CORNER

A new beginning – and no strings attached

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Brian Foster | 23 June 2011



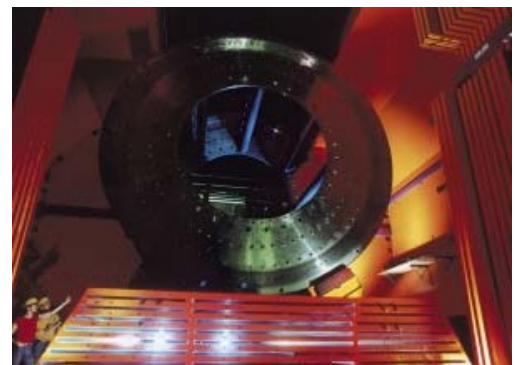
Brian Foster inspects connections on one of the HERA storage ring magnets. Image: © Alexander von Humboldt Foundation / Ausserhofer

When Albrecht Wagner, former chair of the DESY directorate, first suggested to me that I might consider applying for an Alexander von Humboldt Professorship in association with Hamburg University and DESY, I didn't take the idea seriously. I had no intention of leaving Oxford, which is a fantastic place both to live and to work. Then I looked at the advertisement that Albrecht sent me. I was astonished by the generosity of the scheme, which gives the Professor 1 million Euro a year for five years to spend, without any strings attached, on his or her work. That, together with my long association with DESY and Hamburg, which goes back to my first postdoc thirty-five years ago, convinced me that I should apply. So here I am, sitting in my office in DESY trying to work out how to spend these resources to the greatest effect. I thought I might usefully devote this Director's Corner to telling you about my

plans, since ILC plays a very strong part in them.

Deciding on the optimum research programme is no easy matter, as there are so many fascinating things going on in both particle physics and accelerators that would pay handsome dividends from any investment. I am lucky to have great advice and collaboration from my old friends and colleagues Eckhard Elsen and Nick Walker, whom I signed up to the Humboldt enterprise as soon as I heard that I had been awarded the Prize. The main thrusts of the programme were clear from the outset since they reflect my own interests – activity in both particle physics and accelerator physics and the areas of overlap. My own interests have developed in this way over the last decade or so since I became chair of ECFA and European director of the ILC.

In particle physics, I feel that it is extremely important that we extract the maximum possible physics from DESY's electron-proton collider HERA, since it represents a unique data set and is also vital to extract precision cross-sections and new physics from the Large Hadron Collider (LHC). Furthermore, this work has a rather low profile at a time when everyone naturally wants to work on the exciting vistas opening up at LHC. At this stage in my career I don't have to worry about making high-profile measurements so I can help to produce the final definitive physics results from HERA. These will include the joint papers from the H1 and ZEUS experiments, which will stay in the textbooks for many decades. I find this both satisfying and appropriate, as the most enjoyable part of my career to date has been as spokesperson for the ZEUS experiment from 1999 – 2004. We intend to recruit a couple of postdocs and students to help in this, recognising that this is best done jointly with another more prominent activity in either LHC or another part of the DESY and Hamburg particle physics programme.



The ZEUS detector, which took data at DESY's electron-proton collider HERA from 1992 to 2007. Image: DESY / Ginter

The bulk of the resources will however be spent in the area of accelerator R&D, which has increasingly fascinated me since becoming involved in ILC. The challenges and problems are many but the payoff both for accelerators and for particle physics at the energy frontier could be enormous. We are planning a broad programme, which contains elements directly applicable to the superconducting technology of today. One very immediate question we wish to investigate is the optimum industrialisation model for ILC, which will involve some detailed analysis in the next few months in order to inform the ILC technical design process. We are working very closely with CERN experts to get the maximum benefit from the experience gained from LHC construction.



Brian Foster talks with DESY's Eckhard Elsen (left) and Sebastian Aderhold. Image: © Alexander von Humboldt Foundation / Ausserhofer

The development of superconducting technology in the near term to higher gradients and the longer-term potential is also of great interest. DESY is already a world-renowned centre of expertise in this area and the construction of the European X-ray Free Electron Laser (European XFEL) adds a strong focus to many items. There is no shortage of ideas on how to increase the gradient – and the quality (Q) factor – of cavities. We intend to build on the current [ILC-HiGrade](#) project of the European Union to investigate the most promising of these, which can still be realised in time to affect the construction of the ILC, which we all hope is just around the corner – a corner soon to be illuminated by the LHC.

Another topic of interest is the question of the instrumentation with which we can track the incredibly challenging machine parameters and tolerances necessary for a machine like the ILC to operate. This is another area where the ideas that I have worked on as a particle physicist can find direct application and where there is the potential for significant synergy with future detector development in particle physics. It is also an area of significant strength in DESY and Hamburg. Having just returned from the [TIPP 2011 conference](#) in Chicago, the enormous dynamism of this area and its important spin-offs into many other scientific fields is very fresh in my mind. One example is the use of laser-wires to measure beam parameters; the pioneering work of Shintake and others has inspired development by Grahame Blair and others in the John Adams Institute (JAI). This represents one of the many areas of cooperation I hope to develop between my programme, the wider DESY activities and other accelerator centres. Of course my thoughts turn first to JAI, of which I was the founding director and of which I will remain a member, but accelerator physics is nothing if not international and I look forward to establishing links with the leading centres in all these programme areas. Indeed, the integration of the Humboldt Chair with both DESY and the University of Hamburg allows me to access many other parts of the dynamic German science programme. I have to say this is in somewhat of a contrast to the real-terms decline of funding for these areas, particularly felt in particle physics, going on in the UK. Opportunities include the Virtual Institute scheme of the Helmholtz Society, of which DESY is a leading member, which funds close links and cooperation between DESY and international partner laboratories. We look forward to shaping an application, mostly in the laser-plasma area discussed below, for such a Virtual Institute in the coming months.

The final area where I envisage funding is in many ways the most speculative, and exciting, of all. Everyone who has studied quantum mechanics knows of the enormous electric fields typical of atomic interiors. If a way could be found to harness these coherently, then enormous accelerating gradients are the prize. The laser-plasma acceleration programme has been taking off exponentially in recent years. My natural reluctance to join a “band wagon” is overcome by the knowledge that the world-class facilities at DESY, particularly the FLASH accelerators but including several other smaller endeavours, really promise that some unique and crucial investigations towards realising an accelerator that could be used for particle physics can be carried out at DESY. Here the arrival of experts such as Florian Gruener and Jens Osterhoff at Hamburg together with collaboration with Andrei Seryi and Simon Hooker at JAI, and elsewhere, promises exciting developments in the future.

One of the best things about the new adventure I am embarking on is that in most of these areas I am far from an expert, so I have the challenge of a steep learning curve as well as spending these substantial resources wisely. Fortunately I have fantastic collaborators so I can look forward to exciting and challenging times ahead with real confidence. Watch this space from further updates on how we are getting on!

[DESY](#) | [FLASH](#) | [GERMANY](#) | [HERA](#) | [HUMBOLDT PROFESSORSHIP](#) | [UNIVERSITY OF HAMBURG](#) | [XFEL](#) | [ZEUS](#)

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