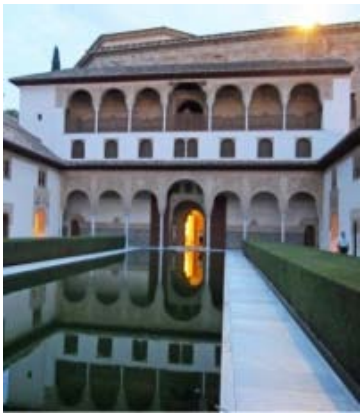
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DIRECTOR'S CORNER



A front row seat at the Granada linear collider workshop

by Barry Barish

The first joint ILC/CLIC workshop was held last year in Geneva. It was an important step towards bringing these two R&D and design efforts closer together. This year we held a second joint workshop in Granada, Spain, and the muon collider effort also participated. One of the primary aims of the CLIC and ILC collaborations is to work more collaboratively on joint problems, and another is to join together behind a single project by the time we propose to build a linear collider. Last week in this column Mike Harrison gave his observations of the Granada meeting that he characterised as 'from the back of the room', and today I add mine 'from the front row.'

AROUND THE WORLD

Hungry for science

Open Day at DESY draws crowds of curious visitors

by Barbara Warmbein



Last Saturday's Open Day and Science Night at DESY in Hamburg, Germany, attracted more than 13 000 visitors. The lab presented its many fields of research, including the ILC, in a tent outside the entrance to the HERA accelerator tunnel. ILC detector developers and accelerator experts explained what the project is all about.

AROUND THE WORLD

The multiplying effects of an accelerator economy

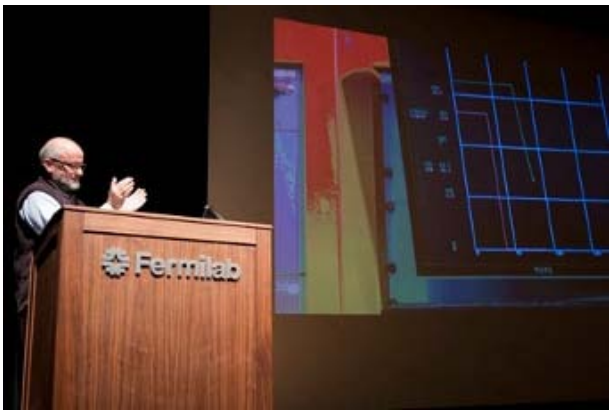
Niowave in Lansing, US is bringing superconducting cavities to the larger science community

by Leah Hesla



A company in Lansing, US is developing accelerator cavities for the ILC. In the course of improving these high-tech devices, it has enhanced its expertise in developing them for other areas of science and, as an added benefit, sustaining the technology R&D.

SLIDESHOW



Tevatron tribute

Images: Cindy Arnold, Miles Boone, Reidar Hahn, Marty Murphy

On 30 September, LCWS11 was winding down in Granada, Spain. On the other side of the world, the Tevatron shut down after 28 years of operation. Fermilab celebrated the life of the collider with a lab-wide ceremony and party.

IN THE NEWS

from ***New Scientist***
1 November 2011
LHC to probe early universe in best detail yet
As researchers start analysing the new data, the LHC is switching to colliding lead ions for four weeks, starting on 5 November. These collisions produce pockets of very dense and hot matter, recreating the conditions in the first moments after the big bang.

from ***symmetry breaking***
1 November 2011
Persis Drell to step down as SLAC laboratory director
Stanford University announced today that Persis S. Drell, director at SLAC National Accelerator Laboratory, has decided to return to her position as a faculty member.

from ***Nature***
28 October 2011
Hunting season for Higgs ends
This year's hunt for the Higgs boson is drawing to a close. On 30 October, the Large Hadron Collider (LHC) at CERN, Europe's particle-physics laboratory near Geneva, will end its 2011 run of the proton–proton collisions that search for the elusive particle, thought to give other fundamental particles their mass.

from ***Time***
26 October 2011
Dark Matter, Darker Still: The Cosmos' Greatest Mystery Deepens
Like Hollywood legends Audrey Hepburn and Katharine Hepburn, dark energy and dark matter are completely unrelated, even though they share a name.

CALENDAR

UPCOMING EVENTS

WHIZARD - Event Generation for LHC, ILC, CLIC
DESY, Hamburg
21- 23 November 2011

TESLA Technology Collaboration (TTC) Meeting
IHEP, Beijing, China
05- 08 December 2011

5th Annual Workshop of the Helmholtz Alliance "Physics at the Terascale"

PREPRINTS

ARXIV PREPRINTS

1110.6924
Development of Readout Interconnections for the Si-W Calorimeter of SiD

1110.5785
Improved jet clustering algorithm with vertex information for multi-bottom final states

Bonn, Germany
07- 09 December 2011

2nd International Workshop on Accelerator-Driven Sub-Critical Systems & Thorium Utilization
Bhabha Atomic Research Centre, Mumbai, India
11- 14 December 2011

SiD Workshop
SLAC
14- 16 December 2011

UPCOMING SCHOOLS

Sixth International Accelerator School for Linear Colliders
Pacific Grove, California, USA
06- 17 November 2011

View complete calendar

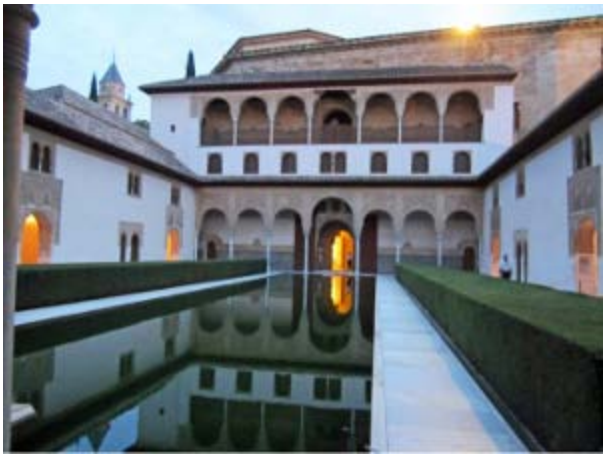
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DIRECTOR'S CORNER

A front row seat at the Granada linear collider workshop

Barry Barish | 3 November 2011



The LCWS11 workshop was held in picturesque Granada, Spain, home of the historic Alhambra, which overlooks the city

With a watchful eye on the physics that is beginning to emerge from the Large Hadron Collider at CERN, Switzerland, as well as the process for updating the European strategy for particle physics, the lepton collider community is moving incrementally towards speaking with one voice! The International Workshop for Future Linear Colliders (LCWS11) held in Granada from 26 to 30 September was large, with some 350 participants, and had parallel threads for the ILC, CLIC and the muon collider communities. As importantly, however, it had joint plenary sessions where progress was reported on the LHC, each lepton collider option, physics and detector technology and designs and plans for the future. In the coming months our community will have to formulate inputs for the update process of the European long-range strategic plan that is getting underway and will be completed in early 2013. The Granada workshop provided for extensive exchanges between the different parts of the lepton collider communities, as well as in-depth working sessions within each option.



M.C. Escher exhibit at the Alhambra on infinite universes captures the spirit of the multiple possibilities for the future of particle physics

Up on a hill overlooking the city of Granada sits the Alhambra, a reddish castle complex representing the 800-year history of Moorish presence in Spain. This world-historic site provided an imposing and inspiring backdrop for the several hundred scientists who are working and planning a new, future large-scale accelerator to follow and complement the LHC at CERN. Interestingly, the uncertain multiple options and branch points that characterise our future planning depend on science results and guidance that will come from the LHC. This uncertainty in the future path of the high-energy frontier is reminiscent of the works of M.C. Escher with their entangled circulating images. It turns out that Escher had a special affinity for the Alhambra, and at the time of the conference there was (and still is) a special Escher exhibit of his work, celebrating the 75th anniversary of his visit to the Alhambra. It is called *Infinite Universes*. (Note the plural!)

Perhaps the best illustration of the open-mindedness and flexibility we must maintain in planning for a future lepton collider was verbalised at the workshop by CERN Director-General Rolf Heuer during his opening plenary talk. He began by stating the obvious regarding LHC results –"finding the Higgs will be a discovery!" He then went on to state what should also be obvious, "excluding the standard model Higgs will also be a discovery!" This simple observation dramatically illustrates that the LHC

experiments will find the answers we need and thereby open and point to the path for the future. Fortunately, according to Rolf, we now have the “LHC poised to clarify the mechanism by which elementary particles acquire mass.”

Finally, Rolf provided a specific message for the linear collider community: It is crucial for us to become a unified community, and the practical realities for these projects must be in hand before making project proposals. As part of the worldwide planning process, documentation (hopefully unified) will have to be prepared as input for the coming update of the European strategy.



Rolf Heuer gives a message to the assembled linear collider community during the introductory plenary session at Granada

I will close today by briefly mentioning what I think were the main accomplishments at LCWS11. For the ILC community, being a dispersed worldwide effort, this meeting brought together a large representation of our various working groups on the physics, the accelerators and the detectors. It also provided points of contact between the ILC, CLIC and muon collider proponents. Perhaps these informal interactions are the most important value of holding such joint workshops. But, more tangibly for the ILC, LCWS11 came at the time when we have made the transition from creating the baseline for the *Technical Design Report* to concentrating on what still needs to be decided and worked out to complete the detailed technical design, as well as costing and documenting it. We have a multitude of remaining tasks to accomplish over the coming year; nevertheless we remain on track to produce what will be a solid TDR at the end of 2012.

FUTURE | LCWS11

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AROUND THE WORLD

Hungry for science

Open Day at DESY draws crowds of curious visitors

Barbara Warmbein | 3 November 2011



Steve Aplin explains how the ILC works to attendees at DESY's Open Day. Image: DESY

It's hard to imagine that not too long ago the mention of particle physics would make people shrug and walk away. Last Saturday, the German lab DESY opened its doors to the public, and busloads of people – families, neighbours, groups of friends – flooded the campus. They tried their hands at manoeuvring overhead cranes, admired the precision machines in the workshops and waited patiently for hours outside the entrance to the HERA tunnel, site of DESY's former particle accelerator, to walk one length of it and emerge in a former detector hall. Many of the more than 13 000 visitors also found their way into the 'particle tent', specially erected for DESY's contribution to LHC, ILC and astroparticle physics.

DESY's ILC group proudly presented their work, the science arguments for the ILC, a model of a time projection chamber and even a mini PET scanner with real detectors. A do-it-yourself linear accelerator with cranks instead of cavities and with balls instead of particles was popular with the kids, and there was even a dedicated ILC talk by Karsten Buesser. ILC software expert Steve Aplin, one of the many DESY staff who volunteered as an 'info source', particularly remembers one discussion with two students of archaeology who started out knowing nothing about high-energy physics. "I explained to them that particle event reconstruction was not really that different from reconstructing a Ming vase," says Aplin. "When you start, you don't really know it's a Ming vase, just a bunch of pieces, some of which are easy to recognise, others not. The missing pieces are like our neutrinos, and the bits of building material and stones are our background." In the end, you either have a restored vase or a better idea of what happened at the particle collision.

Hamburg's science institutions get together for a city-wide "Science Night" every two years. This year's event attracted 20 000 visitors in total. DESY of course features heavily on the programme, and in order to cope with the stream of visitors it usually adds a day to the night, with gates opening at noon and closing again 12 hours later. The DESY campus is an extremely busy place with lots of construction sites and new research programmes, so many people come to every Open Day to learn about what's new. This year, the organisers came up with a new concept of proposing themed walks to different places on site. One walk concentrated on accelerators, one on everything to do with X-rays, and one, of course, on particle physics. There was also a special tour for children and one about the 'pillars of science', highlighting the



Open Day attendees browse the ILC display. Image: DESY

workshops, heavy lifting, computer centre and other services that science couldn't be without. These tours helped people find their way around campus, and if somebody did get lost, there were enough DESY volunteers in blue T-shirts around to put them back on track.

Visitors might not have understood the Higgs mechanism in one day, but they certainly have a better picture of life at a major research lab. Aplin concludes, "Those archaeology students certainly seemed pleased to have understood a bit more clearly what we do."

DESY | PUBLIC EVENT

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AROUND THE WORLD

The multiplying effects of an accelerator economy

Niowave in Lansing, US is bringing superconducting cavities to the larger science community

Leah Hesla | 3 November 2011



Image on Niowave's website homepage. Image: Niowave

On the homepage of a US-based company website is a picture that, at first glance, looks like an advertisement for a major household appliance. A yellow starburst graphic assures you that delivery time is quick. A text-boxed baseline price is presented in glowing type. And at the centre is the touted item: an ILC/TESLA-type accelerator cavity.

Through the ad, Niowave, Inc., a superconducting linear accelerator company based in Lansing, US, showcases its capability for producing cavities with relatively short turnaround times. For the accelerator community, the ad could be a sign that the production of these superconducting structures is very slowly inching its way towards a place in the market as an in-stock product.

"It's an indication of their confidence in this product as a catalog item," said Global Design Effort Project Manager Marc Ross. "It means there's somebody there willing to buy a number of them in that way."

Niowave is one of several US companies developing superconducting technology for the ILC. To weld its cavity cells together, it relies on C.F. Roark, a partner company in Indianapolis, US.

It's too early to predict how well cavities will do in the market as a prefabricated good, but Terry Grimm, who started the company in 2005 and worked extensively with particle accelerators as a laboratory and university physicist, knows there's a niche for them outside high-energy physics.

"We see a real opportunity here – there's a commercial market out there for these devices," Grimm said. The devices aren't necessarily for large, underground high-energy particle colliders. Plenty of biology and defense projects make use of tabletop accelerators that use similar technology as that for the ILC. "Going into the commercial market, we can talk about those smaller machines."

Cavities for the ILC are a much taller order than those for commercial projects. The niobium is purer, the gradients are higher and the basic structures have complicated add-ons. Commercial projects don't require as much of their cavities. But in the course of developing state-of-the-art niobium structures, you learn a few things that can only help when manufacturing simpler systems.

"That work could work out well for them, even for the sake of the technology, not just the company," Ross said.

For Niowave, developing the technology isn't just about maximising gradients. It also means perfecting a basic, so-called

Entry Level model of superconducting cavity, much like the no-frills Chevrolet. This 20 megavolt-per-metre cavity can be produced at a significantly lower cost than the ILC's 35 MV/m 'Cadillac' standard model, and since many of the company's customers don't need the highest possible gradients, the Entry Level could go over well with a fair share of their clients.

Niowave sees enough of a market that it stockpiles raw niobium so that it's within arm's reach, ready to be treated and shaped when an order comes in. It's the only company in the world that can make that claim. Being able to pull niobium off the shelf is the convenient first step in an operation that develops turnkey accelerator systems, including cryogenics and beam testing. Conveniently, the company has a radiation generating license that allows them to conduct beam tests, something that's otherwise reserved for laboratories.



Niowave employee cleans niobium cavity. Image: Niowave

Developing such systems is a relatively young enterprise for industry in the US.

"In the US, the niobium cavities were made at the laboratories themselves. That's part of why it's such a new business for industry," Grimm said. "That's where the ILC has been very helpful – getting industry and the labs working together. The ILC community keeps pushing for more work in that area."



Niowave is housed in a former elementary school in Lansing, Michigan. The research and development of superconducting accelerators takes place in classrooms, offices and lounges – even in the boiler room. The name Niowave is a combination of 'niobium' and 'microwave'. Image: Niowave

Other fields seem to be feeling the effect of the push. Niowave's free-electron laser systems can help see through a cargo container that might be carrying illegal weapons materials. The company is also developing superconducting cavities for electron microscopes in which the high-frequency pulsed electron beam would make it possible to image a series of snapshots in a chemical reaction. There, researchers hope to be able see the chemical reactants transform into products in front of their eyes.

"Some of the scientists that are developing and using electron microscopes come to us. They have some of the things we need, but they have very little experience with microwaves and accelerating cavities," Grimm said. "That's where we come in."

The same push to make better superconducting linacs has also been felt in the Lansing region's economy, best known for automobile manufacturing. Also, Michigan State University, home of the National Superconducting Cyclotron Laboratory and future Facility for Rare Isotope Beams (FRIB), is a hub of atomic and particle physics expertise. A recent renewal of high-technology manufacturing has brought life to an area hit hard by the 2008 recession.

The multiplier effect, said Bob Trezise, CEO of Lansing Economic Development Corporation, is significant.

"This has certainly been true with Niowave, where almost all of its sales originate from customers outside of Michigan," he said. "By combining the research at the new FRIB project and the commercialisation efforts of FRIB's research at Niowave, mid-Michigan has established itself as a worldwide powerhouse for the superconducting accelerator industry."

While reaching out to other areas of exploration, Niowave will continue developing cavities for the ILC.

"They have the opportunity to show that there's a small business model for this technology," Ross said.

ACCELERATOR R&D | INDUSTRIALISATION | INDUSTRY | SRF INDUSTRIALISATION |

SUPERCONDUCTING CAVITY

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