LC NEWSLINE
THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

## DIRECTOR'S CORNER

# Strategies and realities

by Steinar Stapnes

The European Strategy for Particle Physics is expected to be adopted by the CERN Council end May. The physics potential of future linear colliders is well recognised in the Strategy statements. As global projects have cross-regional consequences, this strategy could have a wide impact in and beyond Europe.

## FEATURE

# *From Symmetry Magazine*: The cherry pie collider

by Barbara Warmbein

What's the next step in particle colliders? Symmetry takes a trip into the kitchen pantry to find out. Don't miss the video that (nearly) explains it all, using the analogy of protons vs cherry pies that was first brought by Hitoshi Murayama, deputy director of the Linear Collider Collaboration, during a recent press conference. Enjoy!

## VIDEO OF THE WEEK

# Get to learn more about ILC with videos in two different styles

by Rika Takahashi



Enjoy two different way to gain understanding of the ILC project. Local officials in two ILC construction candidate sites in Japan produced theses promotion videos to invite the laboratory to their region.

## IN THE NEWS

**from *Brookhaven National Laboratory***
13 May 2013
Symposium Held at Brookhaven Lab to Honor Late Physicist Bill Willis
Barry Barish of the Laser Interferometer Gravitational Wave Observatory and International Linear Collider (ILC) spoke about Willis and his co-leadership of the GEM Experiment at the proposed Superconducting Super Collider (SSC) as well as their work together for the ILC.

**from *Jiji***
13 May, 2013
福岡、佐賀知事が研究所訪問＝次世代加速器の誘致で―スイス
国際リニアコライダー（ILC）を九州北部に誘致するため、福岡県の小川洋知事と佐賀県の古川康知事らが13日、スイス・ジュネーブ郊外の欧州合同原子核研究所（CERN）を訪問した。(Governors from Saga and Fukuoka prefectures visited CERN on 13 May with a view to invite the ILC to Kyushu area)

**from *Kahoku Sinpo***
12 May, 2013
ＩＬＣ誘致／描け東北版シリコンバレー
「ＩＬＣは産業集積が進む米国のシリコンバレーも目標にしていく」。仙台市で４月下旬にあったシンポジウムで、国内誘致を進める科学者組織、ＩＬＣ戦略会議の山下了議長（東大准教授）はこう語った。”We are also setting Silicon Valley as a model for ILC science city, where many of the high-tech business has been accumulated,” said Satoru Yamashita of University of Tokyo)

**from *Saga Shimbun***
9 May, 2013
「脊振にＩＬＣを」署名活動
「国際リニアコライダー（ＩＬＣ）」の脊振山地への誘致を後押ししようと、福岡県内の会社役員ら若手有志が署名活動を始めた。１０万人を目標に、インターネットを活用して福岡、佐賀両県をはじめ、九州全域から署名を募る。７月に、ＩＬＣ建設を推進する国会議員連盟に提出する。 (To boost the activities toward the invitation of the ILC to Kyushu, the regional businesspersons has started a campaign to collect signatures on the internet, aiming to collect 100,000 signatures. They are planning to submit collected signatures to the Federation of Diet members for ILC)

**from *businesswire.com***
7 May 2013
RI Research Instruments GmbH Receives DESY Contract for 120 RF Cavities
“RI is pleased to be a reliable industrial partner for the European XFEL project, and looks forward to working on large next-generation projects such as the European Spallation Source and the future International Linear Collider.”

**from *Tanko Nichi Nichi Shimbun***
5 May, 2013
動画サイト上でも 誘致活動熱く
国際リニアコライダー（ＩＬＣ）の国内候補地における誘致活動が、インターネット上でも熱を帯びている。人気動画サイト「Ｙｏｕ Ｔｕｂｅ」では、東北と九州双方のＰＲ動画が公開（アップロード）されている。２作とも「ＩＬＣ誘致」というテーマは同じだが、その構成や雰囲気は相異なる。(Tug-of-war for the ILC becoming hot on the internet. On the Youtube, promotion video produced by two candidate sites are attracting public attentions. Those two video were made under same theme of inviting the ILC, but with completely different styles.)

**from *Iwate Nippo***
27 April 2013
「東北一丸で誘致」決議 ＩＬＣ、6県推進協が総会
東北ＩＬＣ推進協議会の総会は２６日、仙台市内で開かれ、達増知事や村井嘉浩宮城県知事ら６県の出席者が国際リニアコライダー（ＩＬＣ）の東北誘致を一丸となって実現させることを決議した。On 26 April, six mayors from Tohoku region adopted a resolution to realize the invitation of the ILC to the region.

## CALENDAR

**Upcoming events**

IPAC - 4th International Particle Accelerator Conference
Shangai, China
12- 17 May 2013

Photon 2013
Paris, France
20- 24 May 2013

European Linear Collider Workshop (ECFA LC2013)
DESY Hamburg
27- 31 May 2013

Higgs and Beyond
Sendai, Japan
05- 09 June 2013

IHEP XXIX-th International Workshop on High Energy Physics

Protvino, Russia
26- 28 June 2013

**Upcoming schools**

CERN Accelerator School: Course on Superconductivity for Accelerators
Erice, Sicily, Italy
24 April- 04 May 2013

View complete calendar

## PREPRINTS

**arXiv preprints**

1305.3214
Electroweak Supersymmetry (EWSUSY) in the NMSSM

1305.2795
Generation of Neutrino mass from new physics at TeV scale and Multi-lepton Signatures at the LHC

1305.2785
Searches for strong dynamics signals in gauge boson pair production

1305.1866
Higgs Boson Mass in Low Energy SUSY Models with Vector-like Matters

1305.1754
Two Higgs doublet models at future colliders

1305.1692
Physics at the ILC with focus mostly on Higgs physics

1305.1585
Beam Studies of the Segmented Resistive WELL: a Potential Thin Sampling Element for Digital Hadron Calorimetry

1305.0621
Trilinear gauge boson couplings in the standard model with one universal extra dimension

1305.0170
Testability of the Higgs inflation scenario in a radiative seesaw model

1305.0109
Radiative corrections to the Higgs boson couplings in the Higgs triplet model

1304.8023
Direct Probe of Majorana and Extended Higgs Particles in Radiative Seesaw Models at the ILC

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DIRECTOR'S CORNER

# Strategies and realities

Steinar Stapnes | 16 May 2013

*Steinar Stapnes (at that time leading the European Strategy process) announced the launch of the process to update the European strategy for particle physics during an ECFA-EPS special session in Grenoble, France, on 23 July, 2011. Image: LPSC/Tomas Jezo*

The European Strategy for Particle Physics has been submitted to the CERN Council. The goal is final approval in the coming weeks. The significance of the Strategy document is high. It has been drafted by a combination of a scientific preparation group and various appointed representatives of the CERN member states, including also representatives from other countries and/or regions. One important feature of the European process is that from draft to final approval in the Council takes only months, and the Council members/decision represent the governments directly. Secondly – as "global projects" have large cross-regional consequences and this process pre-dates other on-going processes in the US, Japan and other places – it has wide impact also beyond Europe, as a minimum serving as a possible example.

The LHC including its luminosity upgrade is a clear and rather obvious priority for the future, but the physics potential of future Linear Colliders is also well recognised in the Strategy statements. The relevant phrases were already quoted by Lyn Evans in his Director Corner in March:

For CLIC and higher energy hadron machine than LHC as options for post-LHC projects at CERN, *"CERN should undertake design studies for accelerator projects in a global context, with emphasis on proton-proton and electron-positron high-energy frontier machines. These design studies should be coupled to a vigorous accelerator R&D programme, including high-field magnets and high-gradient accelerating structures, in collaboration with national institutes, laboratories and universities worldwide."*

For the ILC, *"There is a strong scientific case for an electron-positron collider, complementary to the LHC, that can study the properties of the Higgs boson and other particles with unprecedented precision and whose energy can be upgraded. The Technical Design Report of the International Linear Collider (ILC) has been completed with large European participation. The initiative of the Japanese particle physics community to host the ILC in Japan is most welcome, and European groups are eager to participate. Europe looks forward to a proposal from Japan to discuss a possible participation"*.

Other statements mention the importance of accelerator R&D, detector R&D and discuss CERNs role in the implementation of projects outside the CERN laboratory as well as its continued work with the European Commission (EC) to implement these strategies. Also these statements are relevant for the LC community.

What can and should we expect to happen in practice as a result? There are at least three main areas that are affected by this strategy: the CERN budget planning itself, the European Commission (EC) support for projects and activities, and various national funding programmes.

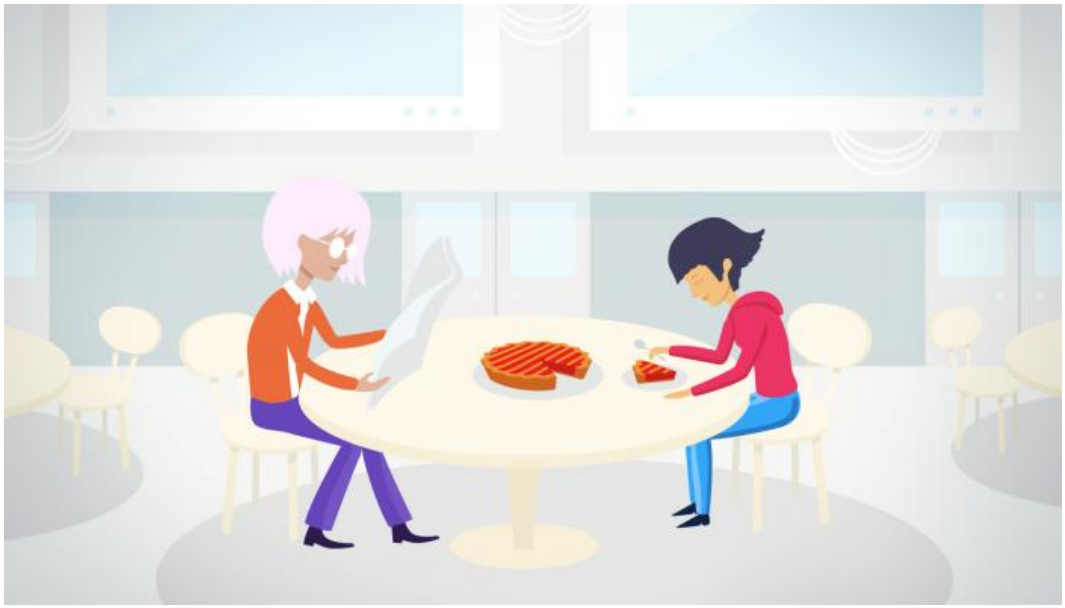
The CERN budget planning for 2014 and beyond is underway and it will be important to see these statements reflected in realities.

Some key recommendations, in particular turning the LHC luminosity upgrade into a real-construction project over the next decade require significant resources, so the balance is non-trivial and delicate. Equally important, over the coming years, Horizon 2020 projects representing the EC implementation tools will unfold and the R&D efforts mentioned are expected to become priorities – discussed as part the implementation of the European Strategy for Particle Physics as stipulated in the Memorandum of Understanding between the European Commission and CERN. Finally the national priorities determine in many cases how the community can participate in the these projects and we all need to work hard to turn there priorities into realities also at this level. For the ILC there is an additional clear wish; a proposal from Japan to participate in such a project is seen as the next natural step to achieve a change of gear towards realisation.

Being optimistic, we can hope that other regional and national processes will not diverge in a significant way from the result of the European process. If this is the case, we will have reached – largely thanks to a bottom up process – an important consensus that should help the transition from strategies to realities in the coming years. New LHC results in 2015-16 might and will hopefully provide additional guidance but for the time being the directions are relatively clear.

We will also be very much helped if the linear collider community can plan and use resources across CLIC and ILC as efficiently as possible, to make the best possible use of our resources. In all areas related to luminosity performance of the machines, detector and physics studies, project planning and implementation studies, there are huge potentials for common efforts. Another feature of the real world and realities is that resources will remain a limitation and determine the speed of our progress.

CERN | CLIC | EUROPEAN STRATEGY FOR PARTICLE PHYSICS | ILC



deconstruction

May 14, 2013

# The cherry pie collider

What's the next step in particle colliders? *Symmetry* takes a trip into the kitchen pantry to find out.

By Barbara Warmbein

Already celebrated for bringing the world news of the Higgs boson, the Large Hadron Collider is only beginning its long journey of discoveries. Yet scientists are already planning the next big machine, the International Linear Collider, to study the LHC's discoveries in more detail.

So what's the difference between the LHC and the proposed ILC? Why do we need both?

For one thing, the ILC would accelerate particles along a straight line some 30 kilometers long while the LHC accelerates them along a circular path 27 kilometers in circumference. But that just skims the surface of their differences.

The two types of machine provide very different types of information because they collide different kinds of particles. The LHC collides protons, which themselves are made up of quarks and gluons. The ILC, in contrast, would collide electrons and positrons, point-like particles that have no known internal structure. Proton collisions are messy, allowing scientists to discover new particles and new processes, while linear-collider experiments are cleaner, allow scientists to explore these new particles and new processes without the complicated debris present at the LHC.

Not clear? Maybe this image helps. The protons in the LHC aren't just single particles; they are each made of a list of ingredients (up quarks, a down quark and gluons). Think of them as cherry pies, which are made up of eggs, flour, sugar, butter and, of course, cherries. When you smash two pies into each other you end up with a lot of fascinating goo. However, you can imagine how many times you would have to smash two pies into each other before you get precisely the same goo as in your first collisions, or before you see a collision where the two stray cherry pits in each pie collided—many, many times. That's why the LHC produces the mind-boggling number of collisions that it

does.

Once you have seen the many interesting things your cherry pie smash-ups can produce, you'll want to look at the most interesting of these interactions in more detail. So ideally you just want to collide just two ingredients—say, two cherry pits—with each other. That's exactly what a linear collider does: Tiny pit smashes into tiny pit. This is still complicated, but there's no butter splattered on the walls of your accelerator.

So while colliding pies offers a broad view that can reveal new particles and new processes, colliding the pits reveals specific properties and detailed information that might not be clear in messier whole-pie data. The two types of collider rely on each other.

This is the analogy that Hitoshi Murayama, deputy director of the Linear Collider Collaboration, offered in English during a recent bilingual Linear Collider press conference. When he translated his description into Japanese, the cherry pies morphed into daifuku bean cakes, a sweet much more common in Japan than cherry pies. In either language the process works the same. Two daifuku bean cakes colliding go "smash splatter squelch," while two red beans colliding make a much cleaner "pling pling."

It's not quite that simple of course. There are many nuances to why colliding whole cherry pies at the LHC makes that type of machine great at discovering new particles and new physics—the pits within the pies, for example, can be brought to higher energy than can be reached by accelerating just the pits alone. Likewise, using just two simple ingredients at a linear machine like the ILC simplifies the post-collision math to such an extent that scientists can deduce with great precision the energy, momentum and trajectory of each particle produced in a collision.

But the analogy gets the idea across, in both English and Japanese: If you mix both types of collider together, you'll bake yourself the potential to reveal particles and processes never before seen.

*Having trouble seeing the video embedded above? Watch it on* YouTube*!*

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VIDEO OF THE WEEK

# Get to learn more about ILC with videos in two different styles

Rika Takahashi | 16 May 2013

Video is one of the most effective way to learn about something complex. In Japan, local officials in two candidate construction sites for the ILC have produced the videos to gain recognition and understanding of the project. These two videos share the same purpose – invite the ILC to their region – but the ways to present are completely different. Tohoku, in north-east Japan, did it in authentic, gentle and elegant way, and Kyushu, Japan's south-west island, with fun and pop, cool-Japan style. Enjoy!

Go for it! Tohoku Big Bang
Video: Tohoku Conference for the promotion of the ILC


Sefuri ILC High school
Video: Saga Prefecture, Fukuoka Prefecture


CANDIDATE SITES | FUN | JAPAN