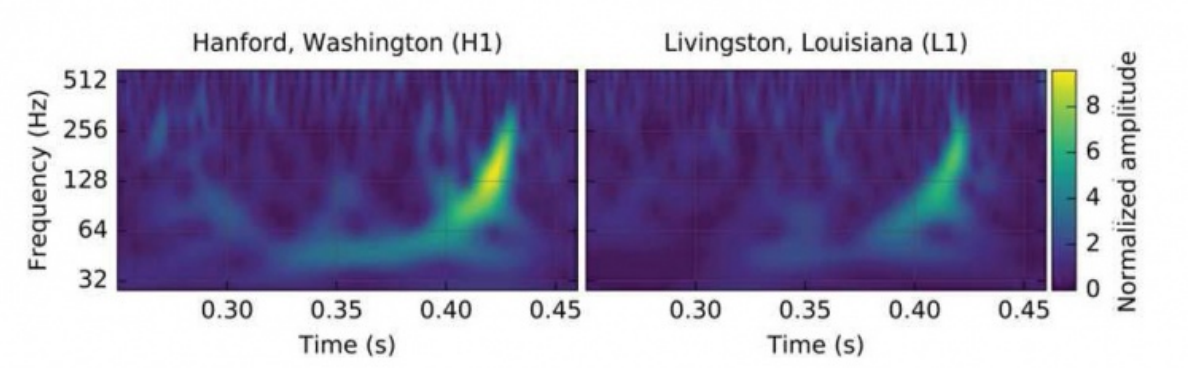
NEWSLINE
THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

FEATURE

A dream comes true

by Barry Barish



The direct detection of gravitational waves, announced today by the LIGO-VIRGO scientific collaborations, marks another great day in the history of fundamental research. It is the product of years of preparation, data taking and hard scientific work and provides just as many answers as new questions to physics. One man has witnessed the project's history and its breakthrough first hand and provides his personal view of the story (and what it means for other science projects): former ILC Director Barry Barish.

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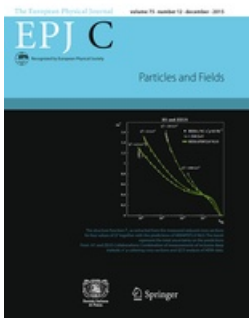
Here's your physics case, once and for all

by Barbara Warmbein



Dear colleagues, this one is for you. All those paper writing thesis completing report submitting physicists out there: here comes a new central paper for your list of references and your reading list. It provides a comprehensive physics case for the e+e- linear collider and puts all the topics and ideas from theory, collider searches, astronomy in context to each other. It's been published in the open-access peer-reviewed European Physical Journal C (EPJC).

DIRECTOR'S CORNER

Towards an Asian Strategy for Particle Physics?

by Akira Yamamoto

Akira Yamamoto, Regional Director for Asia in the Linear Collider Collaboration, had to learn this week that ACFA isn't what he thought it is. ACFA stands for Asian Committee for Future Accelerators, and contrary to what its name suggests it is an independent body, not a subgroup of the International Committee for Future Accelerators ICFA. He reports from their recent meeting in Kyoto, Japan.

IMAGE OF THE WEEK

ARUP tool shortlisted for prestigious prize

by Barbara Warmbein

Remember the ingenious civil engineering tool that British consultancy ARUP has developed for CERN's FCC and that is also being used for site-specific planning of the ILC? That thing where you can play around with shafts, tunnels and rock formations without leaving your desk? It's been shortlisted for a prestigious award, so keep your fingers crossed.

IN THE NEWS

from ***Iwate Nippo***
09 February 2016
ILC経済効果算出へ始動　県推進協、調査委が会合
県国際リニアコライダー推進協議会（谷村邦久会長）は８日、盛岡市内のホテルでイノベーション・経済波及効果調査委員会の初会合を開いた。国際リニアコライダー（ＩＬＣ）実現により本県で見込まれる多面的な効果を分析し、日本政府の誘致決断に弾みをつけるのが狙い。５～６月ごろ最初のリポートを取りまとめる方向だ。Iwate prefectural ILC council had their first meeting of the inovation and economic impact study committee on 8 January, aiming to give a push for japanese government’s decision making for the ILC. They are planning to publish first report in this spring.)

from ***Yomiuri Shimbun***
08 February 2016
[県予算案]国体関連に９４億４０００万円
２０年東京五輪や国際リニアコライダー（ＩＬＣ）誘致などによる旅行者増を見据え、受け入れ態勢の整備を支援する「いわてインバウンド新時代戦略事業費」にも１億１１００万円を盛り込んだ。(Iwate prefecture includede the bdget for preaparation for the increased numbers of the tourists by 2020 Tokyo Olympic game and the ILC.)

from ***21stoleti***
27 January 2016
Nový urychlovač částic: Japonci nechtějí ponechat nic náhodě
Mezinárodní lineární urychlovač (International Linear Collider – ILC), jenž má vzniknout v Japonsku, je zase o krok blíž. Japonská národní výzkumná organizace (KEK) předložila podrobný plán, jak projekt za miliardy dolarů zvládnout. Počítá s trojnásobným navýšením příslušných vědeckých a inženýrských pracovních pozic v průběhu příštích 4 let. (The ILC , which should be built in Japan , is one step closer . KEK has submitted a detailed plan of how the project will cost . With three counts increase in relevant scientific and engineering jobs over the next four years .)

ANNOUNCEMENTS

CERN-JINR School in Norway: new deadline

The deadline for the 2016 CERN-JINR European School of High-Energy Physics, which will take place in Skeikampen (near Lillehammer, Norway) from 15 to 28 June, has been extended to 19 February.

The School is targeted at students in experimental high-energy particle physics who are in the final years of work towards their PhDs, although candidates at an earlier or later stage in their studies may be considered. Sponsorship may be available for a few students from developing countries.

Further details are available here.

CALENDAR

Upcoming events

ECFA Linear Collider Workshop
Santander, Spain
30 May- 05 June 2016

Upcoming schools

Joint Universities Accelerator School
Archamps, Haute Savoie, France
11 January- 18 March 2016

View complete calendar

PREPRINTS

ARXIV PREPRINTS

1602.02162
Probing a slepton Higgs on all frontiers

1602.01698
Contact Interactions in Higgs-Vector Boson Associated Production at the ILC

1602.01308
An SLC-type e+e−/γγ facility at a Future Circular Collider

1602.01231
Di-Higgs Decay of Stoponium at Future Photon-Photon Collider

1602.00977
Systematic Study of Diphoton Resonance at 750 GeV from Sgoldstino

1602.00684
Probing CP violation in e+e− production of the Higgs boson and toponia

1602.00475
750 GeV Composite Axion as the LHC Diphoton Resonance

1602.00209
Lightness of Higgs Boson and Spontaneous CP-violation in the Lee Model: An Alternative Scenario

1601.08193
Probing top quark neutral couplings in the Standard Model Effective Field Theory at NLO QCD

1601.07758
SUSY effects in Rb: revisited under current experimental constraints

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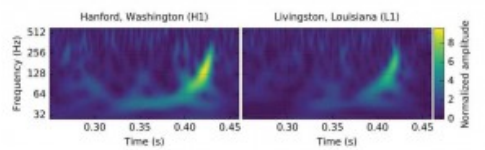

GW150914 observed in LIGO Hanford left and LIGO Livingston on the right. Over 0.25 seconds, the 'chirp' signal increases frequency and amplitude.

More than a decade before becoming Director of the newly forming Global Design Effort (GDE) for the ILC in 2005, I took on the task of directing the **L**aser **I**nterferometer **G**ravitational-wave **O**bservatory (LIGO) project. Like the ILC, LIGO was an incredibly challenging project with potentially a fantastic scientific payoff.

Of course, we had our critics on LIGO: they said the science could not be guaranteed, the project was too hard technically and it would cost too much money. Nevertheless, we doggedly persisted and had unwavering support from the National Science Foundation, and from our two lead institutions, Caltech and MIT. From the beginning, we knew it would be a long hard road. We proposed to build LIGO in two steps: first, Initial LIGO, that used tested technologies and was designed to have a sensitivity where we could "possibly" detect gravitational waves, and a second phase, Advanced LIGO, where we would use more advanced technologies that would significantly improve our sensitivity to where detections would be "probable."

We completed Initial LIGO and were well into data taking and limit setting when, in 2005, I was asked to direct the GDE. I agreed to take on that task for the period of developing a *Technical Design Report* and before we upgraded to Advanced LIGO. During that period, I continued a part-time involvement in LIGO, as we set ever-improving limits for gravitational waves. Despite our lack of success at detecting gravitational waves, the NSF supported our ambitious Advanced LIGO upgrade project.

Since the ILC TDR was completed, I have once again concentrated my efforts on LIGO. We successfully commissioned Advanced LIGO last year, and began our first data run this past September. On 14 September, we recorded a spectacular "eureka" event simultaneously in our two LIGO interferometers separated by some 3000 kilometres. After months of detailed analysis, background studies, physics interpretations, we submitted our discovery paper to Physical Review Letters, where it has now been refereed and accepted for publication.

This event, GW150914, corresponds to the first direct detection of gravitational waves, predicted by Einstein 100 years ago. What did we detect? Our analysis has convincingly concluded that the observed gravitational waves come from the merger of two approximately 30 solar-mass black holes. Such heavy stellar black holes have never been observed and the merger of a pair of black holes is completely new. This single observation is giving us new insights into astrophysics, in order to explain the formation of such heavy stellar black holes, as well as their existence as binary pairs that merge within the lifetime of our Universe. In addition, this event is enabling new tests of the theory of general relativity in what is called the strong field limit that agree beautifully with the best formulations begun by Einstein.

This discovery is very exciting, and as we continue to take data and improve LIGO sensitivity, we will be effectively opening a new window on the Universe. I hope and believe that the ILC will follow a similar exciting path. The ILC also has its detractors, technological challenges and will cost a lot of money. Nevertheless, great experimental science follows from great ideas. It just takes lots of perseverance, patience, support, and sometimes a little good luck!

BARISH | CALTECH | CNRS | EINSTEIN | GRAVITATIONAL WAVES | ILC | INFN | LIGO | MIT | NIKHEF | VIRGO

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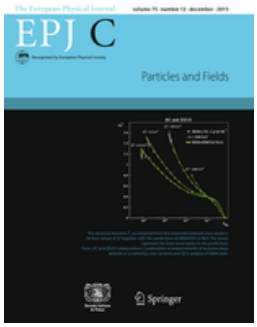

EPJC has published a one-stop reference for the linear-collider physics case

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The work on this paper started around the time the ILC's Technical Design Report was being put together in 2012 as a comprehensive update of the physics case presented in the TDR for the TESLA project some 10 years earlier, initiated by retired DESY theorist Peter Zerwas. A group of 74 authors, topic conveners and an advisory team started working on the project-independent update – and then the Higgs happened. "The journal wanted us to include the very latest results, so we've been adding new information continuously, up until the proof stage," says Gudrid Moortgat-Pick, theorist at the University of Hamburg and one of the authors of the 178-page paper.

The focus of the report lies in Higgs, top quark and electroweak precision physics, but it also dedicates space to ideas from beyond the standard model such as supersymmetry, little Higgs models and extra gauge bosons. The authors are all experts in their fields and are mainly theorists, but some experimentalists had a say as well.

CLIC | COMPOSITENESS | DARK MATTER | HIGGS | ILC | PHYSICS CASE | SUPERSYMMETRY | THEORY

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DIRECTOR'S CORNER

Towards an Asian Strategy for Particle Physics?

Akira Yamamoto | 11 February 2016

Snapshot from the recent ACFA meeting.

I may have been in the accelerator business in general and the linear collider business in particular for a very long time, but there are still things I have not understood properly – particularly on the political side. Last week I was invited to give a talk about the "ILC Technical Status" to the Asian Committee for Future Accelerators (ACFA). It was their 23rd meeting , but it was the first one I attended. I had always assumed ACFA was a regional activity of ICFA, the International Committee for Future Accelerators, but I was taught that that is not the case. ACFA formed independently in 1996 at a time when there were few activities for accelerator science/technology in Asia, so ACFA was founded to develop the particle accelerator fields in Asia.

Its main focus is on the word accelerator: it really is a committee for accelerator-based science, including light sources and photon science, whereas ICFA approaches future accelerator projects from the particle physics side, as complete projects. ACFA'S raison d'etre is to ensure exchange of expertise and experience in accelerator science and technology across Asia and to support society by helping to transfer practical knowledge gained from accelerators to everyday life. Its current chair is Yifang Wang, Director of IHEP, China, and its 34 members include representatives from laboratories in Australia, India, Indonesia, Taiwan, Korea, China, Japan, Vietnam, Bangladesh, Malaysia, Russia, Pakistan, Singapore and Thailand.

I was very impressed with various activities reported from China, Korea, India, Australia, and Russia, as well as from Japan. I was especially interested to hear a report on major activities for technology development in Asia, and I had to agree that really worldwide leading activities for Accelerator-Driven nuclear Systems (ADS) are being integrated in China and India as a unique feature in Asia. The ILC technical status and CEPC (Circular electron and positron collider) design status were reported and their technical features were well discussed in good balance as part of the wider range of the ACFA. The ACFA members were very interested in getting updates on the current status of the ILC from "design to realisation" and of the progress in the CEPC technical design, seeing that they would be prestigious global accelerator-based science project in Asia, they were very supportive for those activities.

The meeting was actually a joint one between ACFA and an organisation called AsiaHEP (Asia-Pacific High Energy Physics Panel), chaired by George W.S. Hou from National Taiwan University, which covers the aspects of the future of particle physics in Asia. AsiaHEP is a panel formed under ACFA. Its members are not necessarilyACFA members. Meetings have been held by itself, or joinlt with ACFA. The purpose of AsiaHEP is in fact to augment its HEP element.They discussed very carefully how AsiaHEP can work together to encourage the international effort for the ILC as a reality and the design effort led by China for large-radius circular colliders, first focused on "Higgs Factory" (CEPC). AsiaHEP and ACFA plan to jointly issue a Statement on ILC and CEPC/SPPC.

The committee is motivated to reach an overall Asian strategy for the future of particle physics, referring the US and the European Strategies for Particle Physics, and the ICFA statement issued in 2014.

ACCELERATOR RESEARCH | ACFA | EUROPEAN STRATEGY FOR PARTICLE PHYSICS | ICFA | P5 | PHOTON SCIENCE

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IMAGE OF THE WEEK

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Screenshot of the tunnel optimisation tool.

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Every year, the Management Consultancies Association (MCA), the representative body for management consultancy firms in the UK, hands out awards in various categories to British consultancies. ARUP and their "Tunnel Optimisation Tool" are shortlisted in the category "Digital and Technology" and are up against a programme that models public transport in London, the digitisation of the UK's rail system or the planning of a new super-warehouse for a big supermarket chain.

"We were interviewed in London with two colleagues from ARUP," says CERN civil engineer John Osborne. "It went well, but it was a bit like the TV show Dragon's Den, where entrepreneurs get grilled by potential investors about their business ideas." The winners will be announced in April.

ARUP | CERN | CIVIL ENGINEERING | FCC | ILC | KITAKAMI