

Where is Europe going?

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In Swedish, Snowmass may translate to two different things:

1. Snömassa – A lot of snow (OK for Swedes, i.e., a lot of useful content)
2. Snömos – vain talk, nonsense, drivel

Hopefully, Snowmass 2013 will converge to a statement of the first kind...

Main recent events in Europe:

- ✓ Particle Physics - Update of The European Strategy for Particle Physics (document approved by CERN's Council in a special meeting in Brussels earlier today, May 30)
- ✓ Astroparticle Physics – New ApPEC (Astroparticle Physics European Consortium) formed 2012-13 with main European funding agencies as members (Precursors: "old" ApPEC; ASPERA & ASPERA-2)

The European version of Snowmass: The Energy and (to a lesser extent) Cosmic and Intensity frontiers:

Time Line of the Update

- The update process started in 2011 by setting up the European Strategy Group (ESG) and the Preparatory Group by Council
- February 2012, Call for scientific input from the community
- September 2012: **Open Symposium** (Kracow)
- December 2012: **Scientific Briefing Book** by the Preparatory Group based on the community input (Open Symposium + written submissions)
- January 2013: **Strategy Group drafting session** (Erice)
Draft of European Strategy Update written and submitted to Council
- March 2013: Council agreed on final draft with minor wording amendments
- May 30 2013: The Council will formally adopt the Strategy Update in a special European Strategy Session of the Council in Brussels



M. Krammer,
Krusenberg, Sweden,
May 17, 2013

COMPOSITION OF EUROPEAN STRATEGY GROUP

MEMBERS	NAME	MEMBERS	NAME
<i>Member States</i>		<i>Director General CERN</i>	
Austria	Prof. A. H. Hoang	Prof. R. Heuer	
Belgium	Prof. W. Van Doninck	<i>Invited</i>	
Bulgaria	Prof. L. Litov	Former President of Council	Prof. M. Spiro
Czech Republic	Prof. J. Chyla	President of Council	Prof. A. Zalewska
Denmark	Prof. J.J. Gaardhoje	<i>Major European National Labs</i>	
Finland	Prof. P. Eerola	CIEMAT	Dr M. Cerrada
France	Prof. E. Augé (until 11.2012)	DESY	Prof. J. Mnich
	Prof. J. Martino (from 12.2012)	IRFU	Dr Ph. Chomaz
Germany	Prof. S. Bethke	LAL	Dr A. Stocchi
Greece	Prof. P. Rapidis	Nikhef	Prof. F. Linde
Hungary	Prof. P. Levai	LNF	Dr U. Dosselli
Italy	Prof. F. Ferroni	LNGS	Prof. S. Ragazzi
Netherlands	Prof. S. De Jong	PSI	Prof. L. Rivkin
Norway	Prof. A. Read	STFC-RAL	Prof. J. Womersley
Poland	Prof. A. Zalewska (until 12.2012)	<i>Strategy Secretariat Members</i>	
	Prof. J. Królikowski (from 1.2013)	Scientific Secretary (Chair)	Prof. T. Nakada
Portugal	Prof. G. Barreira	SPC Chair	Prof. F. Zwirner
Slovakia	Dr L. Sandor	ECFA Chair	Dr M. Krammer
Spain	Prof. F. del Aguila	Repres. EU Lab. Directors' Mtg	Dr Ph. Chomaz
Sweden	Prof. B. Åsman	Scientific Secretary Assistant	Prof. E. Tsesselis
Switzerland	Prof. K. Kirch		
UK	Prof. J. Butterworth		

INVITEES	NAME	INVITEES	NAME
<i>Candidate for Accession</i>		<i>Observer States</i>	
Romania	Dr S. Dita	Russian Federation	Prof. A. Bondar
<i>Associate Member States</i>		Turkey	Prof. Dr M. Zeyrek
Israel	Prof. E. Rabinovici	United States	Prof. M. Shochet
Serbia	H.E. Amb. U.Zvekic	EU	Dr R. Lecbychová
<i>Observer States</i>		ApPEC	Dr S. Katsanevas
India	Prof. T. Aziz	Chairman FALC	Prof. Y. Okada
Japan	Prof. Sh. Asai	Chairman ESFRI	Dr B. Vierkorn-Rudolph
		Chairman NuPECC	Prof. A. Bracco
		JINR, Dubna	Prof. V. Matveev

COMPOSITION OF PREPARATORY GROUP

MEMBERS	NAME	MEMBERS	NAME
<i>Strategy Secretariat Members</i>		<i>ECFA</i>	
Scientific Secretary (Chair)	Prof. T. Nakada		Prof. C. De Clercq
SPC Chair	Prof. F. Zwirner		Prof. K. Desch
ECFA Chair	Dr M. Krammer		Prof. K. Huitu
Repres. EU Lab. Directors' Mtg	Dr Ph. Chomaz		Prof. A.F. Zarnecki
Scientific Secretary Assistant	Prof. E. Tsesselis	<i>CERN</i>	
			Dr P. Jenni
<i>SPC</i>		<i>ASIA/Americas</i>	
	Prof. R. Aleksan	Asia	Prof. Y. Kuno
	Prof. P. Braun-Munzinger	Americas	Prof. P. McBride
	Prof. M. Diemoz		
	Prof. D. Wark		



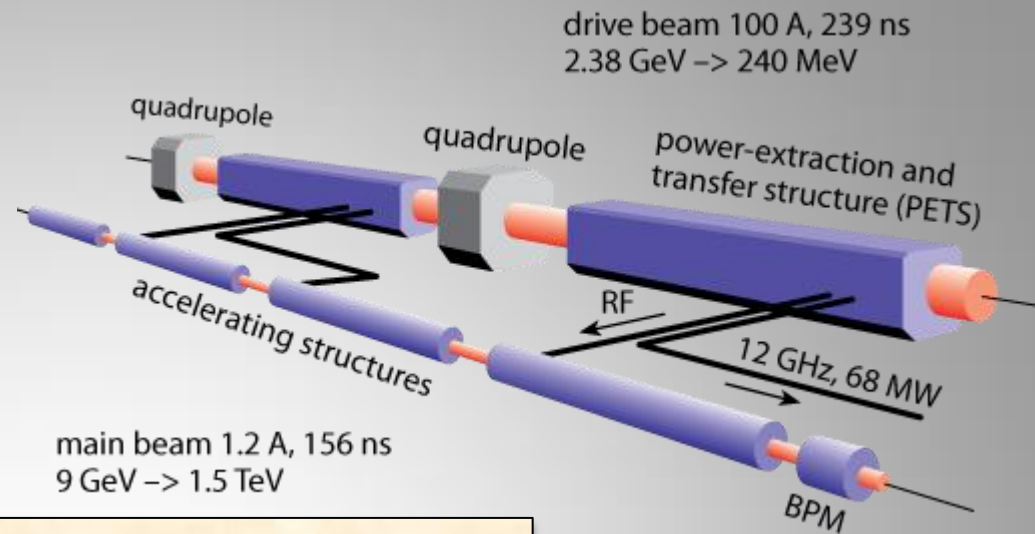
- The success of the LHC is proof of the effectiveness of the European **organizational model** for particle physics, founded on the **sustained long-term commitment of the CERN Member States and of the national institutes, laboratories and universities closely collaborating with CERN**. *Europe should preserve this model in order to keep its leading role, sustaining the success of particle physics and the benefits it brings to the wider society.*
- The scale of the facilities required by particle physics is resulting in the **globalisation of the field**. *The European Strategy takes into account the worldwide particle physics landscape and developments in related fields and should continue to do so.*



The European Strategy for Particle Physics:

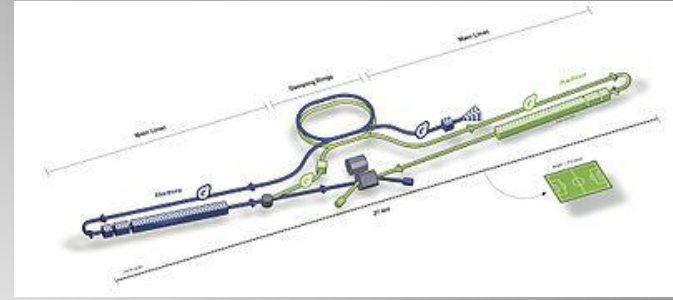
- The discovery of the Higgs boson is the start of a major programme of work to measure this particle's properties with the highest possible precision for testing the validity of the Standard Model and to search for further new physics at the energy frontier. The LHC is in a unique position to pursue this programme. *Europe's top priority should be the exploitation of the full potential of the LHC, including the high-luminosity upgrade of the machine and detectors with a view to collecting ten times more data than in the initial design, by around 2030. This upgrade programme will also provide further exciting opportunities for the study of flavour physics and the quark-gluon plasma.*

Priority 1:
High-
luminosity LHC



Priority 2:
Prepare for
post-LHC
accelerator
(CLIC?)

- To stay at the forefront of particle physics, Europe needs to be in a position to propose an ambitious post-LHC accelerator project at CERN by the time of the next Strategy update, when physics results from the LHC running at 14 TeV will be available. 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.

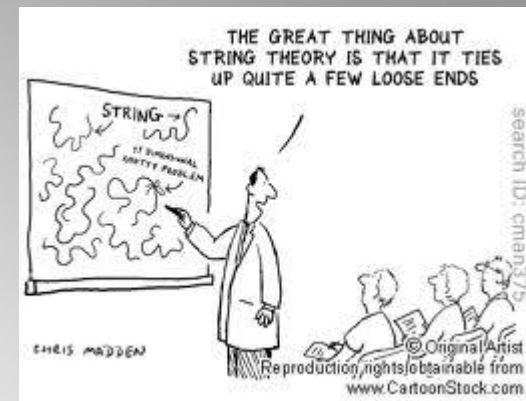


Support for ILC in Japan

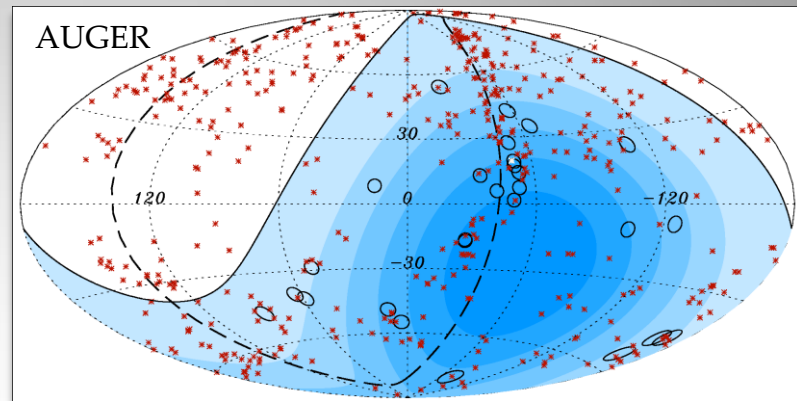
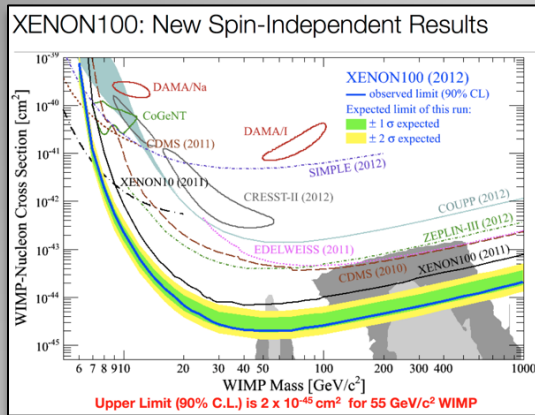
- There is a strong scientific case for an **electron-positron collider**, complementary to the LHC, that can study the properties of the Higgs boson and other particles with unprecedented precision and whose energy can be upgraded. The Technical Design Report of the International Linear Collider (ILC) has been completed, with large European participation. **The initiative from 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.*
- Rapid progress in **neutrino oscillation physics**, with significant European involvement, has established a strong scientific case for a long-baseline neutrino programme exploring CP violation and the mass hierarchy in the neutrino sector. *CERN should develop a neutrino programme to pave the way for a substantial European role in future long-baseline experiments. Europe should explore the possibility of major participation in leading neutrino projects in the US and Japan.*



Support for long baseline neutrino programmes in US and Japan (Snömos!?)



- **Theory** is a strong driver of particle physics and provides essential input to experiments, witness **the major role played by theory in the recent discovery of the Higgs boson**, from the foundations of the Standard Model to detailed calculations guiding the experimental searches. *Europe should support a diverse, vibrant theoretical physics programme, ranging from abstract to applied topics, in close collaboration with experiments and extending to neighbouring fields such as **astroparticle physics and cosmology**. Such support should extend also to high-performance computing and software development.*
- Experiments studying quark flavour physics, investigating dipole moments, searching for charged lepton flavour violation and performing other precision measurements at lower energies, such as those with neutrons, muons and antiprotons, may give access to higher energy scales than direct particle production or put fundamental symmetries to the test. They can be based in national laboratories, with a moderate cost and smaller collaborations. *Experiments in Europe with unique reach should be supported, as well as participation in experiments in other regions, especially Japan and the US.*



A range of important **non-accelerator experiments** take place at the **overlap of particle and astroparticle physics**, such as searches for **proton decay**, **neutrinoless double beta decay** and **dark matter**, and the study of **high-energy cosmic-rays**.

These experiments address **fundamental questions beyond the Standard Model** of particle physics. The exchange of information between CERN and ApPEC has progressed since 2006. *In the coming years, CERN should seek a **closer collaboration with ApPEC** on detector R&D with a view to maintaining the community's capability for unique projects in this field.*

My personal summary of the European Strategy Update (with the caution that some parts of the text are more *Snömos* than others):

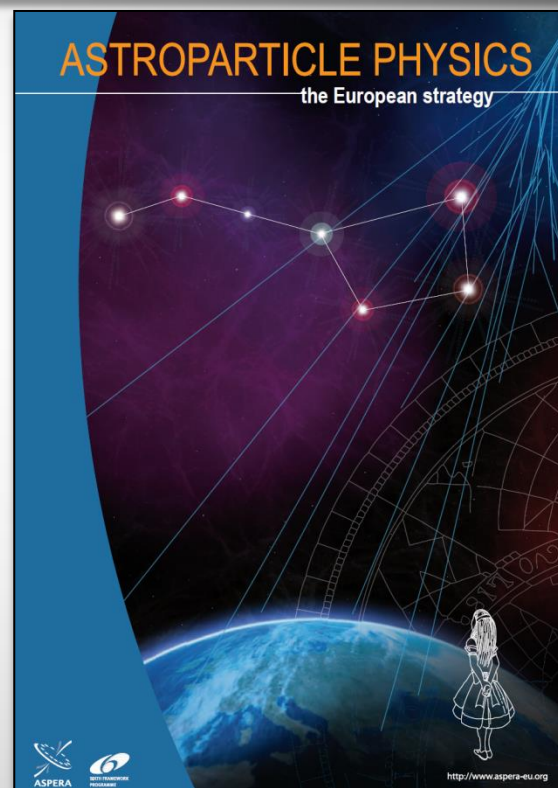
- CERN is committed to stay in lead at the Energy frontier, with the LHC luminosity upgrade to 3000 fb^{-1} as the first priority
- CERN may support ILC in Japan with in-kind contributions, should it be decided to build it
- CERN can imagine in-kind contributions to the Fermilab neutrino program, but has some problems understanding the starting point (under-funded, with far detector on surface). Its view on the European long baseline project(s) seems less clear.
- The "canonical" path for CERN itself would be the luminosity upgrade, followed perhaps by an energy upgrade or a very high-energy electron-positron collider (CLIC). TLEP (80 - 100 km LEP-like machine), an electron-positron machine or a muon collider seem less likely at the moment.

Astroparticle physics European strategy.

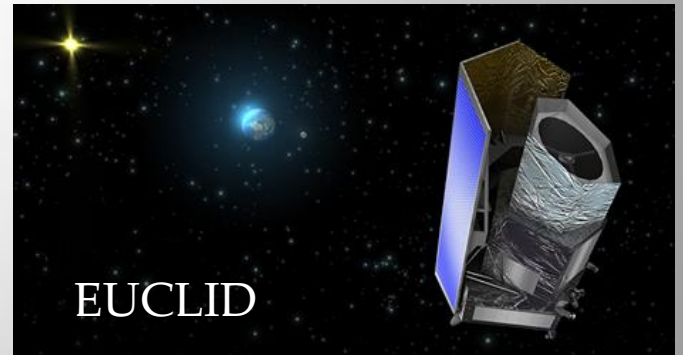
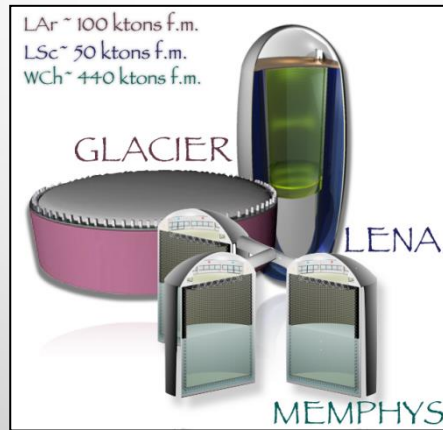
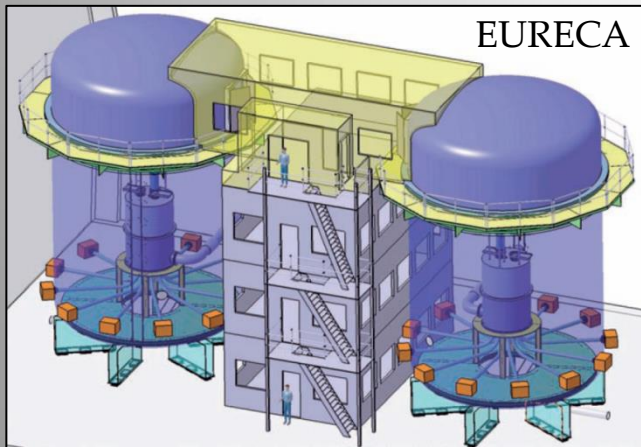
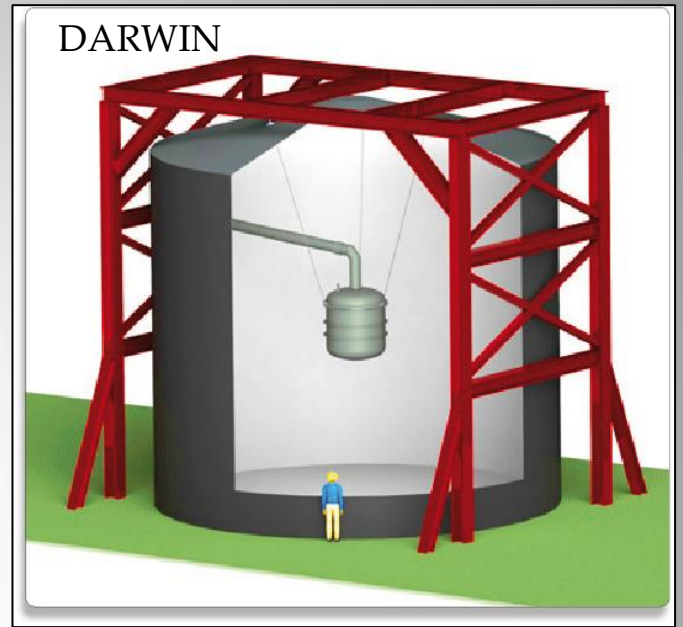
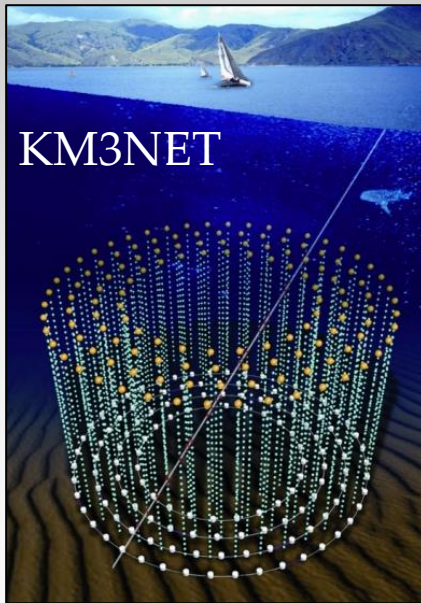
Problems:

- 1) **What is the Universe made of?
In particular: What is dark matter?**
- 2) **Do protons have a finite life time?**
- 3) **What are the properties of neutrinos?
What is their role in cosmic evolution?**
- 4) **What do neutrinos tell us about the
interior of the Sun and the Earth,
and about supernova explosions?**
- 5) **What is the origin of cosmic rays?
What is the view of the sky at
extreme energies?**
- 6) **What will gravitational waves tell us
about violent cosmic processes and
about the nature of gravity?**

ApPEC (Astroparticle Physics European **Coordination** committee, founded in 2001) → ASPERA (2006-2012) → New ApPEC (Astroparticle Physics European **Consortium** founded in 2013)



Solutions: Big projects supported by the ASPERA 2011 Roadmap update



To discuss:

Can we convince our funding agencies to fund *any* new large-scale accelerator if the SM Higgs is the only "new" discovery?

Can the US long baseline neutrino programme be made attractive enough for Europe to join?

Can astroparticle physics & cosmology continue to be run like "smaller-scale" science (CTA has more than 1000 scientists...)?

How should we coordinate space-, ground- and underground-based projects addressing BSM physics with accelerator-based particle physics?

What will be the future role of Asia (besides Japan) in basic science?