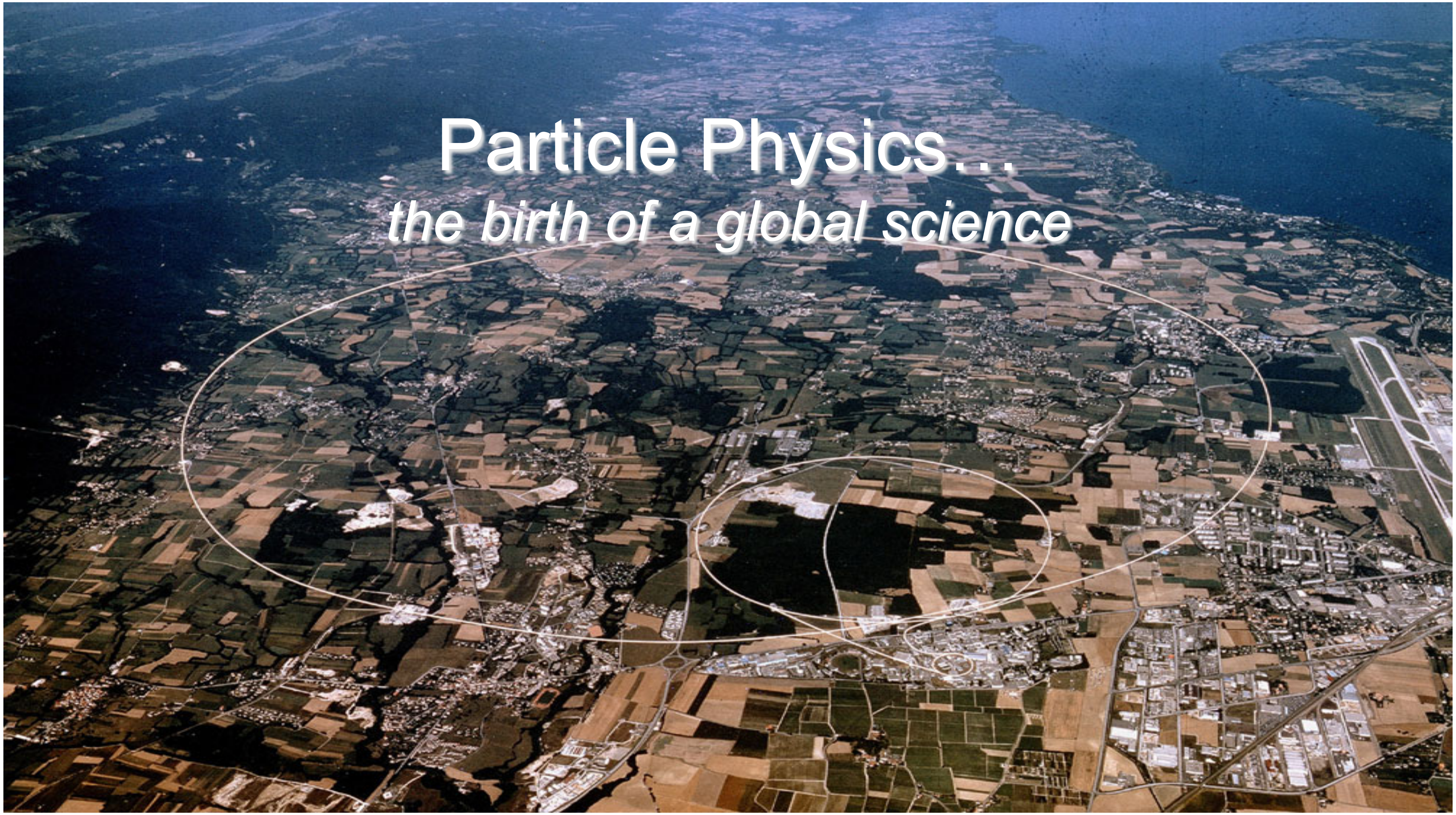
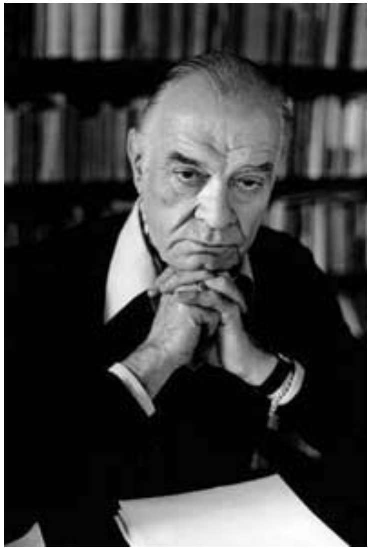
Exploring the frontiers of knowledge
Explorer les frontières du savoir



Dr James Gillies, Head of communication, CERN

1949: The origins of CERN, Lausanne

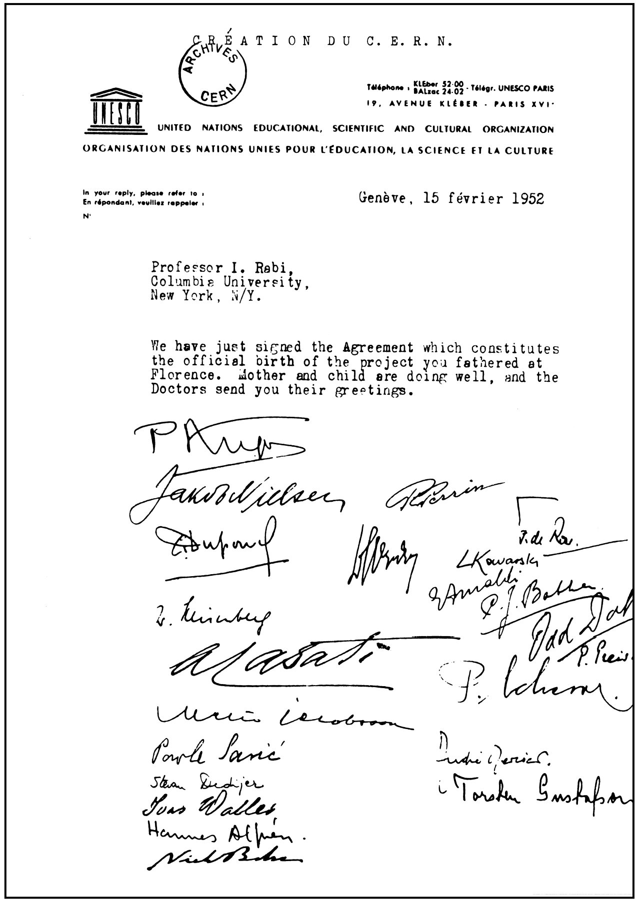


Louis de Broglie proposed: *"the creation of a laboratory or institution where it would be possible to do scientific work, but somehow beyond the framework of the different participating states [Endowed with more resources than national facilities, such a laboratory could] undertake tasks, which, by virtue of their size and cost, were beyond the scope of individual countries".*

1950: UNESCO General Conference, Florence

American Nobel laureate, Isidor Rabi tables a resolution authorizing UNESCO to: *"assist and encourage the formation of regional research laboratories in order to increase international scientific collaboration…"*

1951: UNESCO intergovernmental meeting, Paris



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UNESCO

UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION
ORGANISATION DES NATIONS UNIES POUR L'ÉDUCATION, LA SCIENCE ET LA CULTURE

In your reply, please refer to :
En répondant, veuillez rappeler :
N°

Genève, 15 février 1952

Professor I. Rabi,
Columbia University,
New York, N/Y.

We have just signed the Agreement which constitutes the official birth of the project you fathered at Florence. Mother and child are doing well, and the Doctors send you their greetings.

At a meeting of UNESCO in Paris in December 1951, the first resolution concerning the establishment of a European Council for Nuclear Research was adopted. Two months later, 11 countries signed an agreement establishing the provisional Council – the acronym CERN was born.

1952: The choice of Geneva

Sur le terrain du futur institut nucléaire

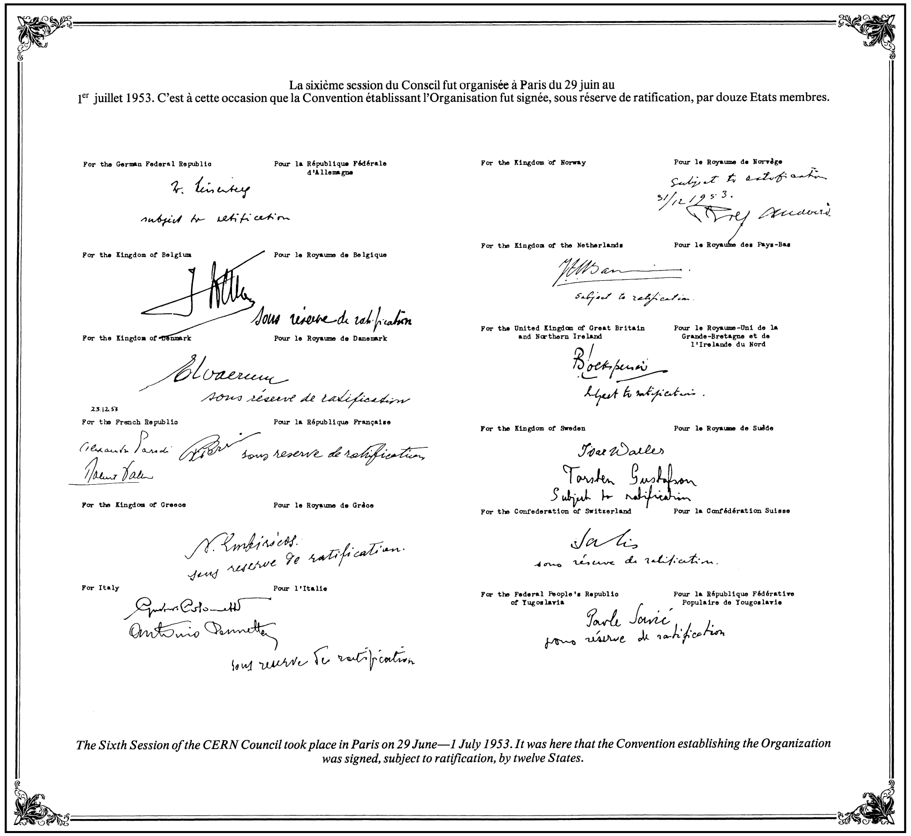
Sous la conduite de M. A. Picot, les membres du Conseil européen pour la recherche nucléaire se sont rendus hier à Meyrin pour reconnaître le terrain où s'élèvera le Centre nucléaire (voir en Dernière heure)

(Photo Freddy Bertrand, Genève)

La Suisse du 30 octobre 1953

At the provisional Council's third session in October 1952, Geneva was chosen as the site of the future Laboratory. This choice was finally ratified in a referendum organized by the Canton of Geneva in June 1953.

1954: The organization is born


La sixième session du Conseil fut organisée à Paris du 29 juin au
1er juillet 1953. C'est à cette occasion que la Convention établissant l'Organisation fut signée, sous réserve de ratification, par douze Etats membres.

For the German Federal Republic — Pour la République Fédérale d'Allemagne
subject to ratification

For the Kingdom of Belgium — Pour le Royaume de Belgique
Sous réserve de ratification

For the Kingdom of Denmark — Pour le Royaume de Danemark
sous réserve de ratification
23.12.53

For the French Republic — Pour la République Française
Alexandre Parodi
sous reserve de ratification

For the Kingdom of Greece — Pour le Royaume de Grèce
sous reserve de ratification.

For Italy — Pour l'Italie
Antonio Pennetta
sous reserve de ratification

For the Kingdom of Norway — Pour le Royaume de Norvège
Subject to ratification
31/12/1953.

For the Kingdom of the Netherlands — Pour le Royaume des Pays-Bas
Subject to ratification.

For the United Kingdom of Great Britain and Northern Ireland — Pour le Royaume-Uni de la Grande-Bretagne et de l'Irelande du Nord
Subject to ratification.

For the Kingdom of Sweden — Pour le Royaume de Suède
Ivar Waller
Torsten Gustafson
Subject to ratification

For the Confederation of Switzerland — Pour la Confédération Suisse
sous réserve de ratification.

For the Federal People's Republic of Yugoslavia — Pour la République Fédérative Populaire de Yougoslavie
Pavle Savić
sous réserve de ratification

The Sixth Session of the CERN Council took place in Paris on 29 June—1 July 1953. It was here that the Convention establishing the Organization was signed, subject to ratification, by twelve States.

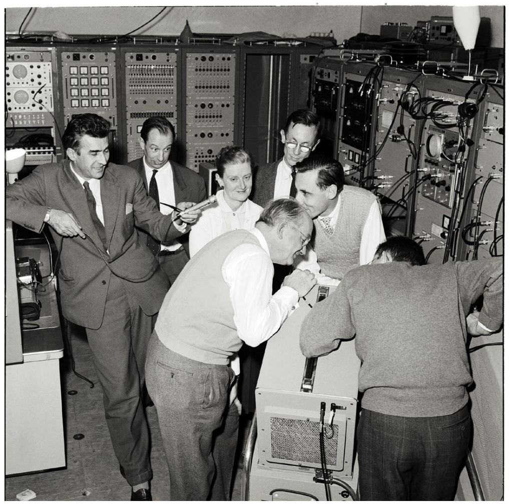
The CERN Convention, established in July 1953, was ratified by the 12 founding Member States: Belgium, Denmark, France, the Federal Republic of Germany, Greece, Italy, the Netherlands, Norway, Sweden, Switzerland, the UK, and Yugoslavia. On 29 September 1954, the European Organization for Nuclear Research officially came into being. CERN was dissolved but the acronym remains.

1957: CERN’s first machine: the Synchrocyclotron

1958: CERN’s first experiment

In July 1958, Tito Fazzini, Giuseppe Fidecaro, Alec Merrison, Helmut Paul and Alvin Tollestrup produced conclusive evidence that approximately one pion in ten thousand decayed into an electron and a neutrino, as predicted by the weak interaction theory: the first of CERN's great discoveries.

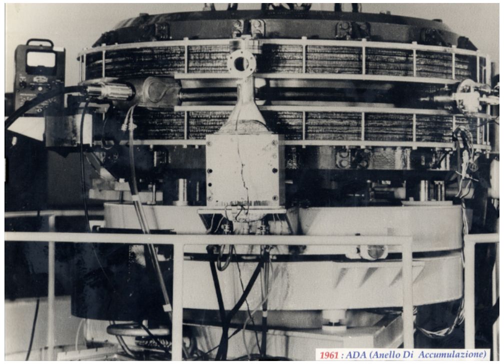
1959: CERN’s first big machine



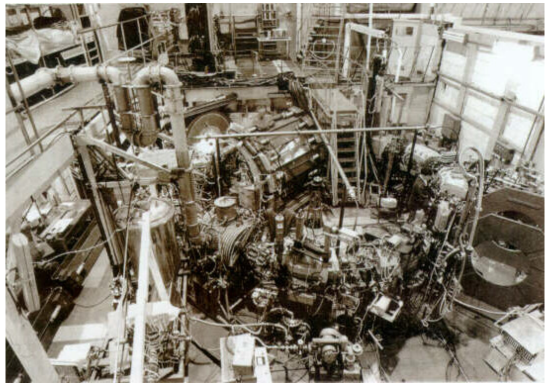
Start up of the CERN Proton Synchrotron, assisted by Hildred Blewett from Brookhaven….

… who shared the technique of strong focusing, invented at Brookhaven, with her European colleagues.

The late 1950s saw the healthy competitive collaboration between the US and Europe that continues to this day…



1961: ADA at Frascati…



… and VEPP-1 at Novosibirsk

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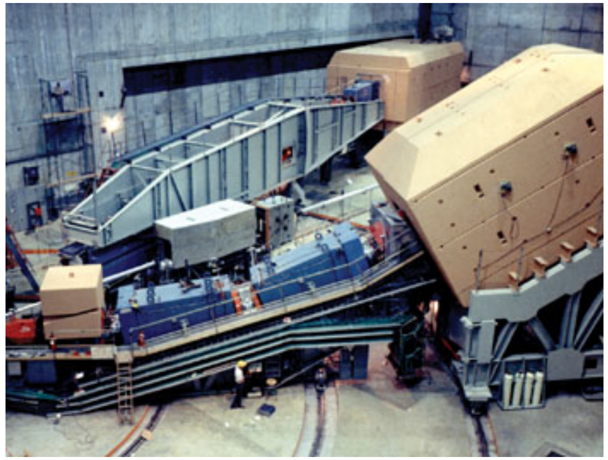
Explorer les frontières du savoir

1960s: Advances in theory

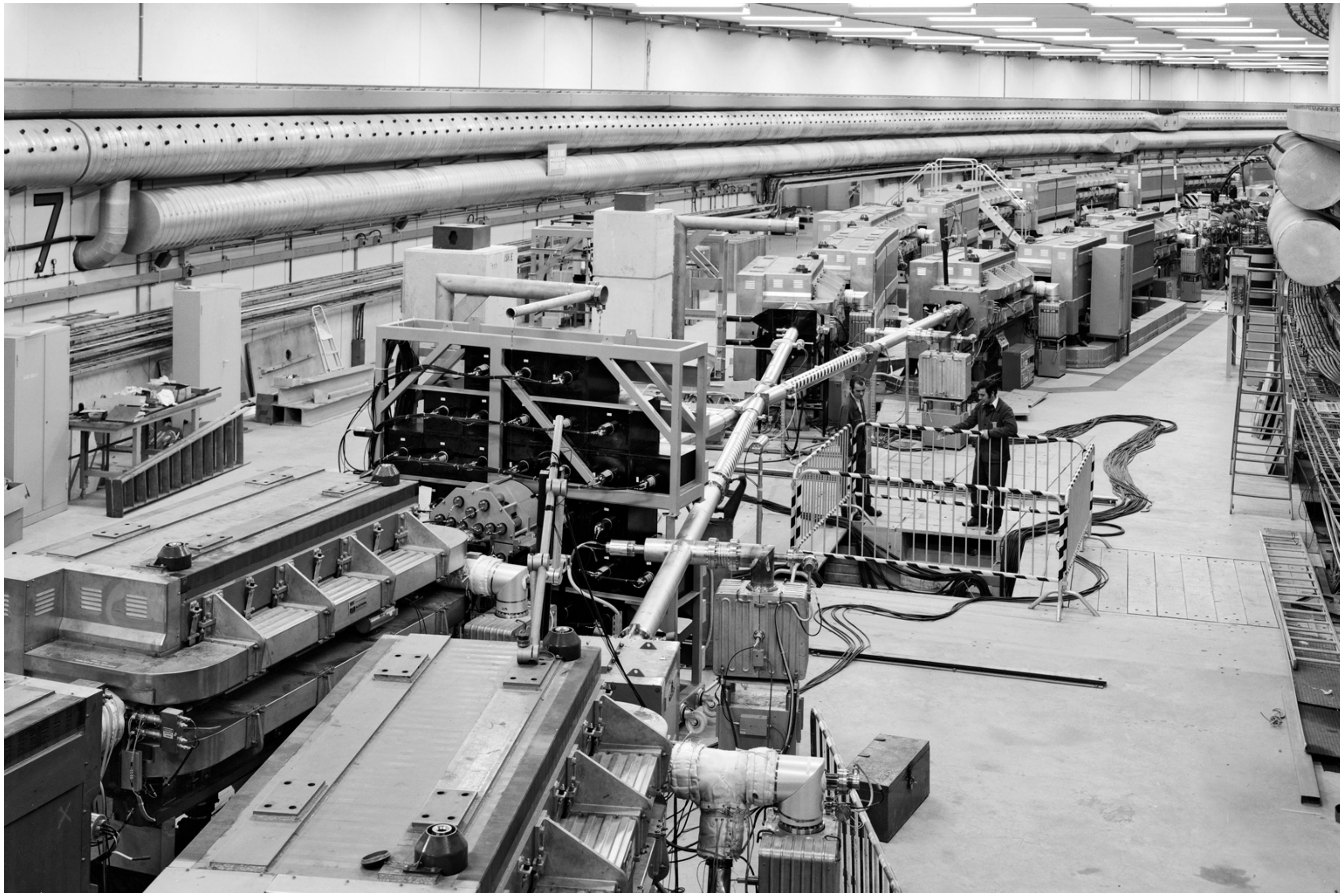
Emilio Segrè Visual Archives

Gell Mann and Feynman: Quarks and partons – discovered at SLAC.



Kibble, Guralnik, Hagen, Englert, Brout… and Higgs: a mechanism for symmetry breaking between electromagnetic and weak interactions.

1965: Approval of the ISR:
The world's first hadron collider



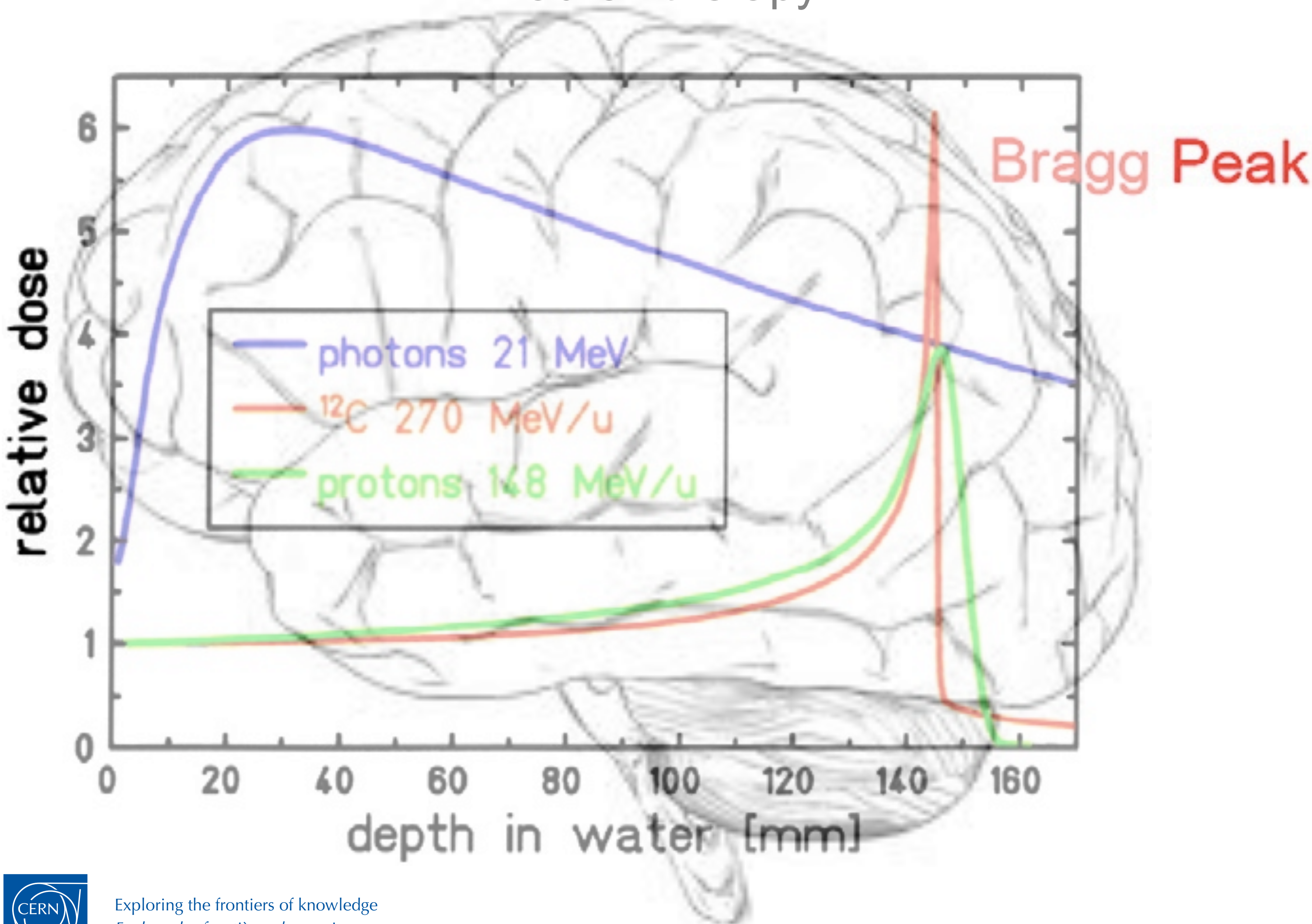
1967: Looking to the East…

In 1967, CERN signed an agreement with the USSR that led to exchanges of personnel and equipment between CERN and Serpukhov.

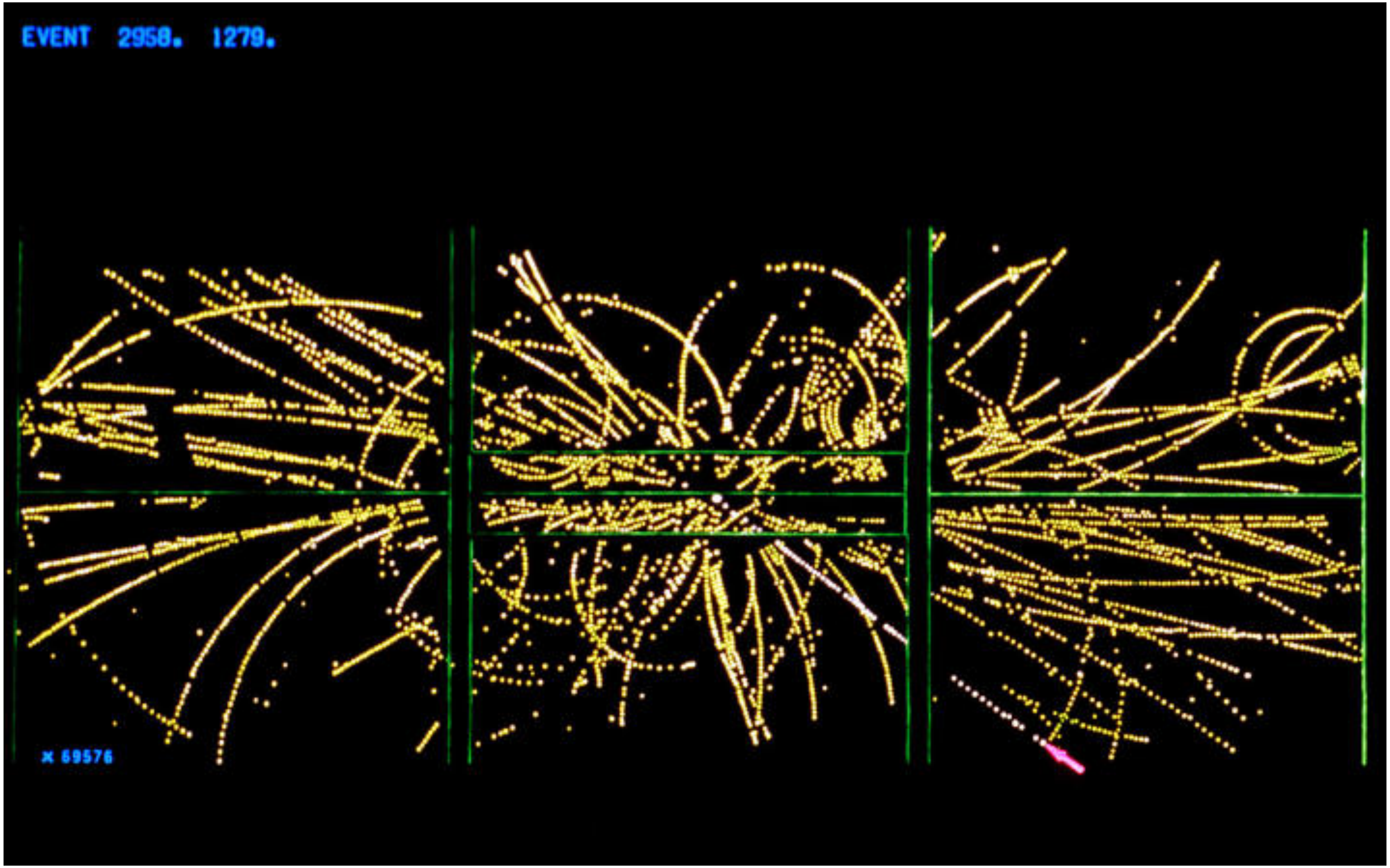
Earlier in the decade, CERN had been the scene of the first scientific contacts between East and West Germany following the erection of the Berlin wall..

1967: The arrival of a new friendly rival: Fermilab

Hadron therapy

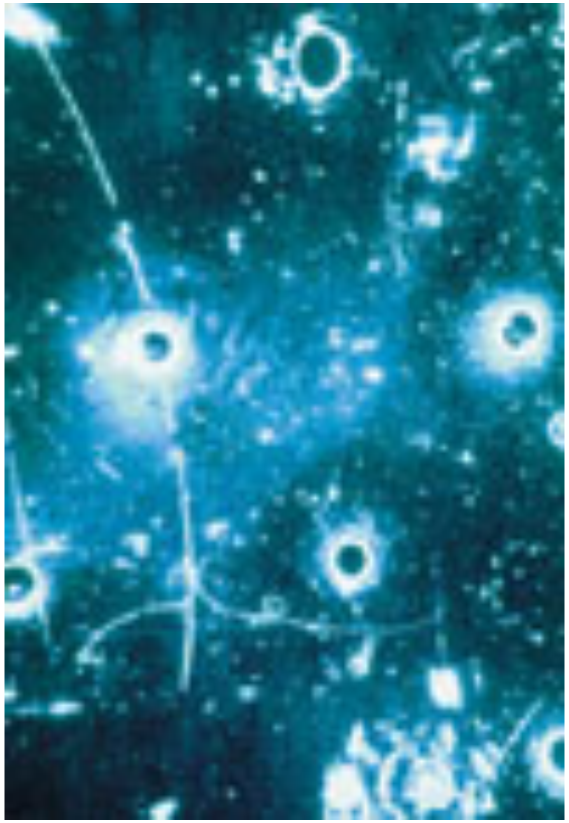


1968: MWPC – revolutionising the way particle physics is done

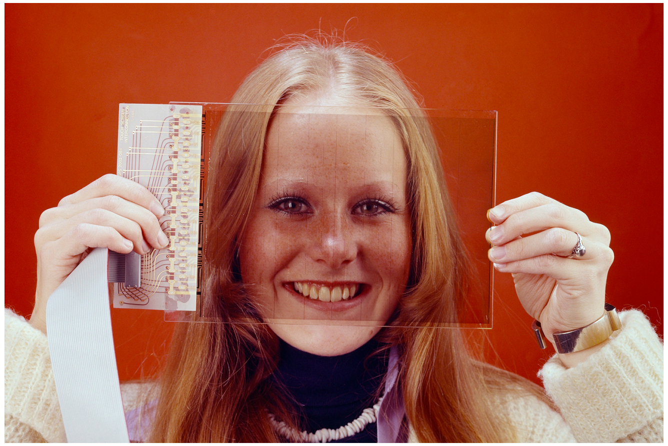


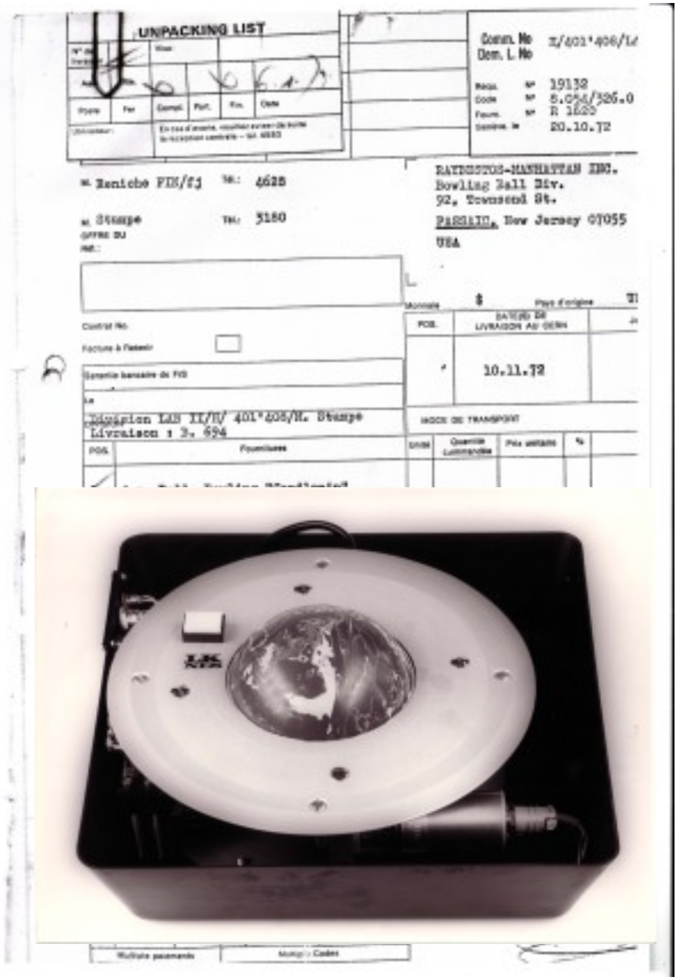
And a few other things as well…

1973: Neutral currents

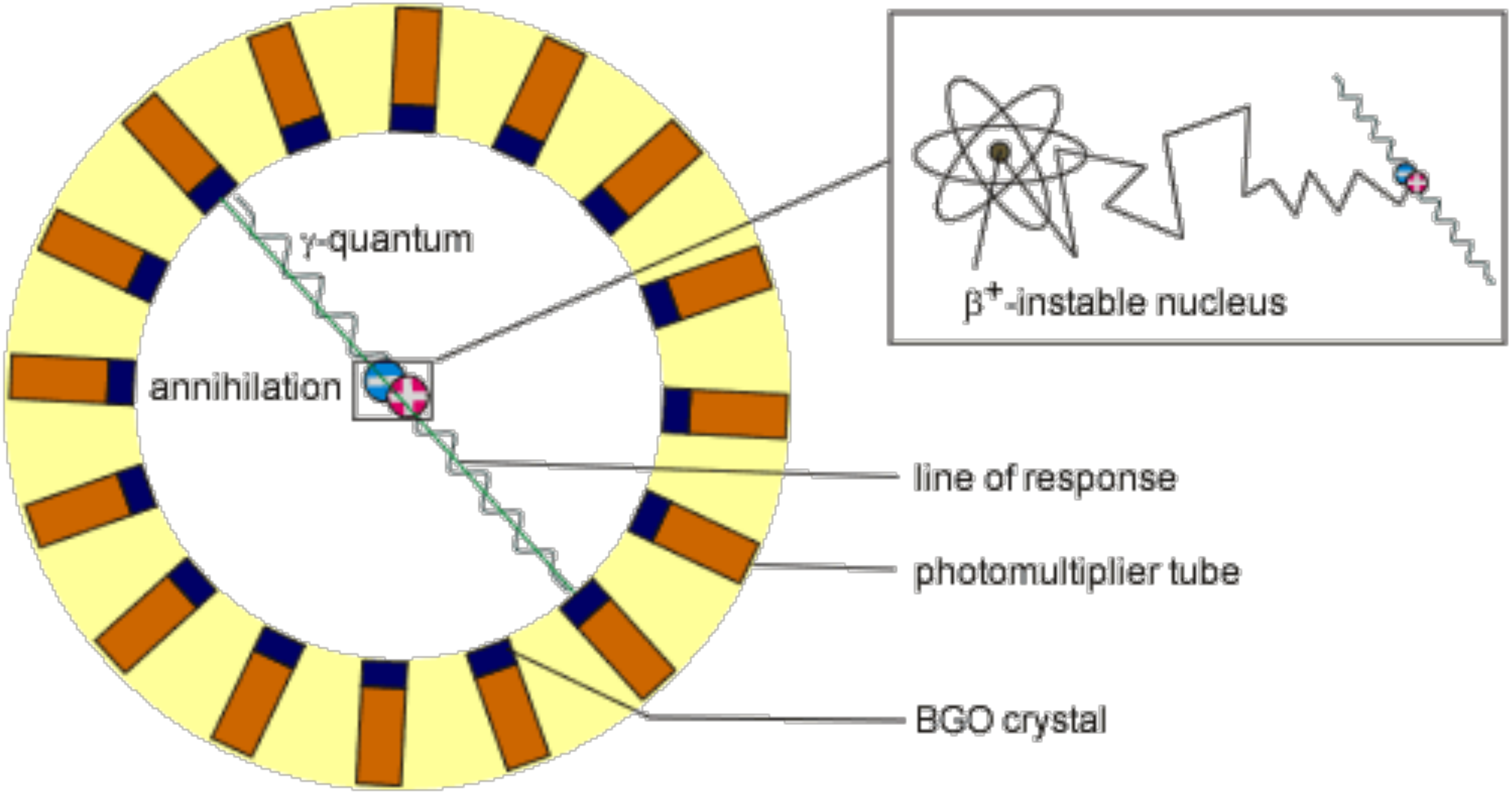


1976: The SPS begins operation

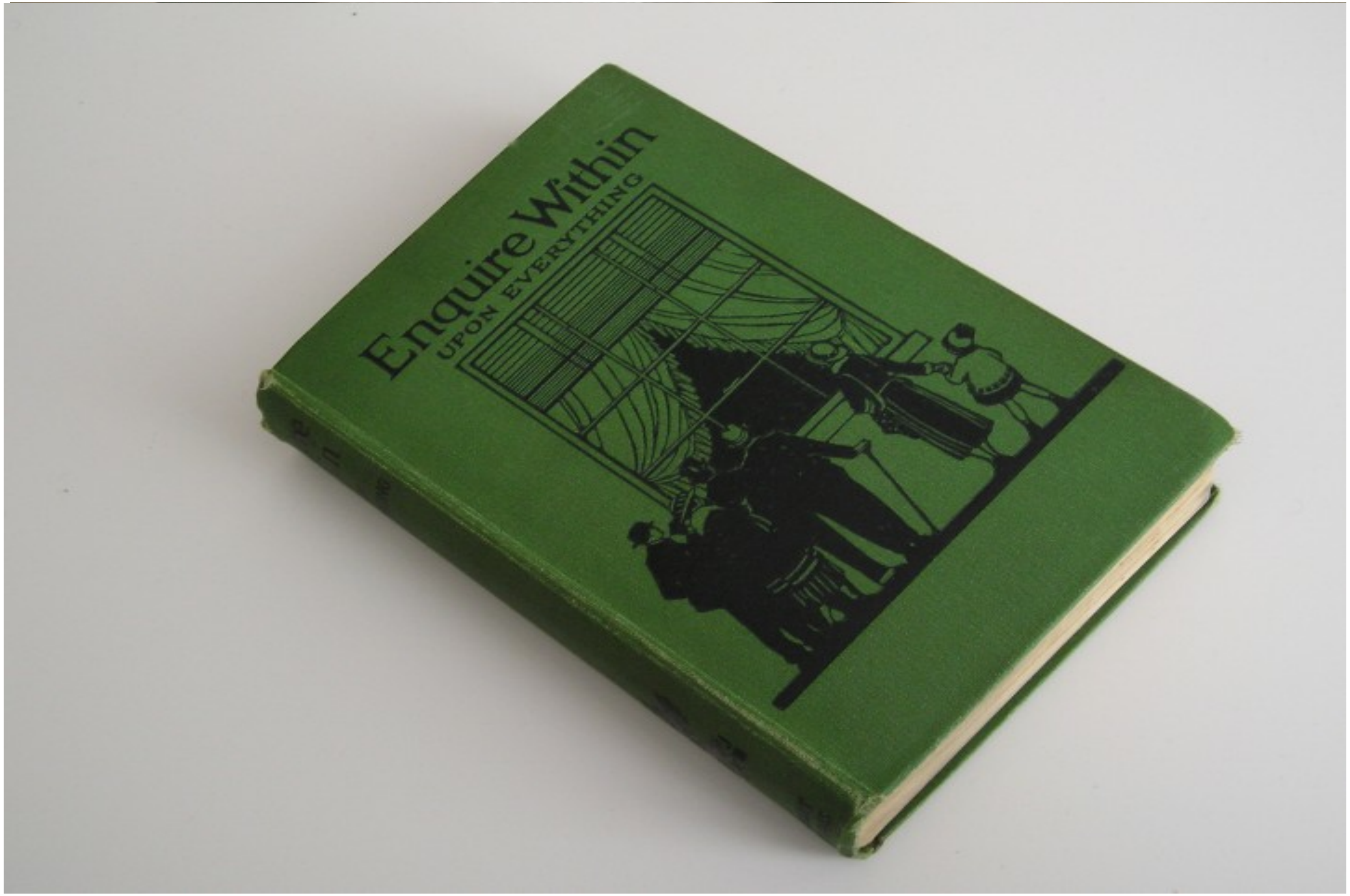




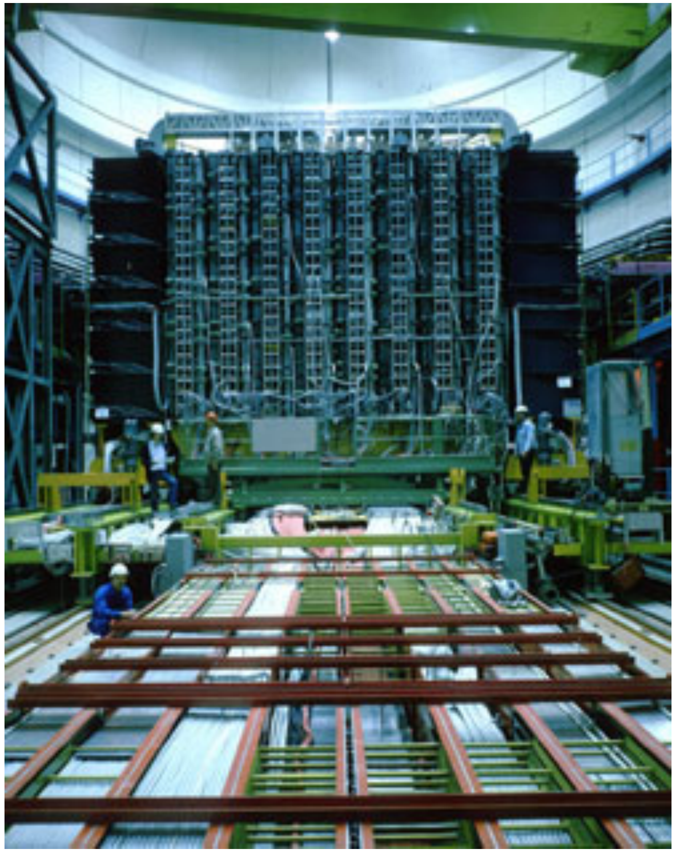
1979: CERN builds a detector for a hospital…



In 1980, a young chap called TimBL comes to CERN



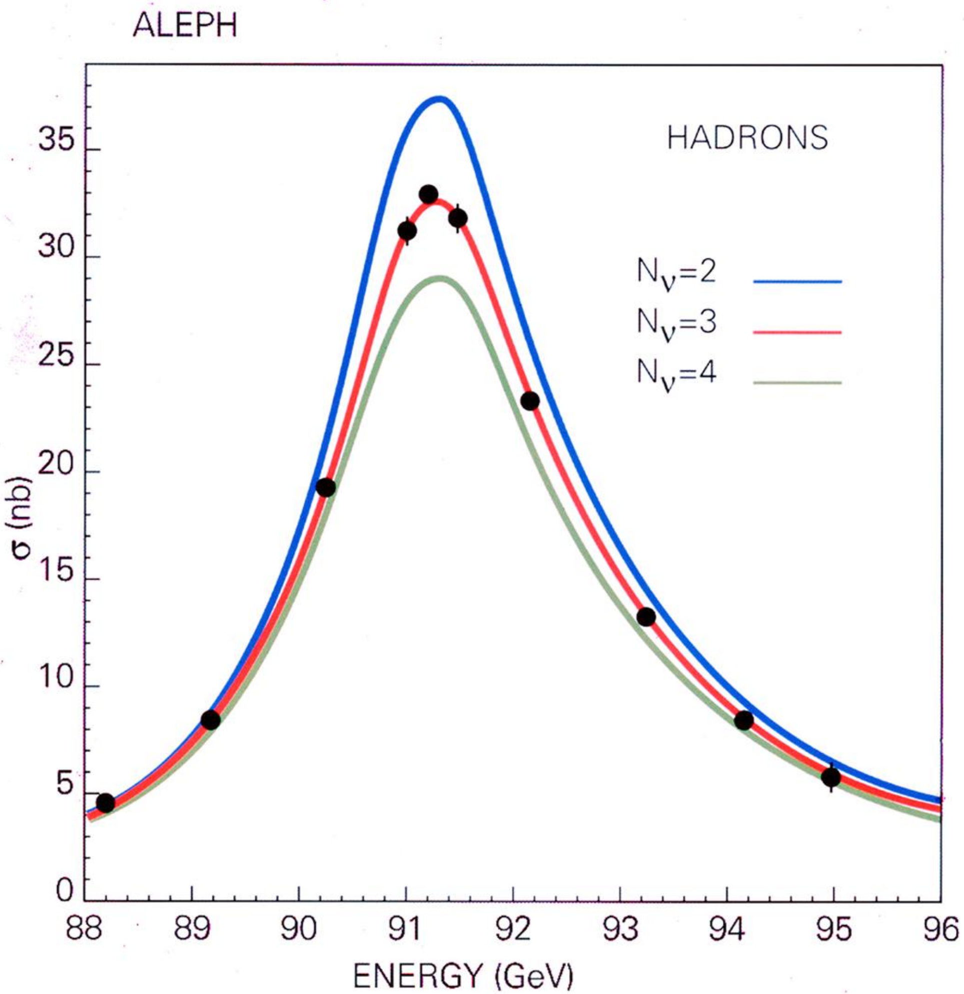
1983: CERN’s first golden age



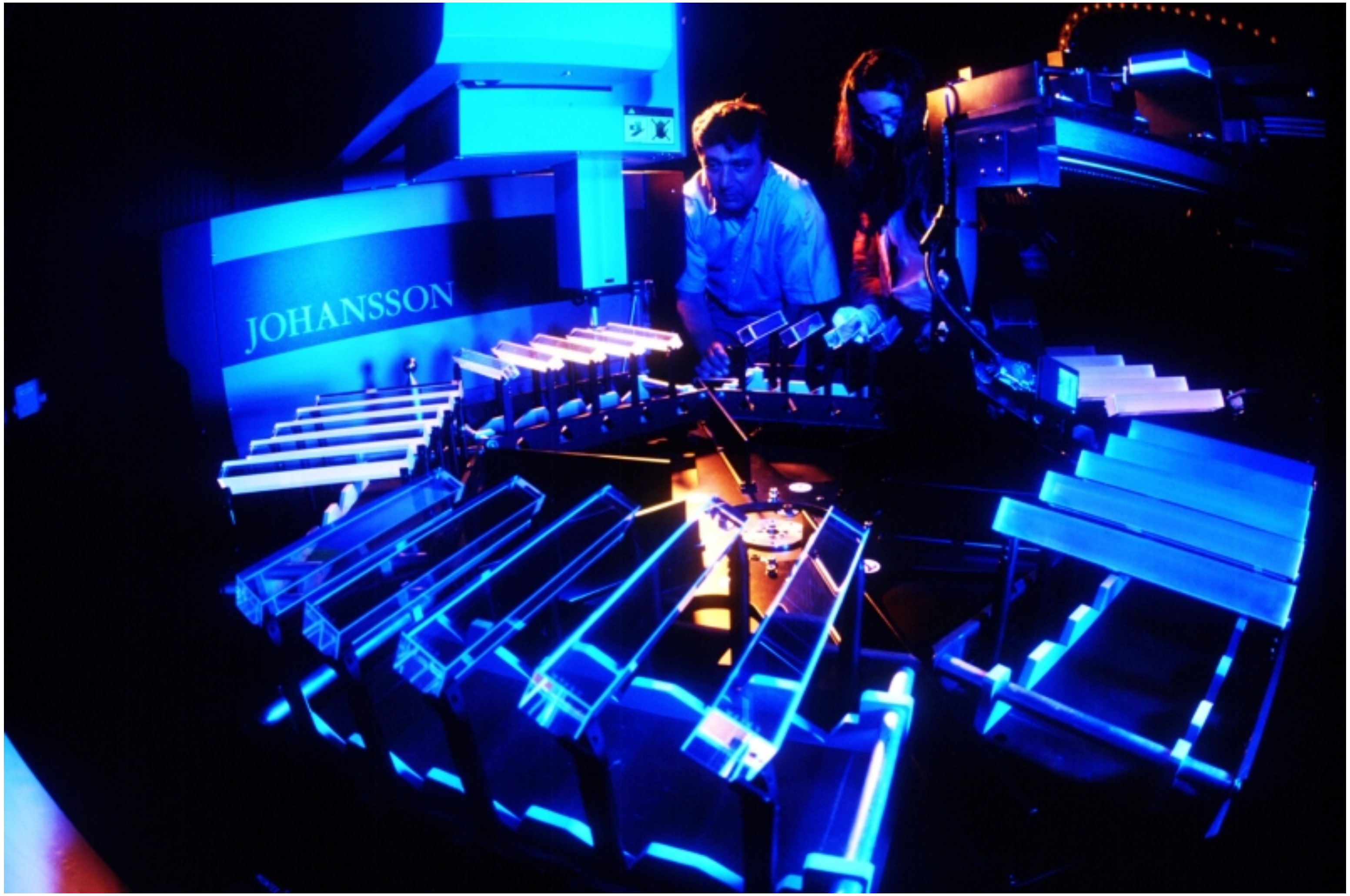
- The SPS working as a collider discovers the W and Z particles, mediators of the weak interaction.
- This experimental confirmation of the electroweak theory leads to the award of the Nobel prize the following year…
- … and continues CERN’s tradition of electroweak science.

1987: CERNET gives way to INTERNET

1989: LEP and SLC
The W and Z factories



1980s: Another contribution to PET



1989: TimBL's back

Vague but exciting ...

CERN DD/OC

Information Management: A Proposal

Tim Berners-Lee, CERN/DD

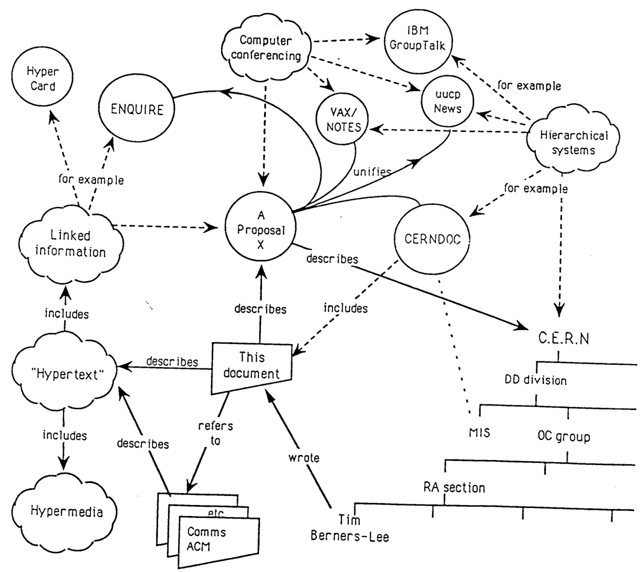
March 1989

Information Management: A Proposal

Abstract

This proposal concerns the management of general information about accelerators and experiments at CERN. It discusses the problems of loss of information about complex evolving systems and derives a solution based on a distributed hypertext sytstem.

Keywords: Hypertext, Computer conferencing, Document retrieval, Information management, Project control



The World Wide Web

The most valuable document ever?

930430

ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE
CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

STATEMENT CONCERNING CERN W3 SOFTWARE RELEASE INTO PUBLIC DOMAIN

TO WHOM IT MAY CONCERN

Introduction

The World Wide Web, hereafter referred to as W3, is a global computer networked information system.

The W3 project provides a collaborative information system independent of hardware and software platform, and physical location. The project spans technical design notes, documentation, news, discussion, educational material, personal notes, publicity, bulletin boards, live status information and numerical data as a uniform continuum, seamlessly intergated with similar information in other disciplines.

The information is presented to the user as a web of interlinked documents .

Acces to information through W3 is:

- via a hypertext model;
- network based, world wide;
- information format independent;
- highly platform/operating system independent;
- scalable from local notes to distributed data bases.

Webs can be independent, subsets or supersets of each other. They can be local, regional or worldwide. The documents available on a web may reside on any computer supported by that web.

...

Declaration

The following CERN software is hereby put into the public domain:

- W 3 basic ("line-mode") client
- W 3 basic server
- W 3 library of common code.

CERN's intention in this is to further compatibility, common practices, and standards in networking and computer supported collaboration. This does not constitute a precedent to be applied to any other CERN copyright software.

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Geneva, 30 April 1993

W. Hoogland
Director of Research

H. Weber
Director of Administration

opie certifiée conforme

ait à Genève le 03-05-93

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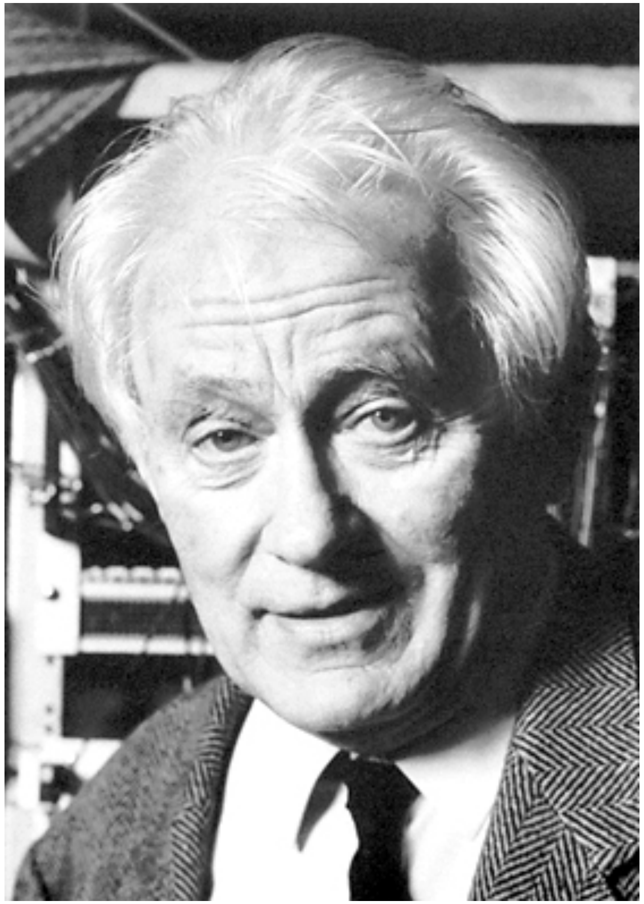
DIVISION DES FINANCES
- CERN -

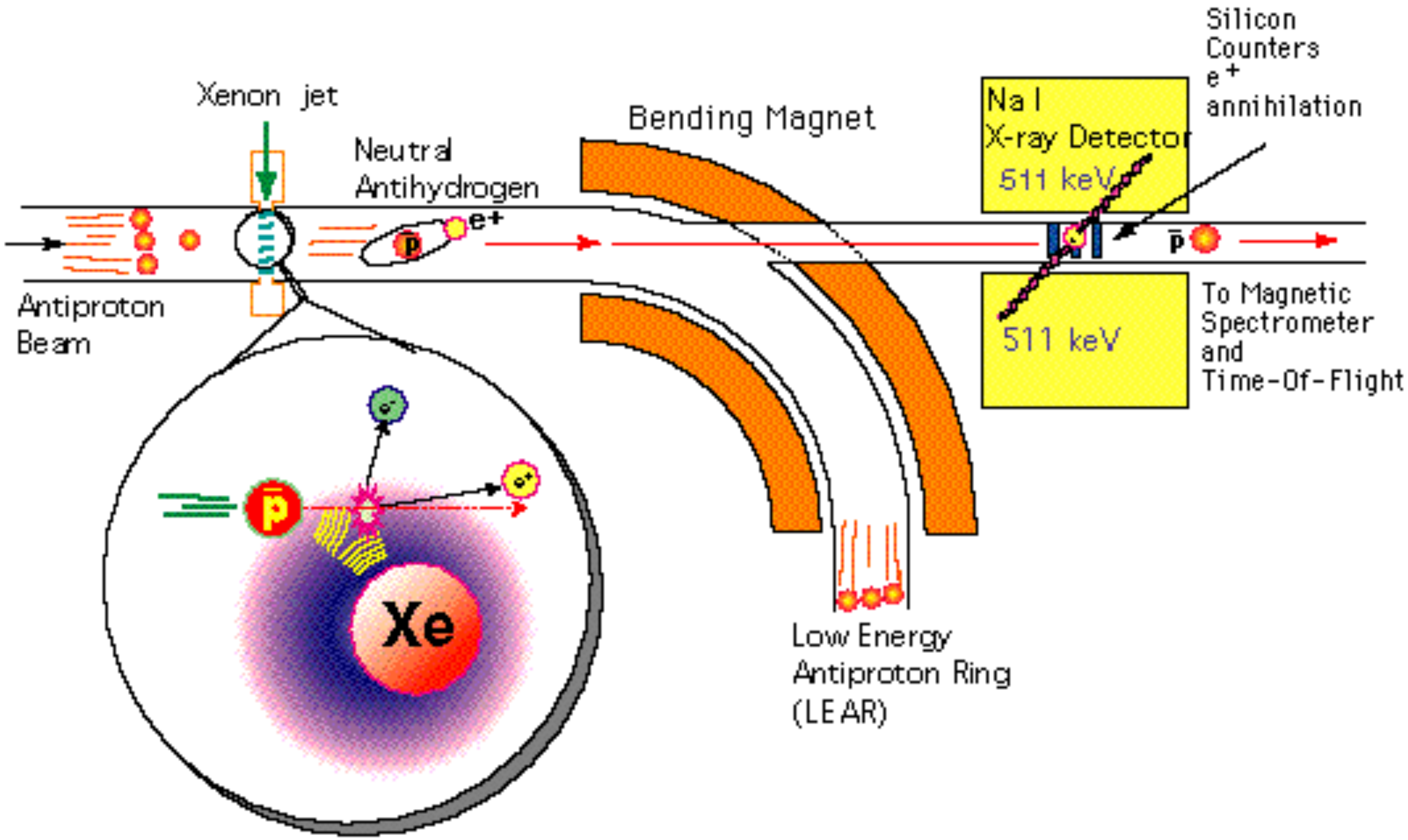
1992: George Charpak wins the Nobel Prize



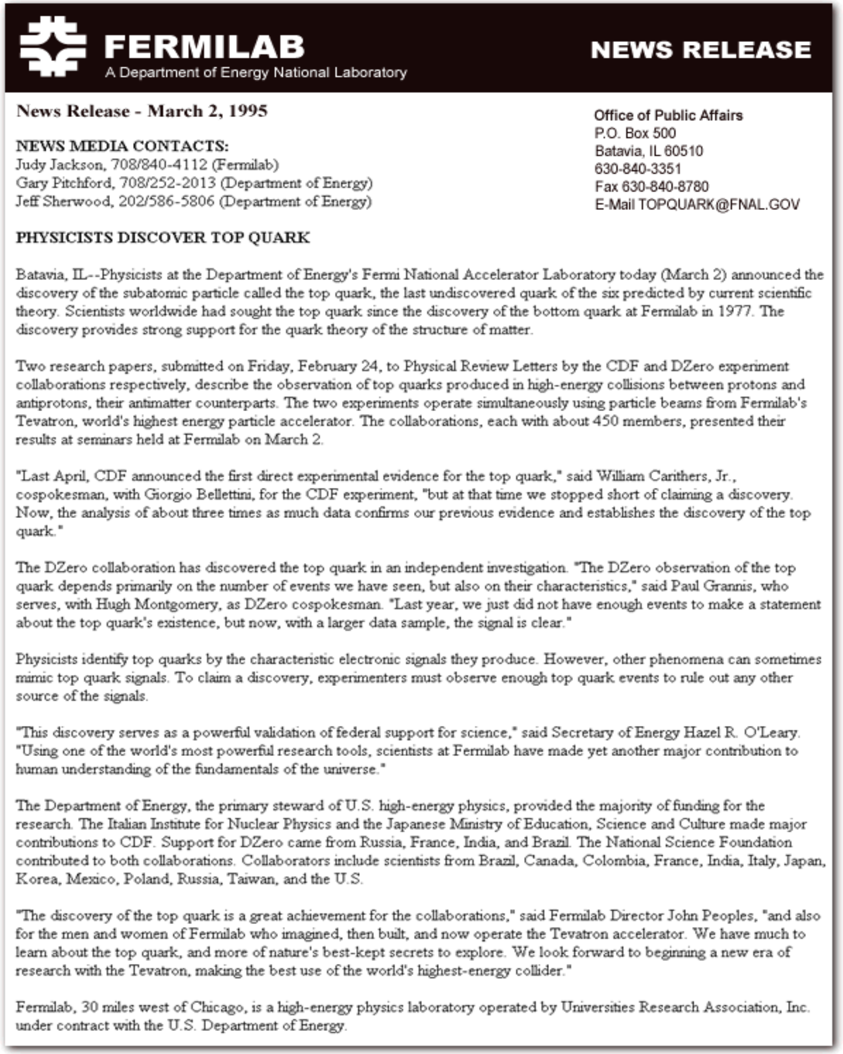
1993: A tiny preference for matter

- CERN experiment NA31 publishes the first indication at the particle level that nature has a preference for matter over antimatter… accompanied by Fermilab experiment E731.
- This result was refined in 2001 by NA48 at CERN and KTeV at Fermilab.

1995: first observation of antihydrogen



1995: A discovery at Fermilab



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NEWS RELEASE

News Release - March 2, 1995

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Jeff Sherwood, 202/586-5806 (Department of Energy)

PHYSICISTS DISCOVER TOP QUARK

Batavia, IL--Physicists at the Department of Energy's Fermi National Accelerator Laboratory today (March 2) announced the discovery of the subatomic particle called the top quark, the last undiscovered quark of the six predicted by current scientific theory. Scientists worldwide had sought the top quark since the discovery of the bottom quark at Fermilab in 1977. The discovery provides strong support for the quark theory of the structure of matter.

Two research papers, submitted on Friday, February 24, to Physical Review Letters by the CDF and DZero experiment collaborations respectively, describe the observation of top quarks produced in high-energy collisions between protons and antiprotons, their antimatter counterparts. The two experiments operate simultaneously using particle beams from Fermilab's Tevatron, world's highest energy particle accelerator. The collaborations, each with about 450 members, presented their results at seminars held at Fermilab on March 2.

"Last April, CDF announced the first direct experimental evidence for the top quark," said William Carithers, Jr., cospokesman, with Giorgio Bellettini, for the CDF experiment, "but at that time we stopped short of claiming a discovery. Now, the analysis of about three times as much data confirms our previous evidence and establishes the discovery of the top quark."

The DZero collaboration has discovered the top quark in an independent investigation. "The DZero observation of the top quark depends primarily on the number of events we have seen, but also on their characteristics," said Paul Grannis, who serves, with Hugh Montgomery, as DZero cospokesman. "Last year, we just did not have enough events to make a statement about the top quark's existence, but now, with a larger data sample, the signal is clear."

Physicists identify top quarks by the characteristic electronic signals they produce. However, other phenomena can sometimes mimic top quark signals. To claim a discovery, experimenters must observe enough top quark events to rule out any other source of the signals.

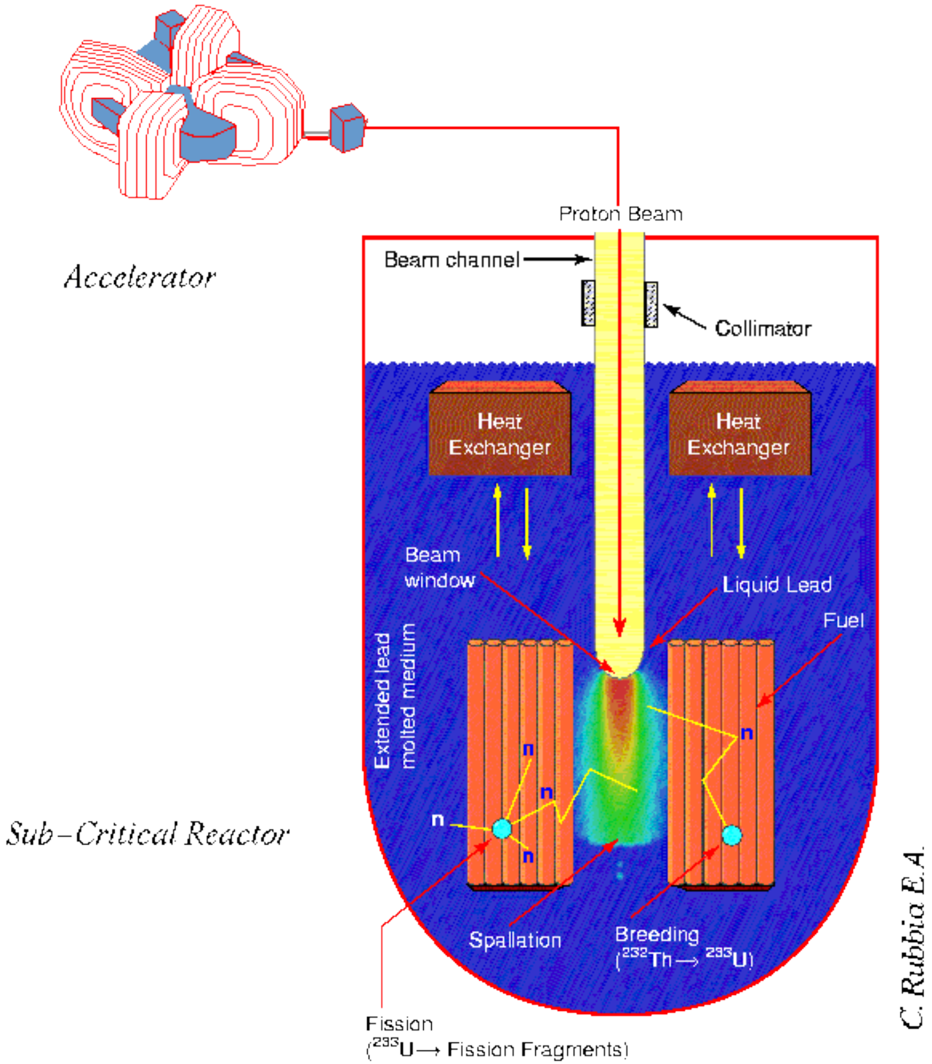
"This discovery serves as a powerful validation of federal support for science," said Secretary of Energy Hazel R. O'Leary. "Using one of the world's most powerful research tools, scientists at Fermilab have made yet another major contribution to human understanding of the fundamentals of the universe."

The Department of Energy, the primary steward of U.S. high-energy physics, provided the majority of funding for the research. The Italian Institute for Nuclear Physics and the Japanese Ministry of Education, Science and Culture made major contributions to CDF. Support for DZero came from Russia, France, India, and Brazil. The National Science Foundation contributed to both collaborations. Collaborators include scientists from Brazil, Canada, Colombia, France, India, Italy, Japan, Korea, Mexico, Poland, Russia, Taiwan, and the U.S.

"The discovery of the top quark is a great achievement for the collaborations," said Fermilab Director John Peoples, "and also for the men and women of Fermilab who imagined, then built, and now operate the Tevatron accelerator. We have much to learn about the top quark, and more of nature's best-kept secrets to explore. We look forward to beginning a new era of research with the Tevatron, making the best use of the world's highest-energy collider."

Fermilab, 30 miles west of Chicago, is a high-energy physics laboratory operated by Universities Research Association, Inc. under contract with the U.S. Department of Energy.

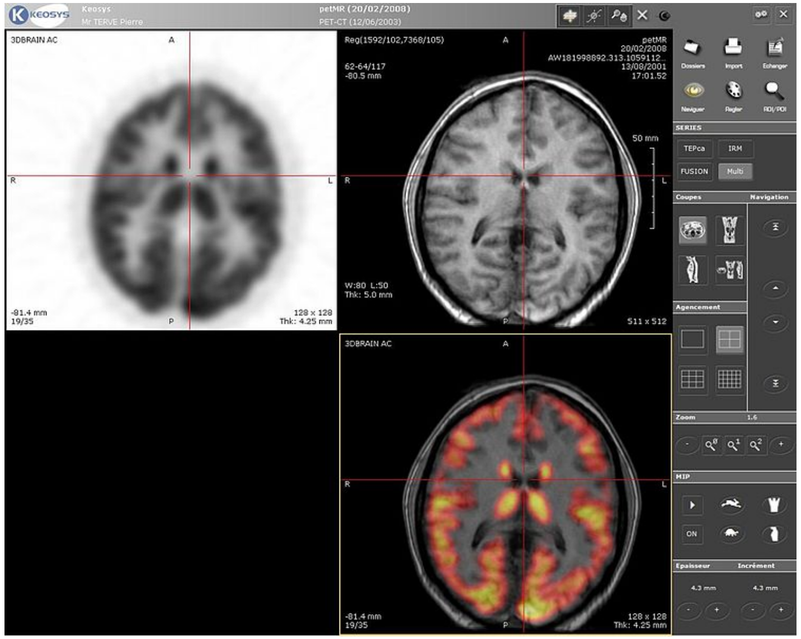
1997: Accelerator Driven Systems



1993: US cancels the SSC project

1994: CERN Council approves LHC...
SSC was gone, but it shaped the LHC.
CERN embraces US, Japan, others… LHC becomes a global

PET instalment three: APDs

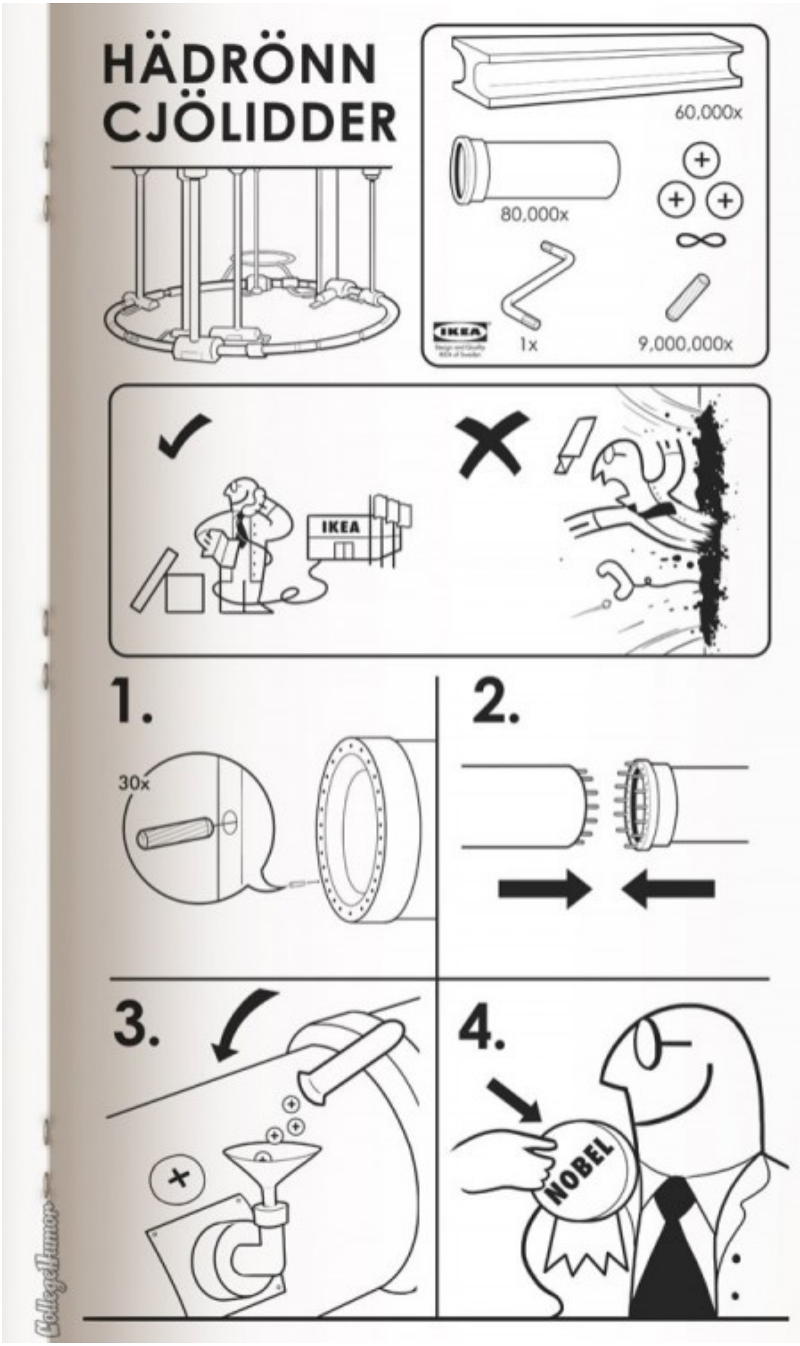


2000: The end of LEP

2 November 2000: Steve Myers pulls the plug

2003: Fear and loathing… are they going to end the world?


TCR 10:54:33:24



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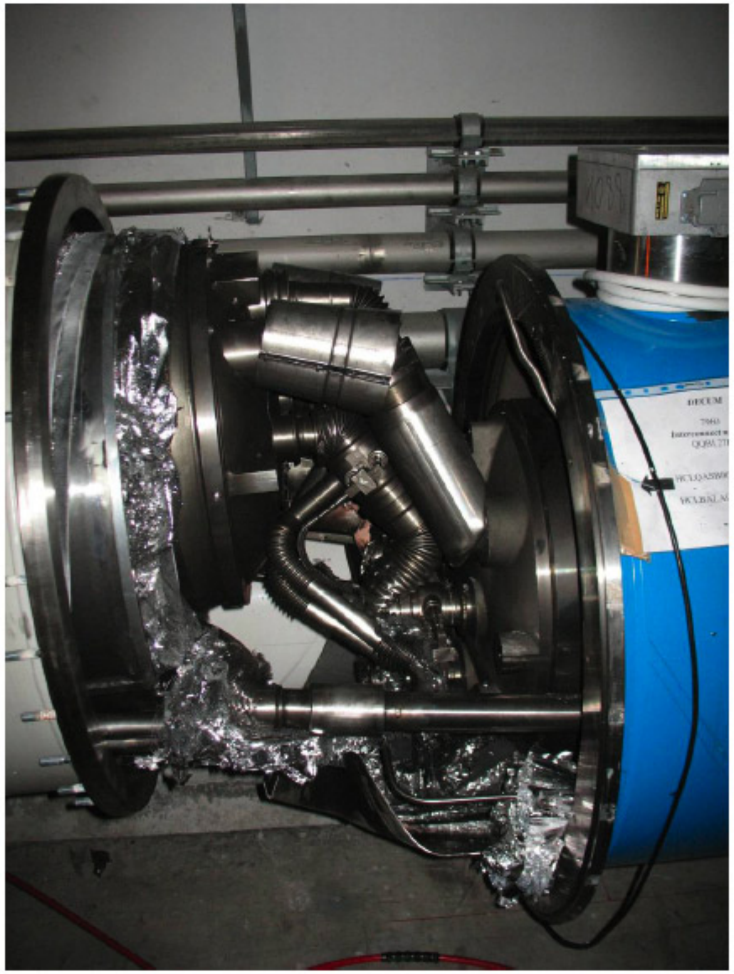
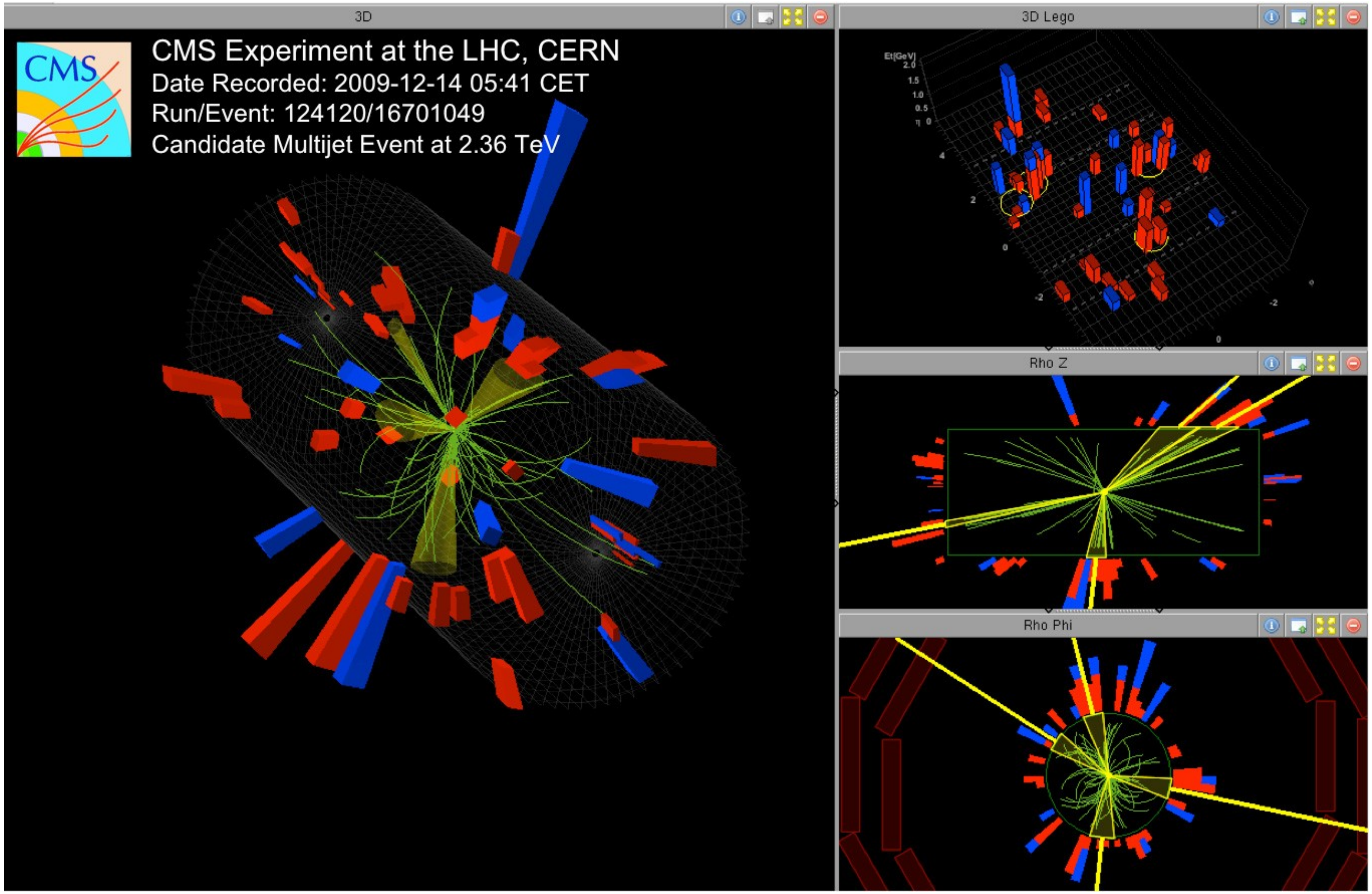
2008: First beam

2008: Breakdown



2009: First collisions



2010: The LHC overtakes the Tevatron
High energy running begins

- LHC starts running at 3.5 TeV per beam
- Soon recording data far faster than the Tevatron

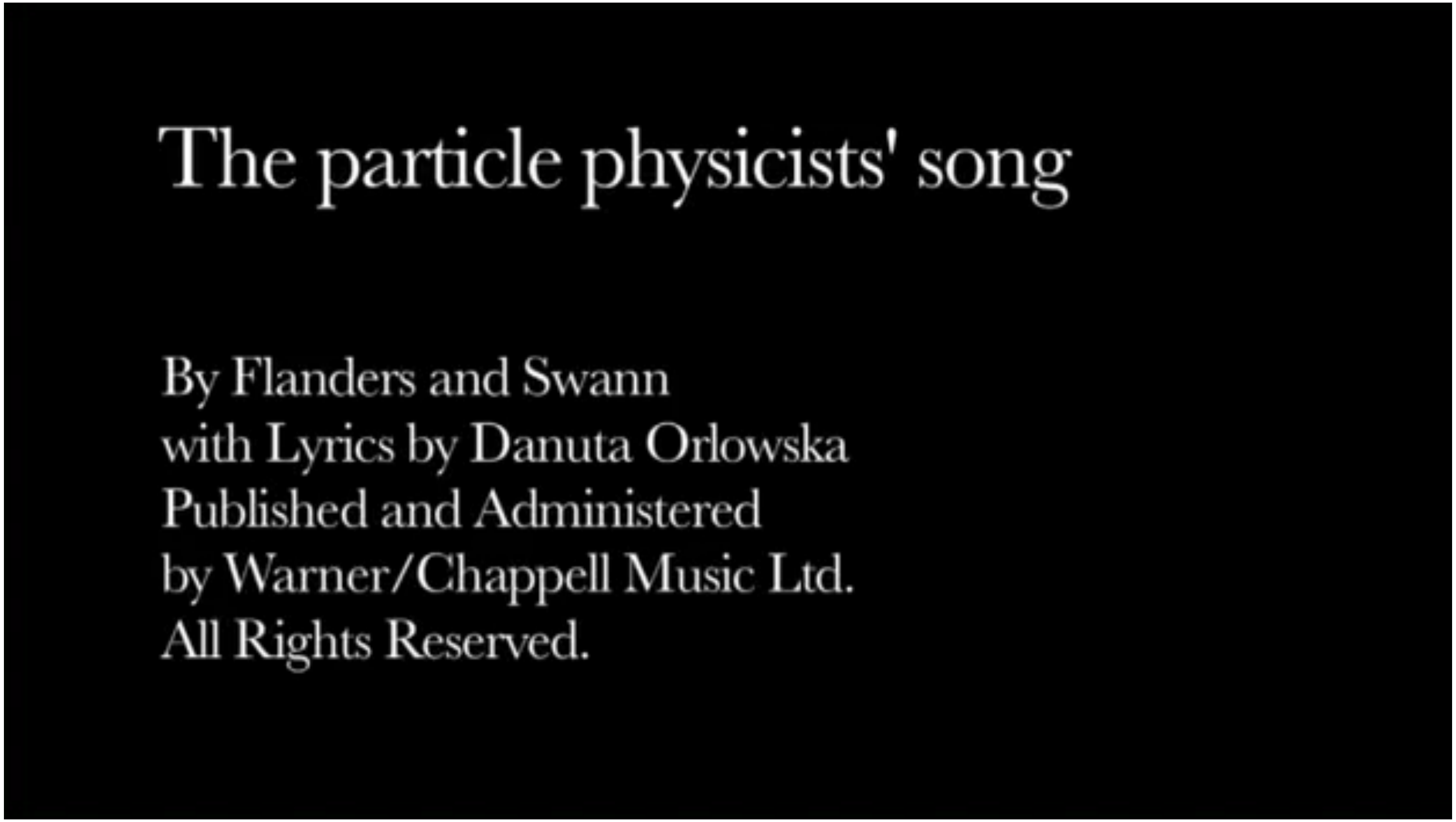
2010: Opening to the world…

16 September 2011: Israel becomes associate member of CERN

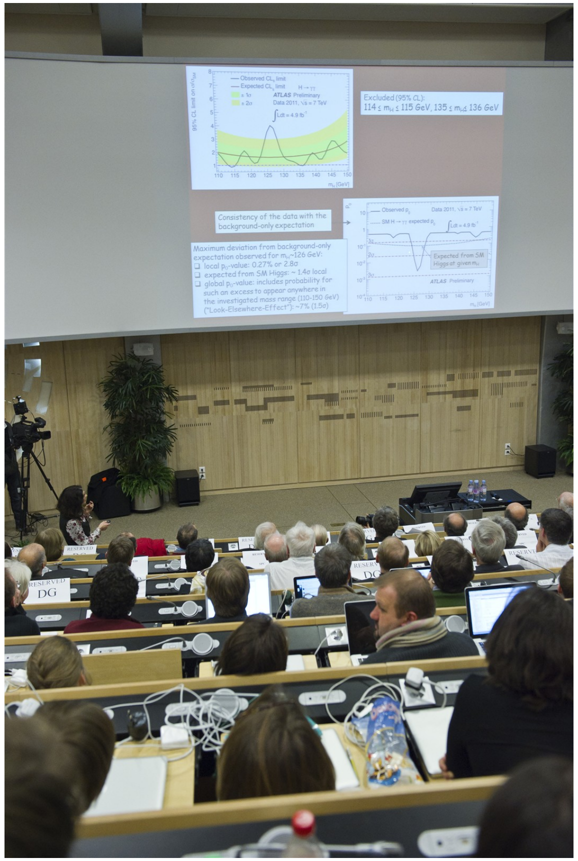
CERN

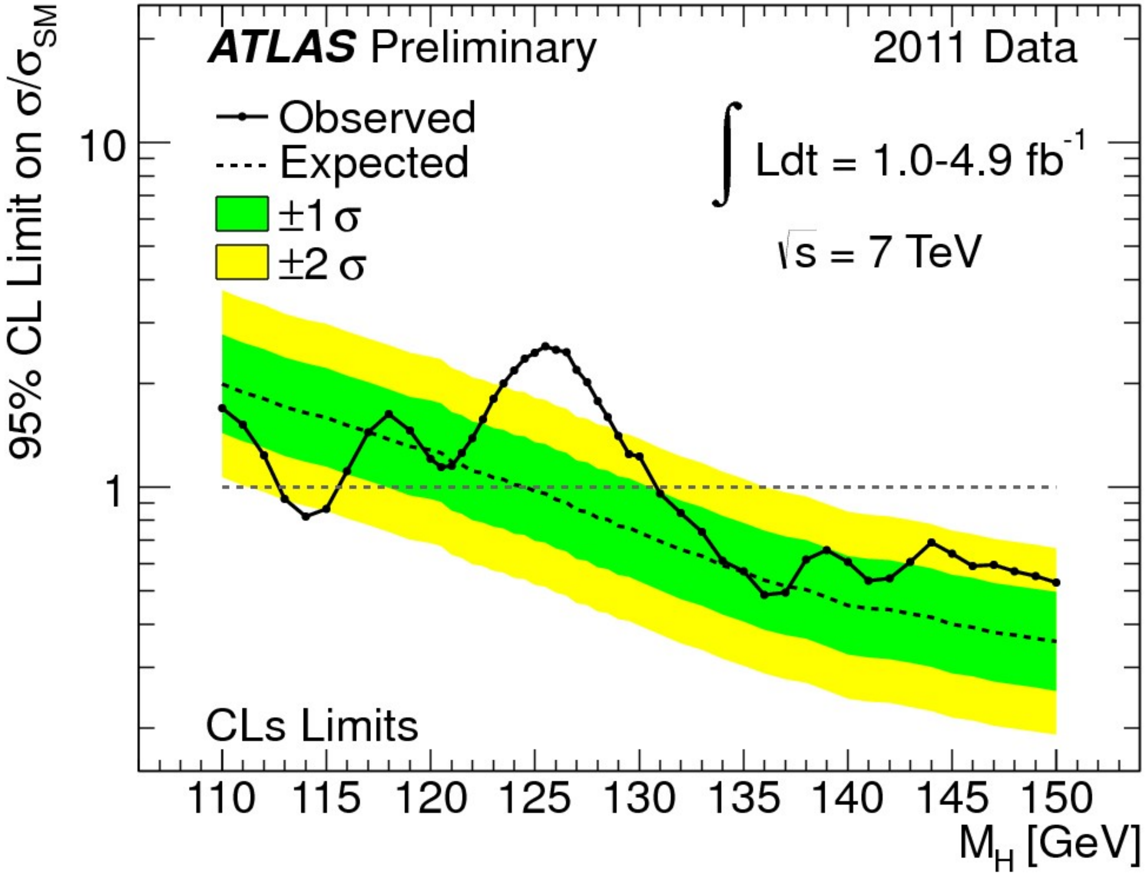
Exploring the frontiers of knowledge
Explorer les frontières du savoir

2010: Flanders and Swann…



2011: Hints of Higgs





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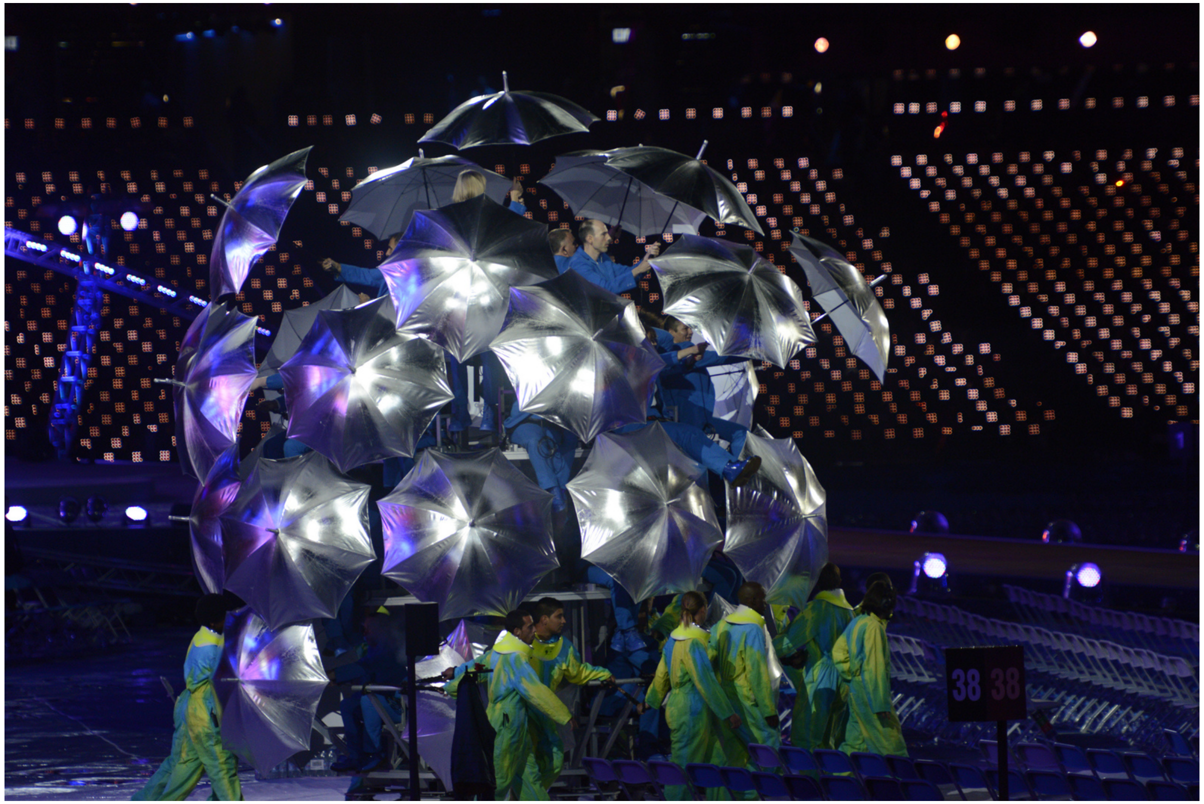
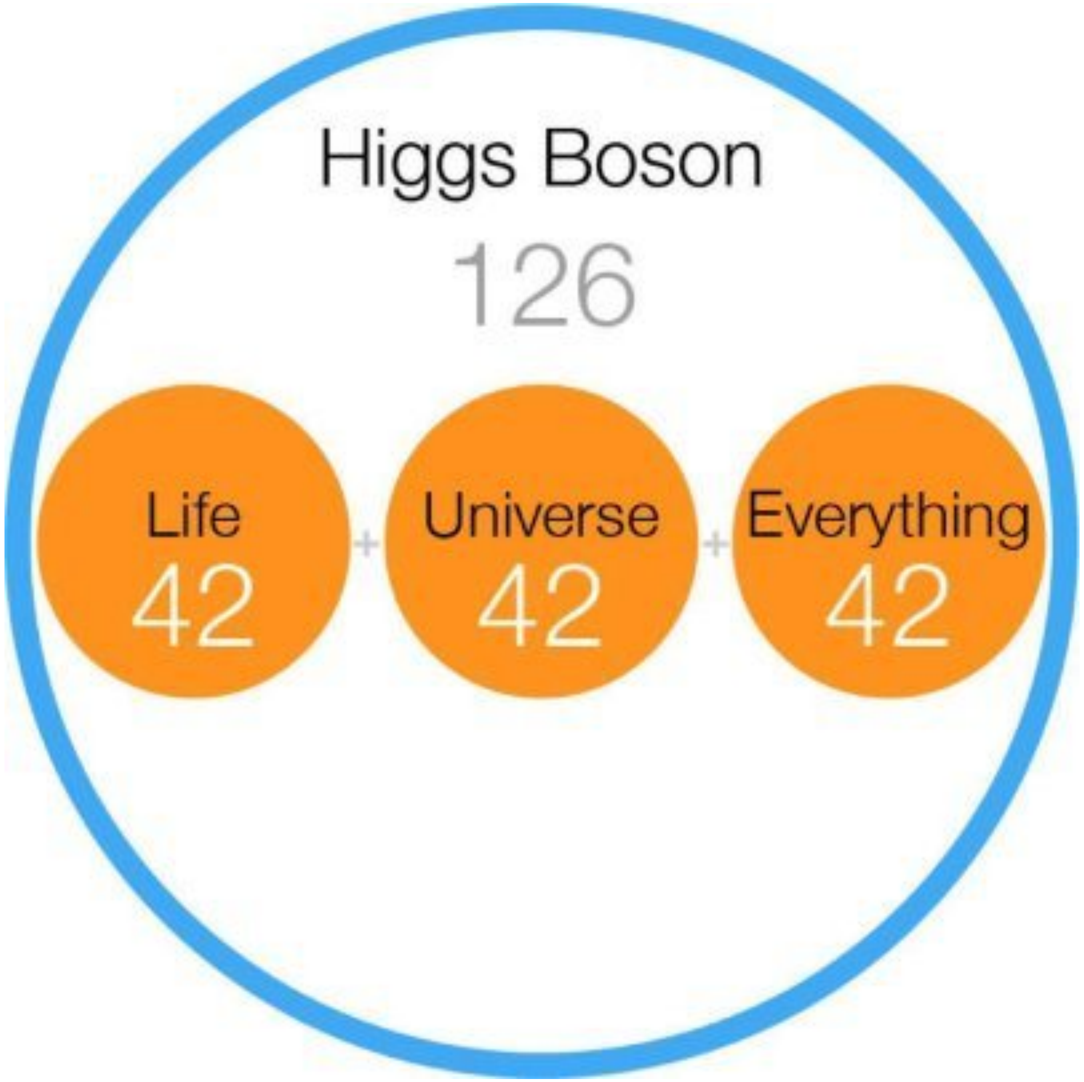
2012: A discovery!



'The Large Hadron Collider at CERN is the largest most complex machine in the world, possibly the universe. By smashing particles together at enormous energies, it recreates the conditions of the Big Bang. The recent discovery of what looks like the "Higgs particle" is a triumph of human endeavour and international collaboration. It will change our perception of the world and has the potential to offer insights into a complete theory of everything.'

Stephen Hawking

2012: Final word from the Tevatron



What next?

2013: LS1
2015: High energy running
~2018: LS2
~2020: High luminosity running
~2025-30: LHC closes

2020s: Linear collider in Japan?
Later: LEP3? CLIC? VLHC?

The physics will tell us where to go…

Open Sesame?

Middle East

X-ray Source Produces a Glimmer of Hope

What do you do with a secondhand synchrotron? Two physicists had the idea of making it a gift to the troubled Middle East, where a home for it is now rapidly taking shape

Allan, Jordan—The tawny hills around this village 30 kilometers north of Amman are fringed with pine, olive, and oak trees. Here, among shepherd boys tending sheep and goats, an unlikely building is taking shape. It will soon house one of the most advanced scientific instruments in the region, a synchrotron light source called SESAME, which is designed to allow researchers from across the Middle East to probe the shapes of proteins and the atomic structure of new materials.

The project, which began when physicists rescued a Berlin synchrotron from the scrap yard in 1997, seemed far-fetched to some but is fast becoming a reality. In April, SESAME (Synchrotron Light for Experimental Science and Applications in the Middle East) became a self-governing UNESCO organization when Israel joined Jordan, Egypt, Turkey, Bahrain, and Pakistan as the sixth official member. Two more, the Palestinian Authority and Iran, are in the process of joining.

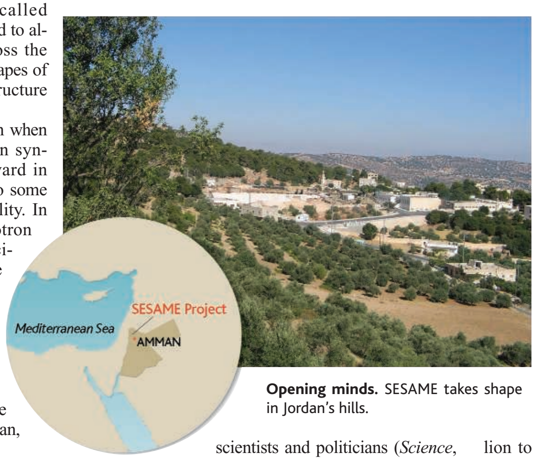
At the building site, donated by Jordan's government, the foundations are laid and walls are starting to rise. And last month, more than 90 scientists gathered in Turkey for SESAME's latest users' meeting to discuss the research they hope to do once the machine comes on line.

A synchrotron light source is a particle accelerator that propels electrons in a circle at close to the speed of light. The electrons give off intense beams of ultraviolet and x-ray light as they curve around the ring, and researchers

knife in my heart," he says. BESSY I had been a groundbreaking machine, he adds, "and it was still in huge overdemand."

Winick wondered if it couldn't be reassembled somewhere else, with a few updates and modifications. His proposal quickly gained support from European and Middle Eastern scientists and politicians (*Science*, 25 June 1999, p. 2077). In the hopeful days following the Oslo accords between Israel and the Palestinians, supporters argued that the machine would not only aid scientific development but also enable scientists to work together and build personal ties. Germany quickly agreed to donate the disassembled BESSY I, and in 2000, delegates from participating countries chose the Jordanian site.

Not everyone was convinced it would work. "I am one of the people who thought the project would never get off the ground,"



Opening minds. SESAME takes shape in Jordan's hills.

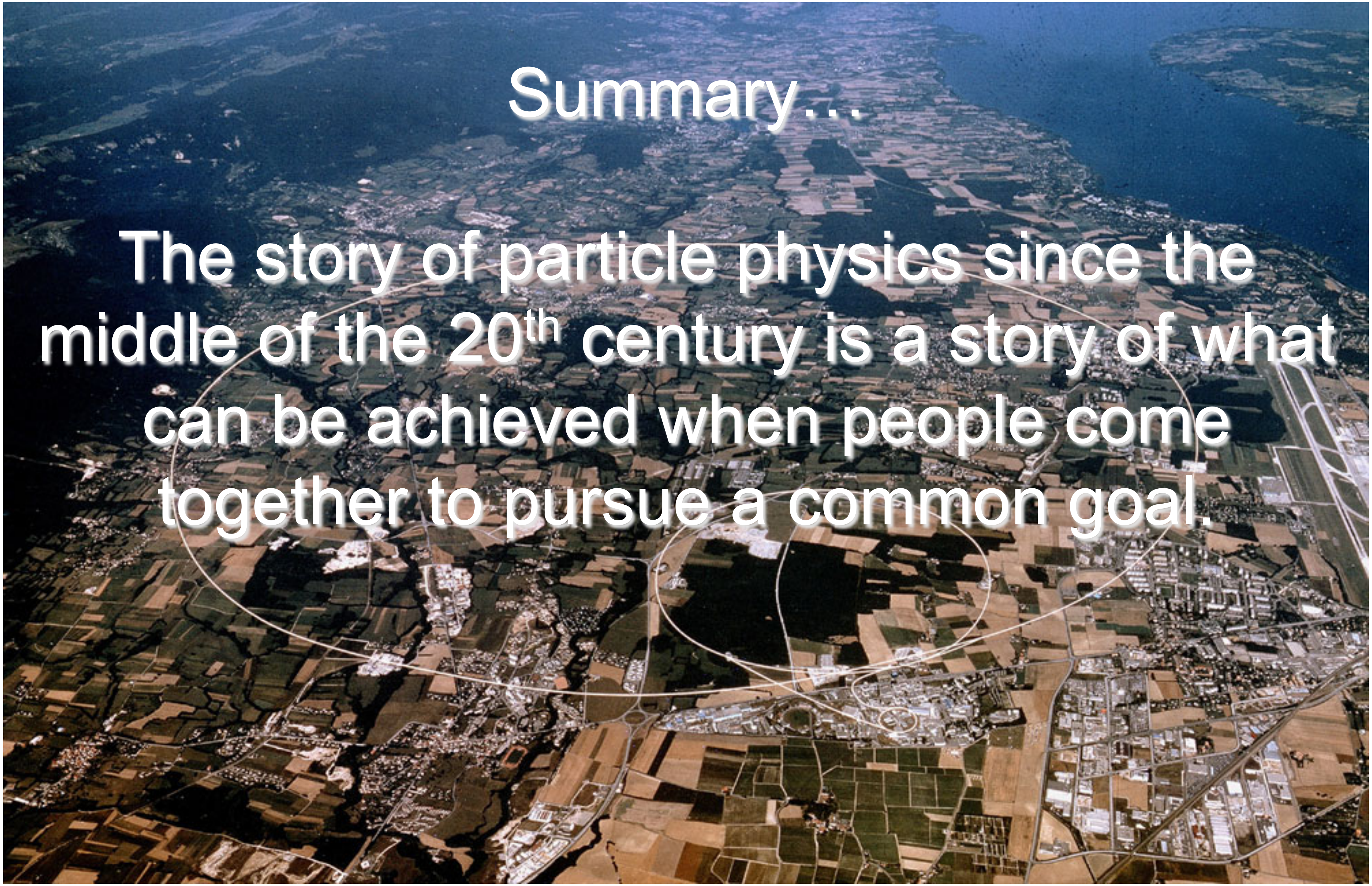
former director of the CERN particle physics lab near Geneva, Switzerland, and UNESCO's Maurizio Iaccarino, who were touring the region to build support for SESAME. "As soon as the meeting was finished, the king asked me to prepare a letter [requesting to join] on the spot," says Khaled Toukan, Jordan's research and education minister, who serves as the acting director of SESAME.

The Allan site in Jordan also had a geographical advantage. Scientists in Istanbul can reach Amman in a 2-hour flight, Sayers notes. And, in theory, it's a 2-hour drive for scientists from Israel and the West Bank. But Israel's current military crackdown has brought long waits at checkpoints, and that 70-kilometer trip can take more than 6 hours now. The Israeli and Jordanian governments have promised to streamline travel for SESAME users, says Moshe Deutsch of Bar Ilan University in Ramat Gan, Israel.

SESAME's main challenge now is to secure promised funding from the European Union. Member countries' contributions cover the day-to-day costs, but updating the machine requires outside funds. The E.U. has promised $12 million to upgrade the synchrotron from 0.8 to 2.5 GeV, but bureaucratic delays are holding up the final agreement. Once the E.U. money comes through, supporters hope that the United States and Japan will pitch in on the estimated $10 million to $15 million needed to build beamlines, the equipment that aims and focuses the x-rays onto the experiments.

Although SESAME won't produce its first x-rays until 2008, it is already fulfilling part of its mission, Sayers says. The project has sent more than two dozen scientists from the region to train at existing synchrotron sources. That effort has been a bit too successful, she adds: "The places [where] they were working have all offered them permanent jobs."

And, despite the dramatic increase in violence in the region, participants say


Summary…
The story of particle physics since the middle of the 20th century is a story of what can be achieved when people come together to pursue a common goal.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