



Overview of the Education and Technology Transfer activities at CERN

J. A. Rubio



Technology Transfer Activities

The European Particle Physics community (CERN) has always done Technology Transfer

Mainly through:

Training of personnel

Procurements

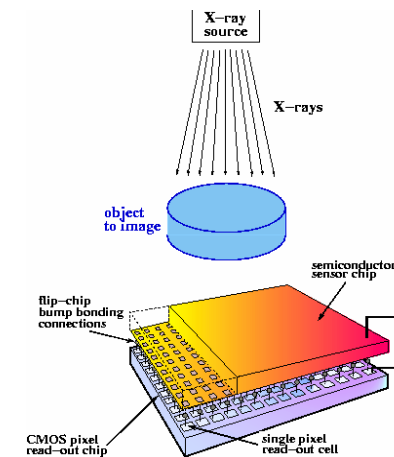
Collaborative agreements for High Tech equipment prototypes

CERN wide domains:

Accelerator

Detector

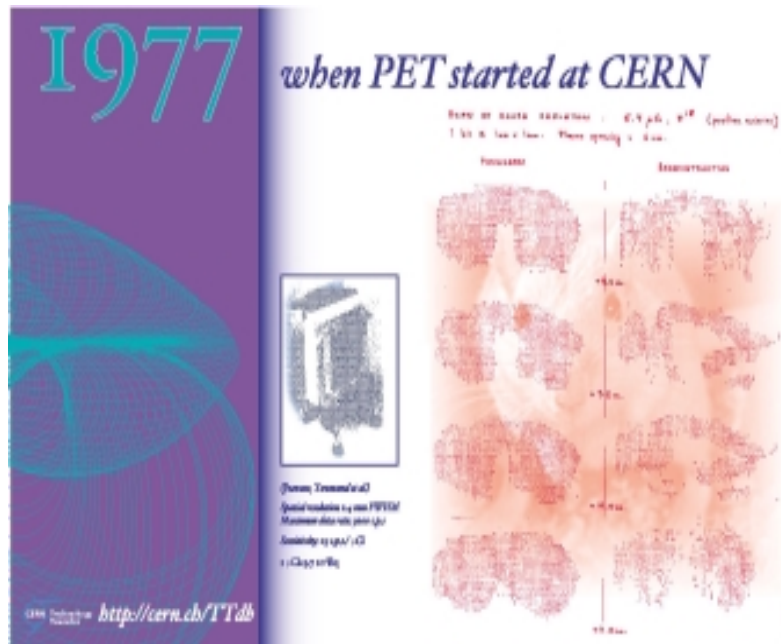
Information technologies





Society requires to get social benefits from scientific developments

However:



“I believe with Schopenhauer that one of the strongest motives that leads men to art and science is escape from everyday life with its painful crudity and hopeless dreariness, from the fetters of one’s own ever shifting desires”.

Albert Einstein

“The interaction between technology and science is not a one-way street from basic to applied work, but flows in both directions, from technology to science and science to technology”

Ch. Townes



Accelerators in the World

Category

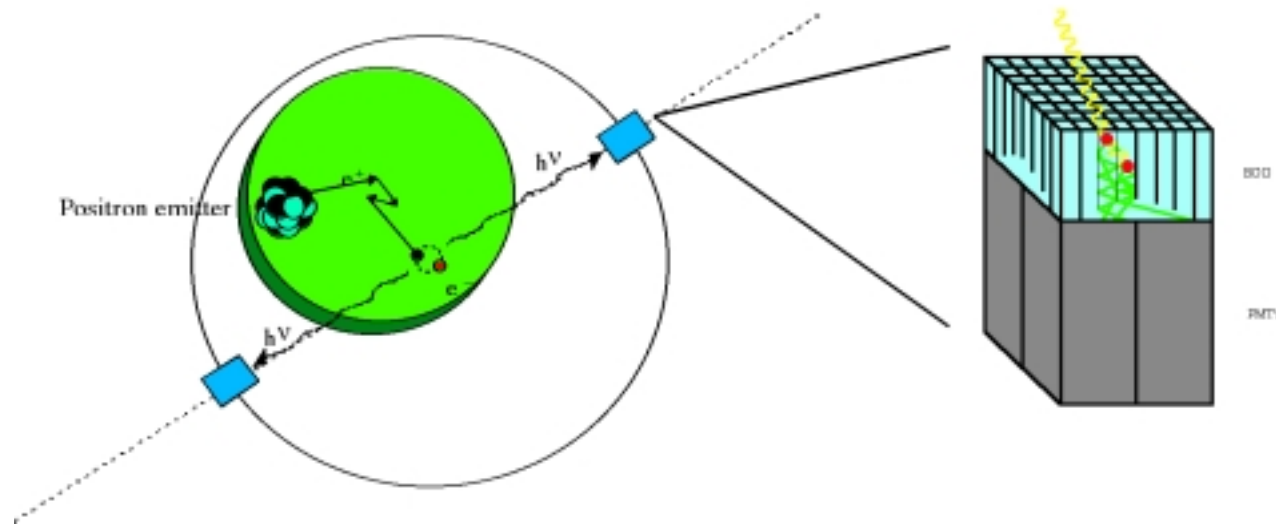
Number in use

Ion implanters and surface modification	~ 7000
Accelerators in industry	> 1500
Accelerators in non-nuclear research	~ 1000
Radiotherapy	> 5000
Medical radioisotope production	~ 200
Hadrontherapy	~ 20
Synchrotron radiation sources	~ 70
NP and HEP research accelerators	~ 110
Total	~ 15000



Detectors: Medical Imaging

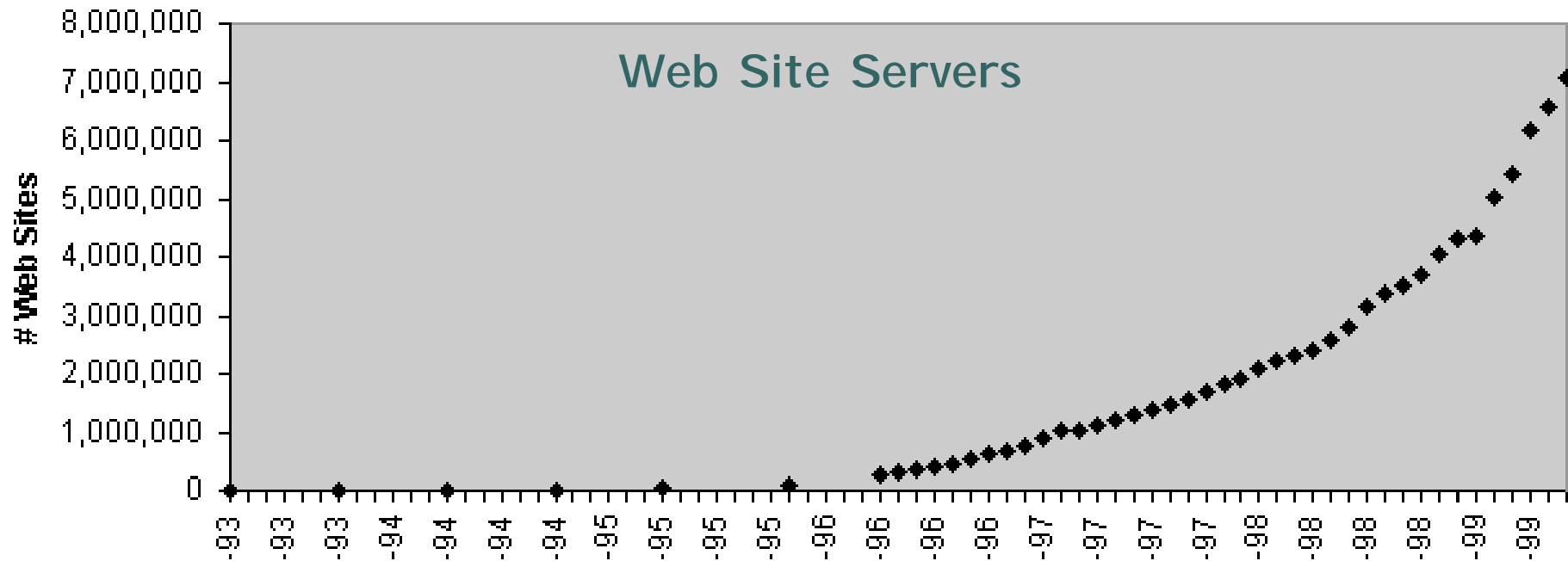
Working principle of a PET scanner:





Information Technologies: the Web

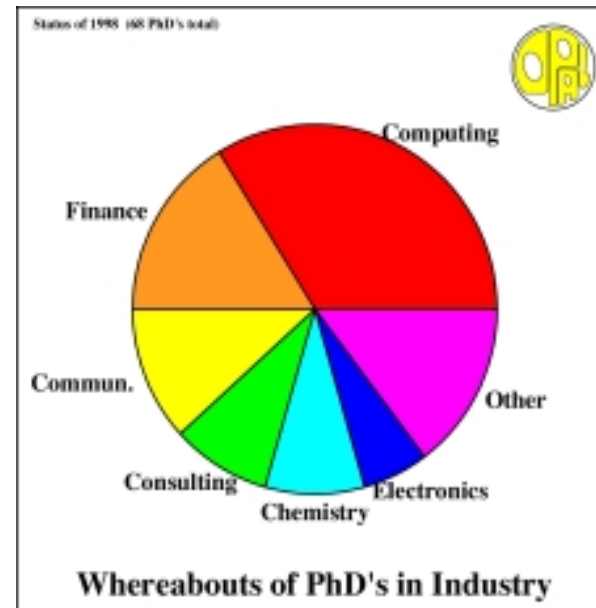
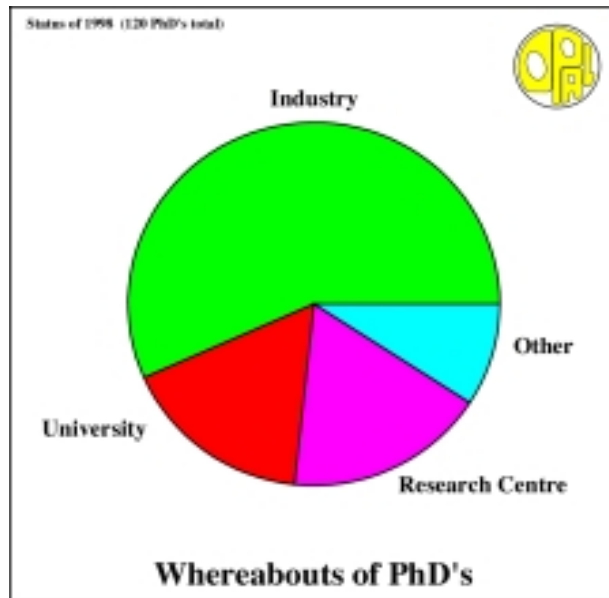
- Invented at CERN in 1989 as application layer on top of the internet infrastructure
- Development started in Europe (small) and US (big, >50 computer scientists initially for MOSAIC)
- 80% of the most visited sites: US, <10% Europe





“Classical” technology Transfer activities

TT Through training of personnel



Under study



“Classical” technology Transfer activities

TT Through procurements and collaborative agreements

M. Streit Banchi, E. Autio et al.

Procurements 1997-2001:

6806 Companies ----- 2128 MCHF

649 High Tech (10 %)----- 54 %

154 Companies responded to the survey -- 498 MCHF



“Classical” Technology Transfer activities

Summary

38% developed new products

13% started new R&D teams

42% increased their international exposure

44% indicated technological learning

36% indicated market learning

52% would have had poorer sales performance without
CERN

41% would have had poorer technological performance

**Benefits were correlated with “flexible technical
specifications” for the call for tenders**

Partnership

It might bring new perspectives for procurements



Technology Transfer Activities

Proactive policy

1999:

Basis for TT policy

Focus on IPR, licensing and TT projects

Aim: to broaden the scope of TT at CERN



2002:

Aim: enlarge the framework of TT Activities

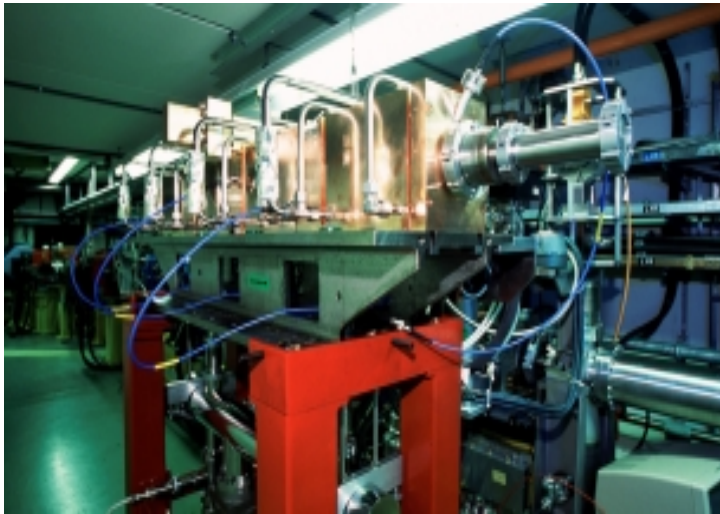
Results based on three years of TT experience at CERN





"For centuries, the relations between science and society have been governed by a tacit bargain. Scientists generally want to make discoveries that are universal or beautiful or fundamental, whether or not they can foresee any specific benefit for society...

... Society has generally been willing to support work in pure science mostly because it expects that will yield applications.



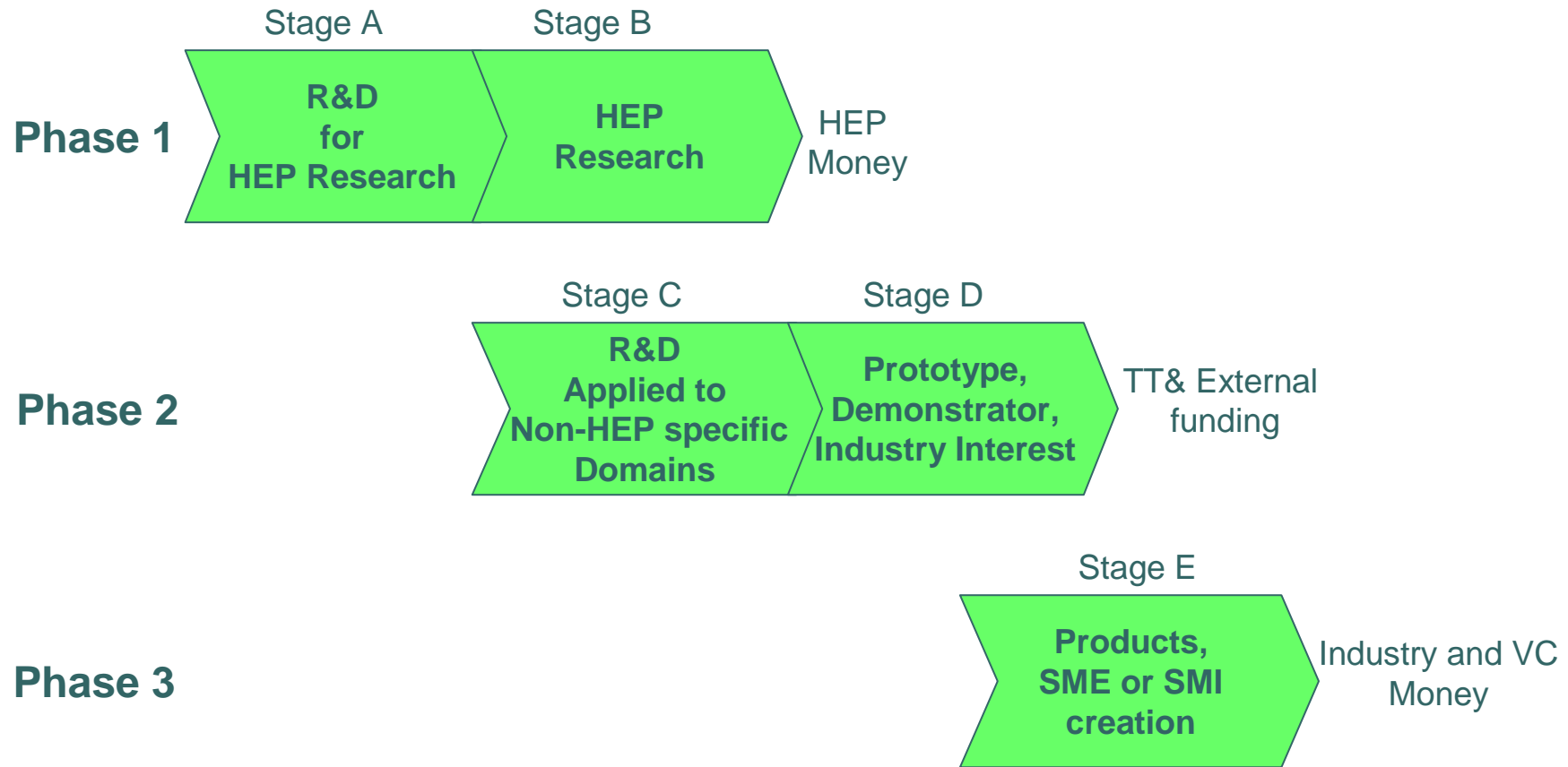
This expectations has generally proved correct...but now this bargain seems to be unraveling...

... the trouble that the Super Collider has faced in Congress is just one symptom of the disenchantment with pure science.

Stephen Weinberg



Stages in development of technologies and projects





The TT Database

<http://cern.ch/ttdb>

The screenshot shows the Technology Transfer Services Home Page in Microsoft Internet Explorer. The browser title is "Technology Transfer Services: Home Page - Microsoft Internet Explorer provided by CERN". The address bar shows "http://dbnetra01.cern.ch:9000/aislogin/pls/ttdatabase/display.main". The page features a navigation menu on the left, a main content area with sections for "CERN developed Technologies", "Projects related to TT activities", "Protected Inventions", and "News and seminars", and a "HOT TOPICS" sidebar on the right. The main content area also includes a "How Technology Transfer is organized at CERN?" section and a "Disclaimers" section.

Technology Transfer
Intellectual Property Rights

CERN developed Technologies
Technologies developed at CERN in different domains: Electronics, Mechanics, Software, Accelerators, Vacuum e.t.c.

Projects related to TT activities
Projects with high potential for industrial applications: Medical, Electronics, accelerators etc. They are supported by TT funds.

Protected Inventions
Some of the inventions discovered at CERN are protected by patents, mainly to the interest of the industry in the MS of CERN.

News and seminars
Upcoming events: seminars, presentations, conferences related to TT matters and News from TT like success stories etc.

How Technology Transfer is organized at CERN?
[Guidelines for inventors, authors ...](#)

Use the menu on the left part of the browser to navigate the TT web pages with public access. Use our login system to get more privileges.

Disclaimers
This web site contains information about technologies, projects, protected inventions, contacts and other matters that are only related to TT matter. The information made available within this web site may be not complete.

For more information on any TT matter, please, contact the [Technology Transfer Service](#)

HOT TOPICS

ChemicalVia
It is a new method, patented by CERN, to make microvias on high-density printed multilayer circuits of different types, such as Sequential Build-Up (SBU), High Density Interconnected (HDI), or laminated Multi-Chip ...

FPARC/CERN Knowledge Transfer
FPARC has launched an enhanced Knowledge/Technology Transfer initiative with CERN and will be exhibiting at "Britain at CERN' 11 - 14 November 2002.

TT 2002 - Competing in the Knowledge Economy
Technology Transfer and Innovation UK
10-12 July 2002
[View](#)



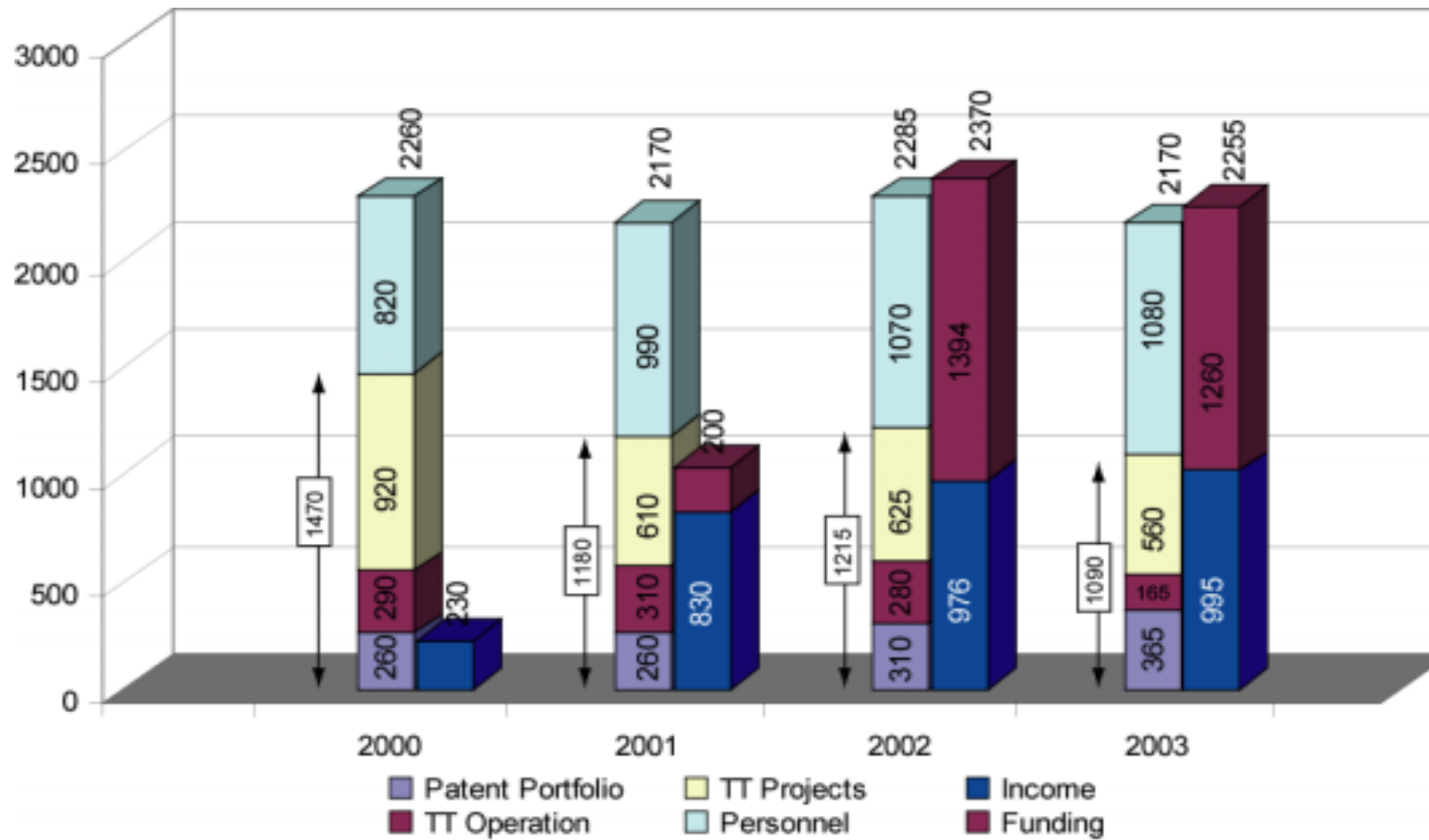
Summary of TT

- 160** Technologies inventoried in the **database**
- 82** Technology Transfer cases treated in 2003 (**19 generated in 2003**)
- 22** Patents by end 2003 (**4 more in the process of filing**)
- 60 % of patented technologies are licensed or used in partnership agreements**
- 62** Licenses by the end of 2002 (**14 in 2003**).
- 35** Licenses involving revenue for CERN at the end of 2003
- 7** Start-ups promoted. **5 being successful**
- 28 partnership agreements (10 in 2003)**
- 8 service contracts in 2003**
- 8 consultancy agreements in 2003**
- 1 standardization vacuum devices case completed**

A number of expressions of interest to the EU FP6



TT Budget and Income





Example of Licensing (stage E)

Pumping Device by Non Vaporisable Getter and method to use it



- The getter material is coated on all internal surfaces of a vacuum chamber and its activation is carried out passively during the standard bakeout procedure.

- **Applications:** for chambers, vacuum components, to improve the performance of existing pumps or to create pumps of innovative design; microelectronics, vacuum thermal insulation, flat screen displays, Cathode Ray Tubes, energy transportation, energy generation, etc

Licensed for vacuum chambers, vacuum Components and sputter-ion pumps.

Few companies



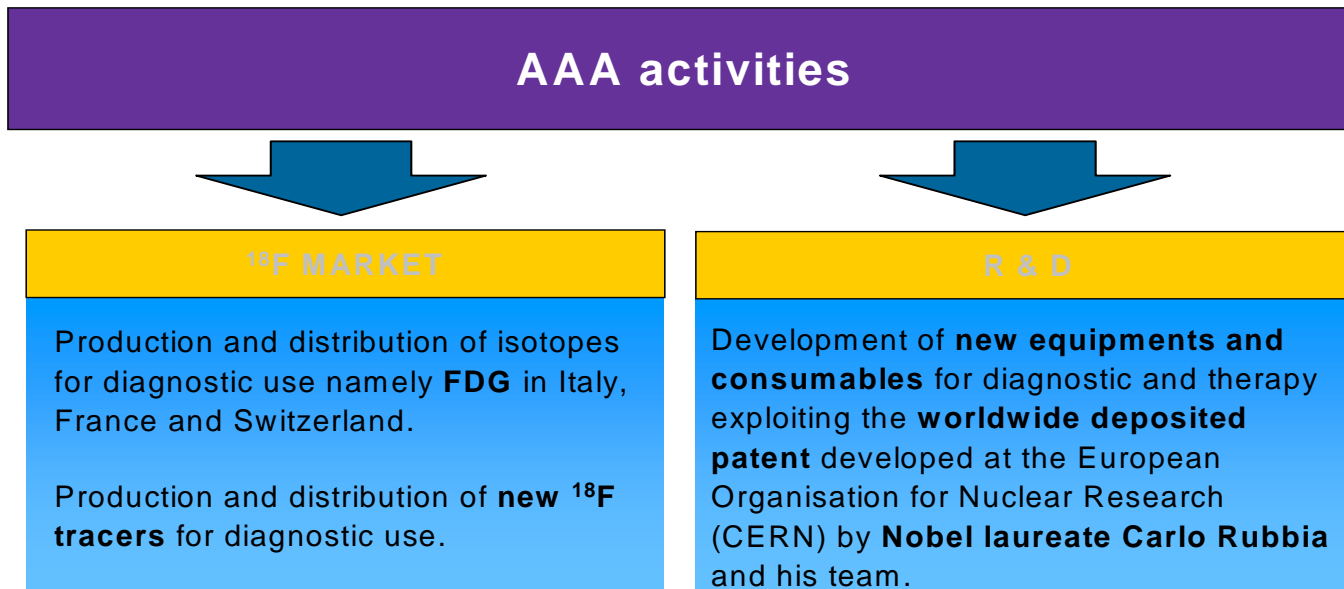
Example of Partnership (stage D) Start-up



Advanced
Accelerator
Applications

AAA Laboratory for radiopharmaceutical production

AAA is a CERN spin-off addressing the **fast growing demand of medical isotopes** using **CERN proprietary technology** and **AAA management know-how** in the production of **PET isotopes**.



by courtesy of S. Buono

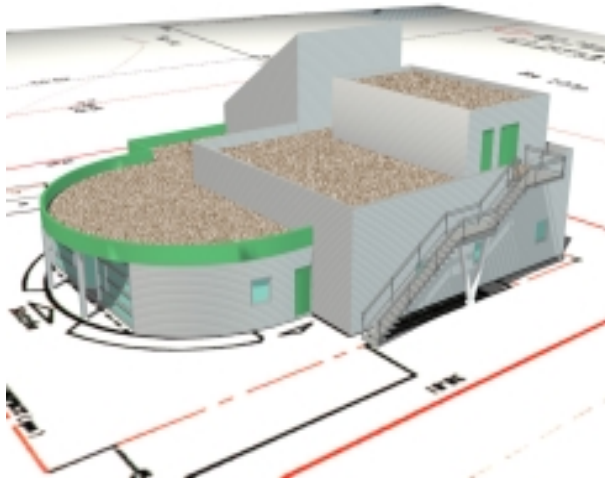


Example of Partnership (stage D) Start-up



Advanced
Accelerator
Applications

AAA is currently **building** a
radio-pharmaceutical
laboratory in St. Genis
Technoparc (France-01)



AAA laboratory



The laboratory will be equipped with a
particle accelerator (**Cyclotron**), **hot
cells** and a **GMP clean room** for the
production of radiopharmaceuticals.

by courtesy of S. Buono

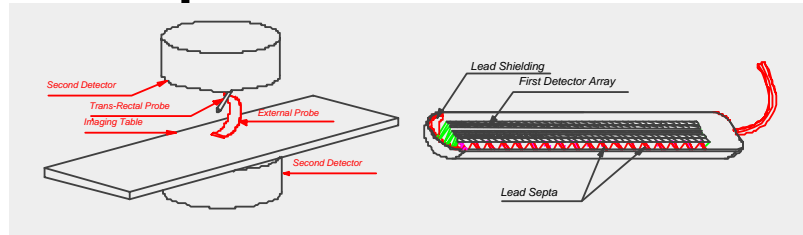


EuroMedIm objectives

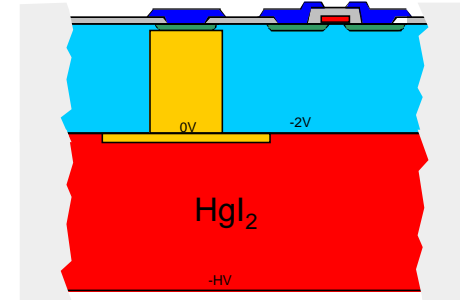
- Bring together several centers of excellence already involved in generic technological developments, nuclear medicine instrumentation and molecular imaging activities.
- Organize them around **Joint Research, Integration and Dissemination Activities.**



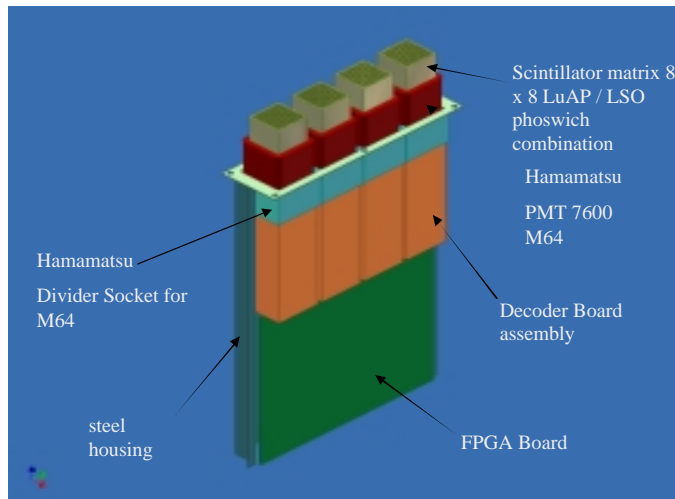
EuroMedIm technologies



Detection based on Compton Scattering

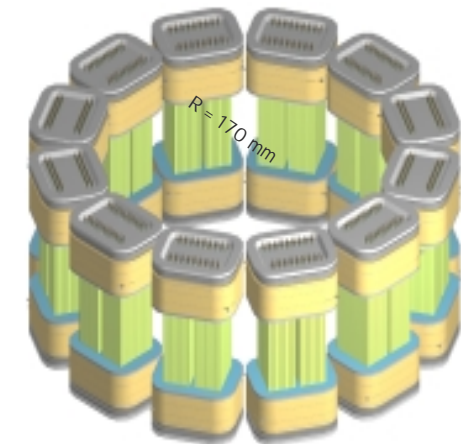


Active Pixel Sensors +
converting material deposition



Crystal + photodetector technology

HPDs



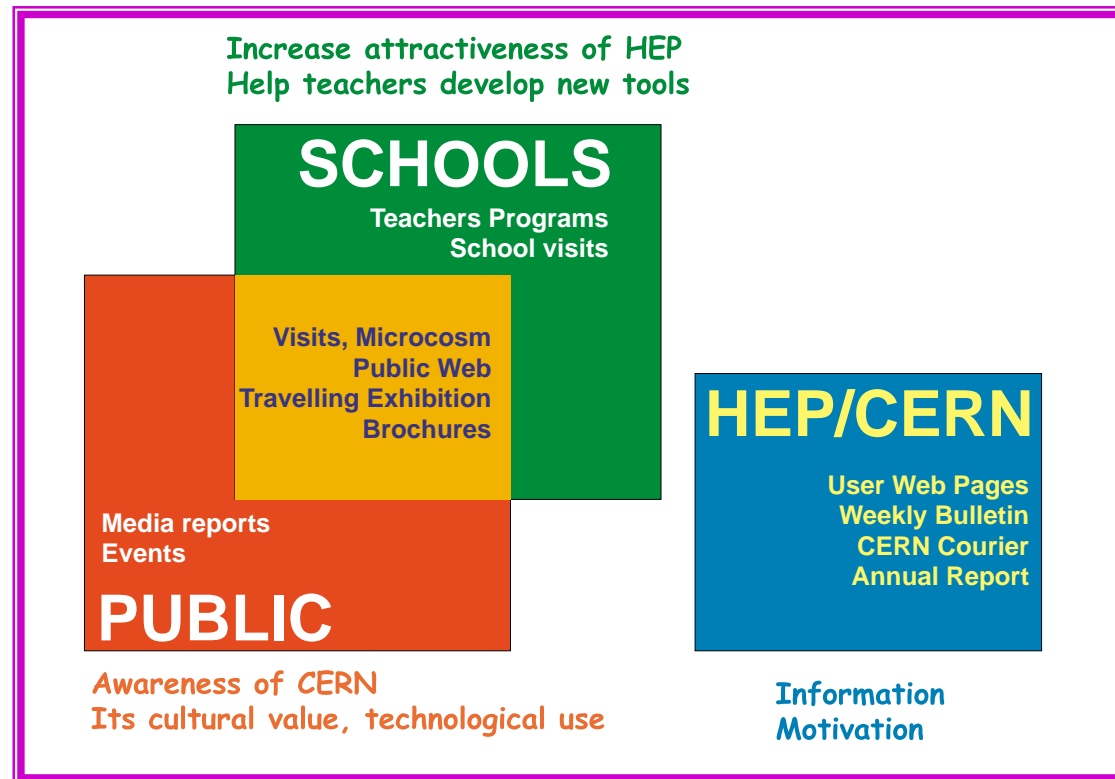


Education and Communication

General Public: Increase the level of awareness of CERN, its cultural value and the usefulness of its technology

Schools: Help teachers to create interest for science and particle physics

HEP: Inform and motivate CERN staff and users





General Public

Press Office

300-400 journalists/yr.

Press, radio, TV, Interviews -
Documentaries

<http://info.web.cern.ch/info/Press/>



Travelling Exhibition

150,000 visitors / yr.

Off the road in 2003 for refurbishment

Public Web Pages

200,000 visitors / yr.

Guided CERN Tour for
non-scientists, Kids
pages, Educational
resources for teachers

<http://www.cern.ch>





General Public - Visitors

Guided Tours

20,000 visitors/yr.

Reception + Organization of Visits +
Guides

<http://public.web.cern.ch/public/visit/visit.htm>



Microcosm

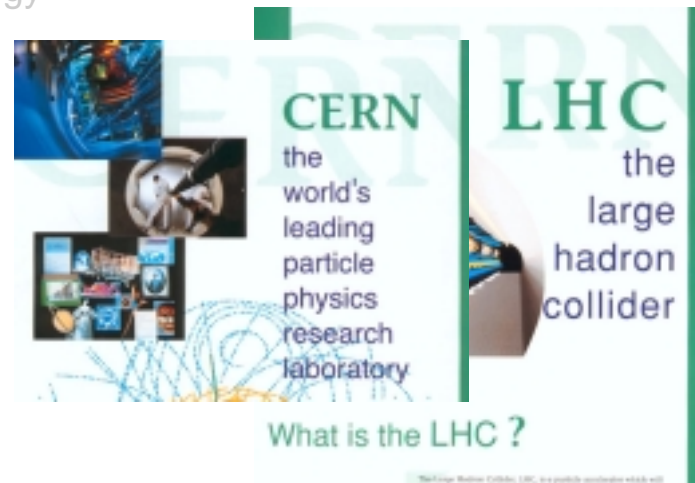
30,000 visitors / yr.

Permanent exhibition on CERN's research and technology

Brochures

100,000 copies / yr.

General information on CERN,
LHC machine, Experiments, Applications,
Safety
New series coming, starting this year





Events + Young Public

Special educational events

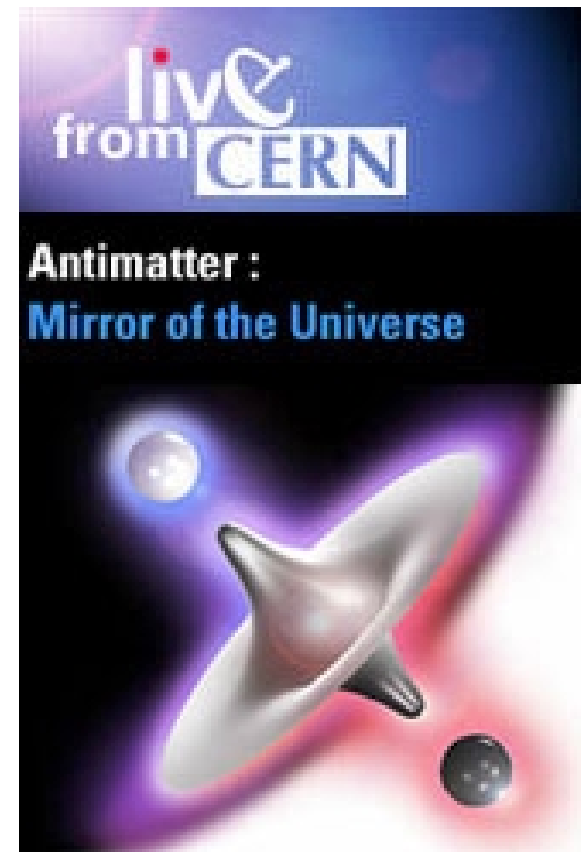
Enhancing the attraction of basic science, in collaboration with ESA, ESO, ESRF...



(Sponsored by European Union,)

9/3/2004 March 2004

Web-Casting “Live from CERN”



02/02/2004 TT - Presentation

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Teacher programmes

The screenshot shows the CERN Education Project website. At the top, there is a header with the CERN logo, the text "CERN Education Project", a globe icon, and language selection buttons for "Français" and "Español". Below the header is a "Spotlight on:" section featuring a "Newsletter" icon and a thumbnail of a newsletter. A main navigation menu on the left lists several options: "Teacher Programmes", "Newsletter for Teachers", "School Visits", "European Projects", "Microcosm for schools", "Practical Info & Contacts", and "About this site and the project". Below this menu is a link for "CERN Online Resources". At the bottom of the page, there is a yellow box with the text "*** NEWS ***" and "DECEMBER 2002: New".



for teaching

<http://visitservice.web.cern.ch/VisitsService/education/>



HEP Community and CERN staff

Weekly Bulletin
6500 copies/ week
<http://bulletin.cern.ch/>



bulletin



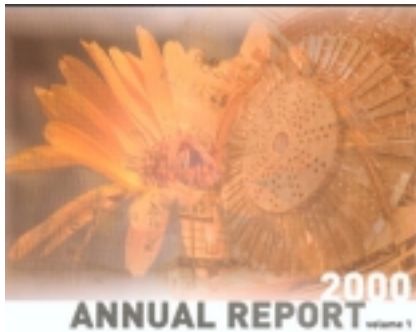
*Dernier délai pour soumission des articles : mardi 12.00 h.
Les articles du Bulletin se trouvent également sous
<http://Bulletin.cern.ch/News/>*

*Deadline for submission of articles : Tuesday 12.00 hr
Bulletin articles can also be found at
<http://Bulletin.cern.ch/News/>*

CERN Intranet
6 million visitors/year
<http://www.cern.ch/>



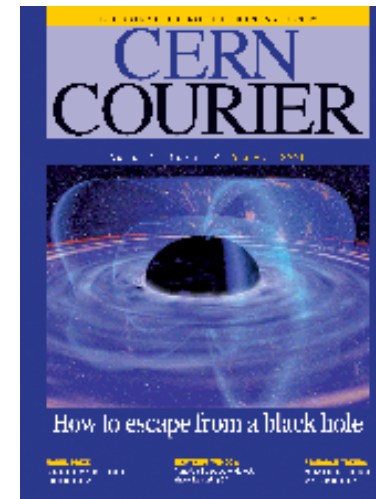
Annual Report



Yearly progress report
<http://publications.cern.ch/>

9/3/2004 March 2004

CERN Courier



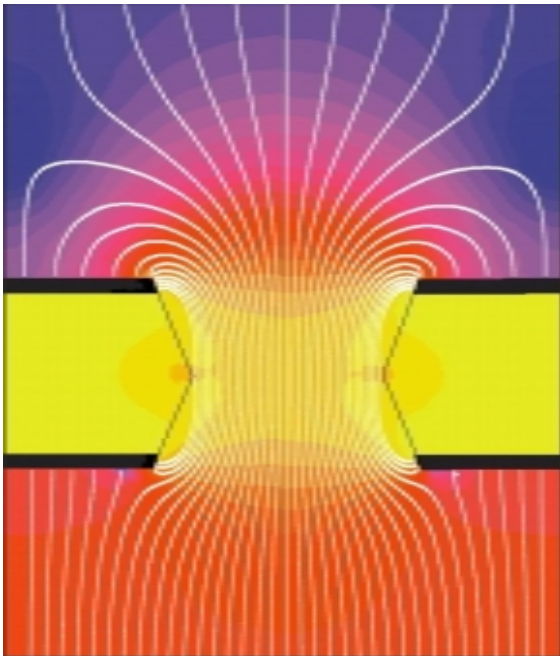
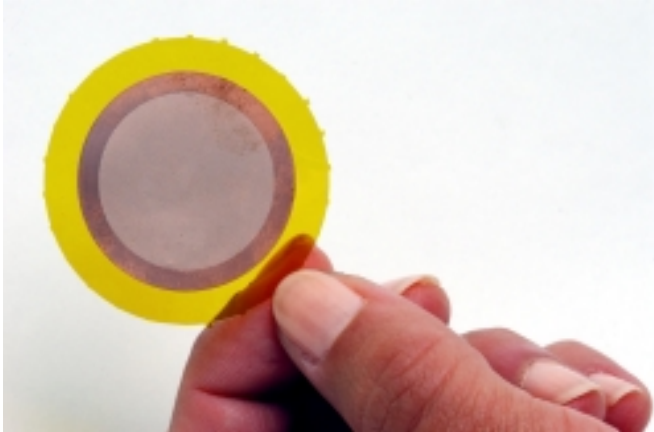
“The” journal of High Energy Physics
25,000 copies, 10 issues/year
World-wide distribution
<http://www.cerncourier.com>



New events...

→ les lundis découverte

 <p>MICROCOSM → la musée interactif du CERN</p>	<p>→ Le plus grand frigo du monde : la science du froid</p> <p>Lundi 5 mai</p>	<p>→ Les matériaux à la loupe de l'ultra-son et du microscope électronique</p> <p>Lundi 2 juin</p>
	<p>→ L'atome et la physique à l'échelle des premiers instants de l'univers</p> <p>Lundi 7 juillet</p>	<p>→ Bonnes vacances et rendez-vous à la rentrée</p> <p>août</p>
<p>Bienvenue, chaque 1^{er} lundi du mois aux lundis découverte (à partir du 5 mai 2003)</p> <p>Mettez la main à la pâte, écoutez, expérimentez, discutez, échangez, et vous découvrirez les sciences et les technologies qui se font au CERN. Nul besoin d'être spécialiste - chaque mois, une facette différente du CERN vous sera dévoilée dans une ambiance décontractée.</p> <p>Age conseillé, dès 12 ans Entrée libre et gratuite, sans réservation De 19h30 et jusqu'à 21h00</p> <p>Microcosm CERN, CH-1211 Genève, Suisse Bâtiment 33 (réception), Entrée A. Tél. +41 (0)22 767 9494 Fax: +41 (0)22 767 9710 visite.service@cern.ch</p>	<p>→ Des cristaux pour la médecine leurs propriétés comme les cristaux transparents centimètres</p> <p>Lundi 1^{er} septembre</p>	<p>→ L'alignement parfait : les tubes des géométries</p> <p>Lundi 5 octobre</p>
	<p>→ La vie du futur : un ordinateur à l'échelle de la planète</p> <p>Lundi 3 novembre</p>	<p>→ La pièce à l'œuvre : l'électronique à l'écoute des bruits de la matière</p> <p>Lundi 1^{er} décembre</p>
	<p>l'Hebdo</p>	
	<p> http://www.cern.ch/microcosm/</p>	



"We have arranged a global civilization in which most crucial elements profoundly depend on science and technology. We have also arranged things so that almost no one understands science and technology. This is a prescription for disaster. We might get away with it for a while, but sooner or later this combustible mixture of ignorance and power is going to blow up in our faces... "

Carl Sagan



There is a deficit of people's knowledge of science.



- Science should be publicly perceived as a cultural activity; art,literature,music..
- Governments should support effective strategies for the dissemination of information on Science and Technology (Education)
- Scientists and engineers have a responsibility to engage actively in public debate about their professional work (Education)
- Both governments and scientists should promote the application of scientific knowledge into tangible benefits for the Society (Technology Transfer)

•Thank for the kind invitation

OECD, UNESCO.