



# CERN Education Programme

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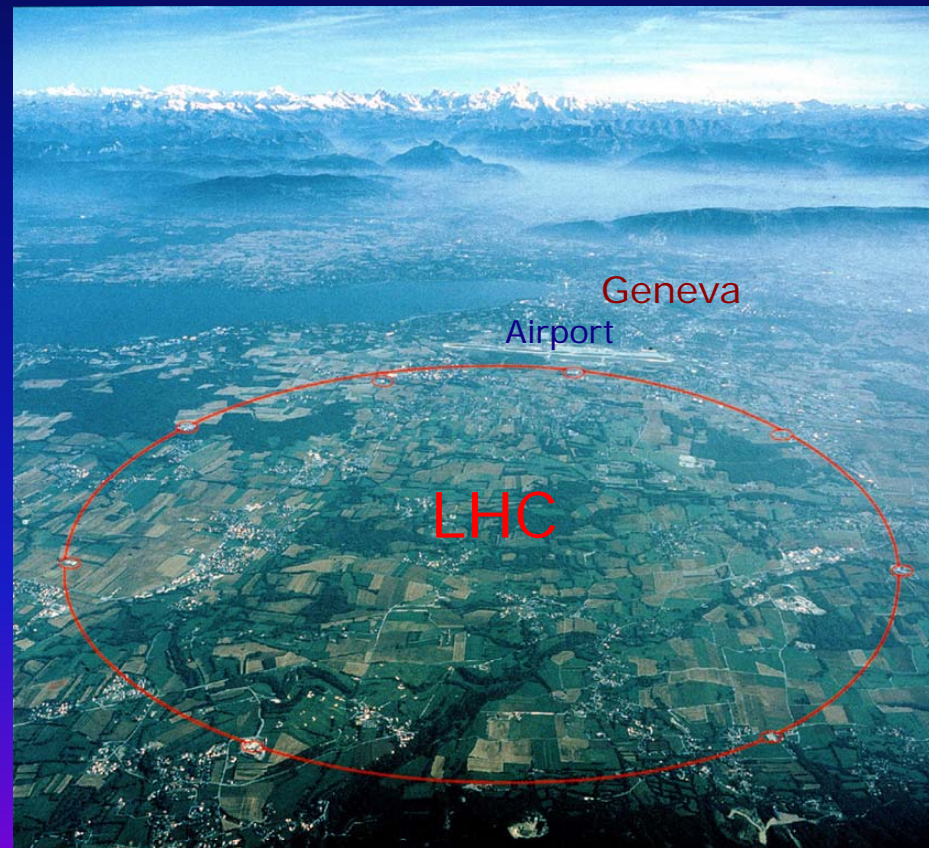
# Overview

- **Education – a strategic mission**
- **Communication & Education**
- **Teacher Programmes**
- **Education Resources**
- **EIROFORUM activities**



# What is CERN ?

CERN is the largest science laboratory in the world  
CERN has built the largest particle accelerator in history - the LHC  
The LHC will produce particles that existed only shortly after the Big Bang





# Who works at CERN ?

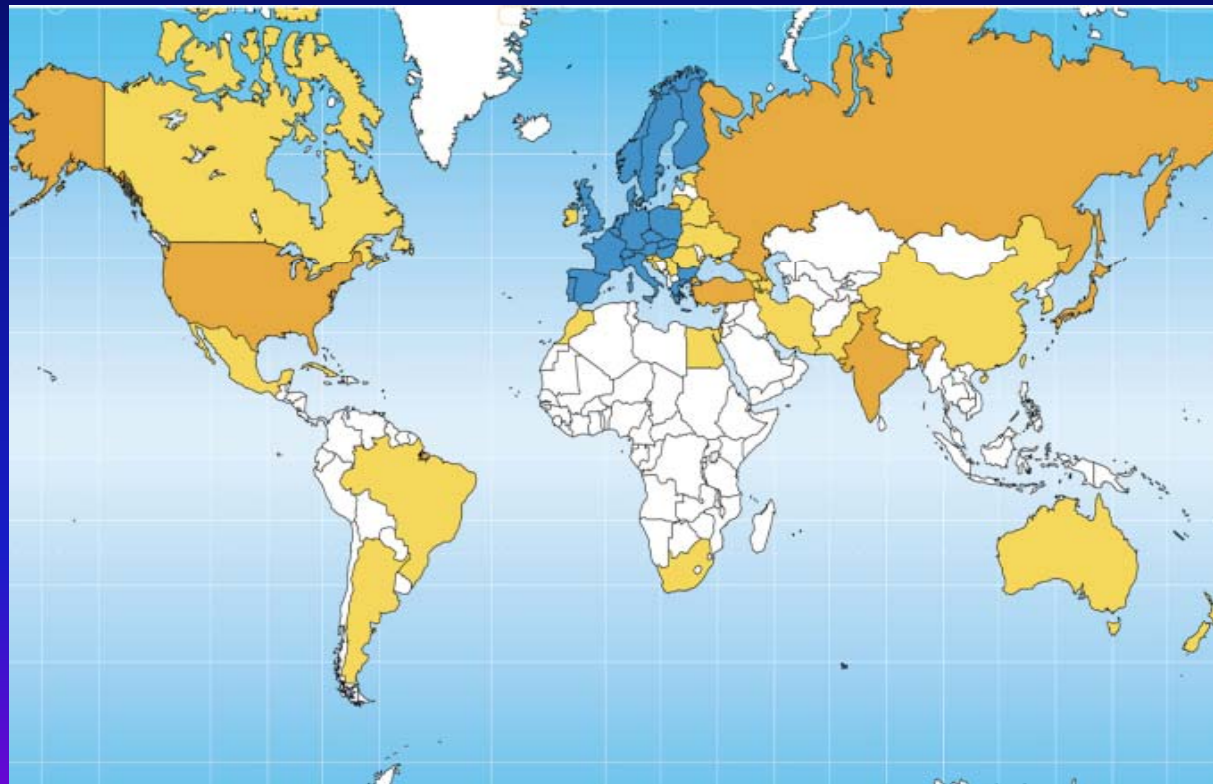
Scientists from 108 countries

2350 CERN Staff

+ 350 fellows + associates

7150 Visiting physicists

70 % from member states  
25 % from observer states  
5 % from other states



# CERN Director General Robert Aymar

- Fundamental research
- Training the future generation of scientists
- Technology transfer
- International collaboration

**CERN provides educational support for researchers  
schools, students, teachers, and educators**





# Communication

> **800 media visits** per year (TV, newspapers, radio)

**Visitor programme** (60,000 visit request - 25,000 accepted - 50 % schools)

**Permanent and temporary exhibitions** (Microcosm, soon 'Globe')

**Open day** (2004: 30,000 visitors, 2008: > 40,000 visitors)

**Public webpages**

**Live webcasts**



# Education

## **Academic Training Programme**

## **Teacher Programmes**

## **Creation and provision of teaching resources**

### **Video-"Chats" :**

virtual meetings between CERN scientists and school classes, other groups

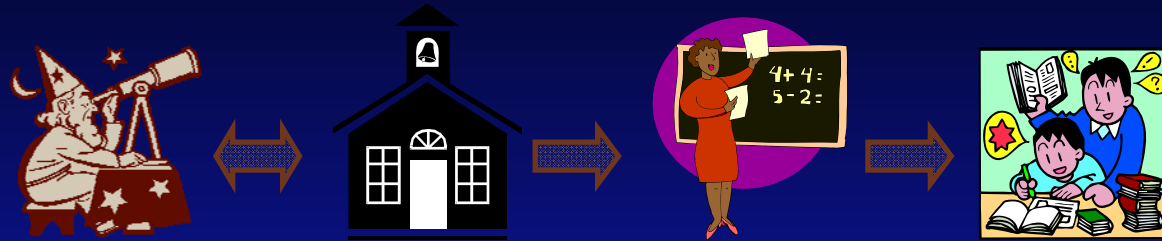
**Web-Lectures** (teacher courses, colloquia, seminars, etc)



# Goal of CERN Teacher Education

## Bring modern research closer to schools

OLD

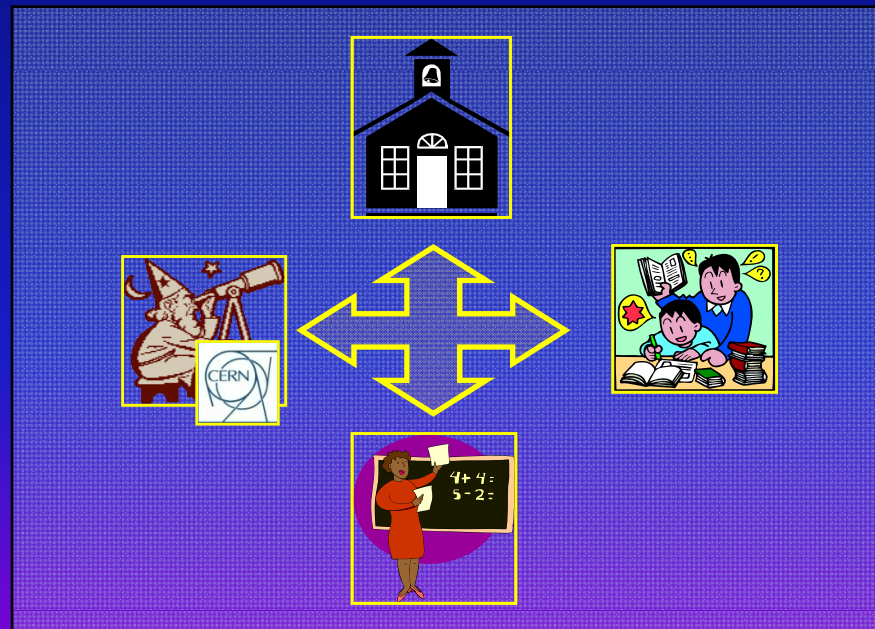


Research

University

School Teacher Students

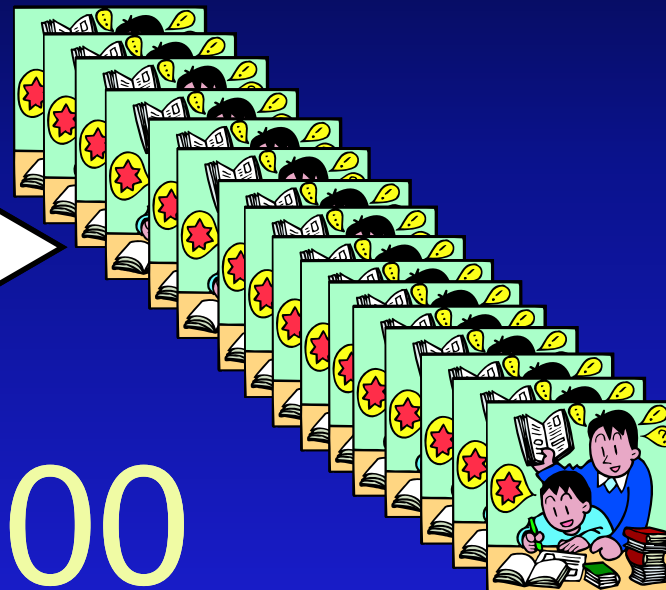
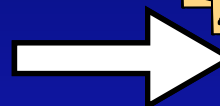
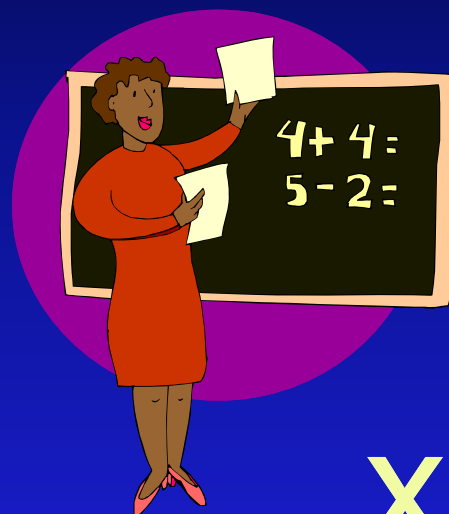
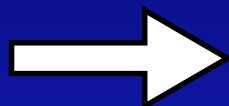
NEW







# Looking for multiplicative factors



x 1000

School Teacher

School Students



# What are we trying to achieve with the help of physics teachers ?

## 1: RAISE AND MAINTAIN THE INTEREST OF STUDENTS IN MODERN SCIENCE

Motivate them to continue scientific education at school  
Help them to better understand the physical world

### **Improve scientific literacy**

## 2: INSTIL A FEELING OF MYSTERY AND DISCOVERY POTENTIAL

Motivate students to take up physics at universities

### **Prepare the future generation of physicists**

# **SCIENCE IS ALIVE !**

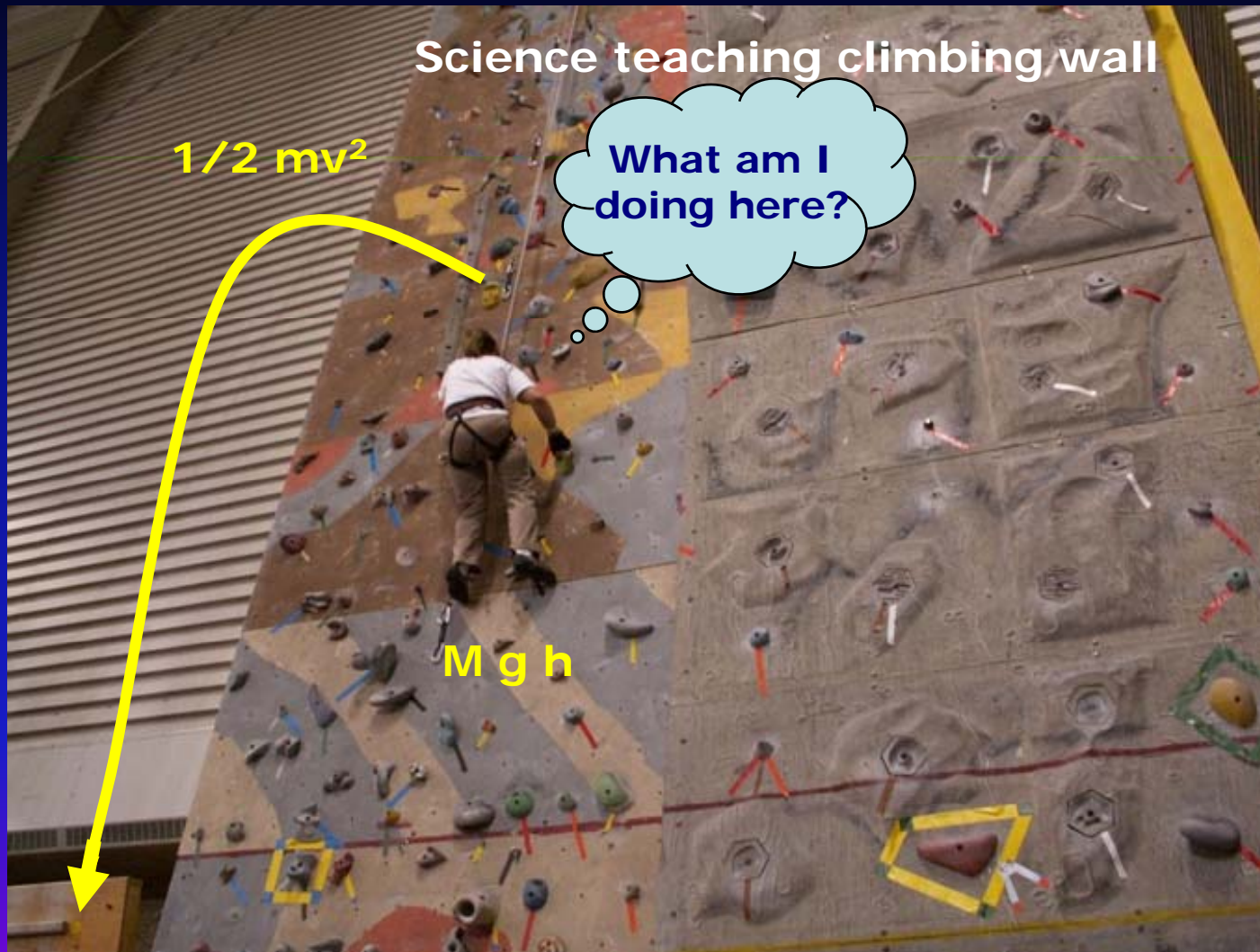


# How researchers view science





# How school students view science





# Take students on a sight-seeing tour ...



Use modern physics to inspire and motivate students



# CERN teacher programmes

## International "High School Teacher" school (3 weeks)

Core programme

Fully funded by CERN for MS participants (programme, travel, accommodation)

Participants from Africa, Asia, Middle East, South America (HELEN), US - funded externally

**In English**

## National schools (1 week)

Member states

External funding of travel, accommodation

Build networks between teachers and with scientists inside country

**National language** (speakers from the national science community)

## International weekend schools (3 days)

Partially funded by CERN for MS participants (programme, accommodation)

**In English**



# Content of CERN Teacher Schools

## Lectures:

Particle Physics

Cosmology

Accelerators (LHC)

Detectors

Applications (IT, Medicine)

## Guided tours:

Experimental facilities

Antimatter factory (AD)

PS/LEIR

CLIC

Computing Centre - GRID

## Activities:

Interactive teacher lab

Educational Resources

Games, Quiz

Lesson reviews (Q+A)



## 2007: 20 CERN Teacher Schools

Participants from	Number	Date
Europe, World (HST, 3 wk)	43	2 - 21 / 7 / 2007
Europe (PhT, 3 d)	50	March 2007
UK (Science Learning Centres, 3d)	48	10 - 13 / 4 / 2007
Poland (2 schools)	83	April, May 2007
Slovak Republic	44	22 - 28 / 4 / 2007
Finland (4 schools)	62	April, June 2007
Germany (3 schools)	120	June, Sep, Oct 2007
Spain (Catalonia)	40	22 - 28 / 7 / 2007
Hungary	40	19 - 25 / 8 / 2007
Portugal	40	9 - 15 / 9 / 2007
Denmark	30	21 - 26 / 10 / 2007
UK (Science Learning Centres, 3d)	26	23 - 26 / 10 / 2007
Norway	40	12 - 16 / 11 / 2007
Poland	40	26 - 30 / 11 / 2007

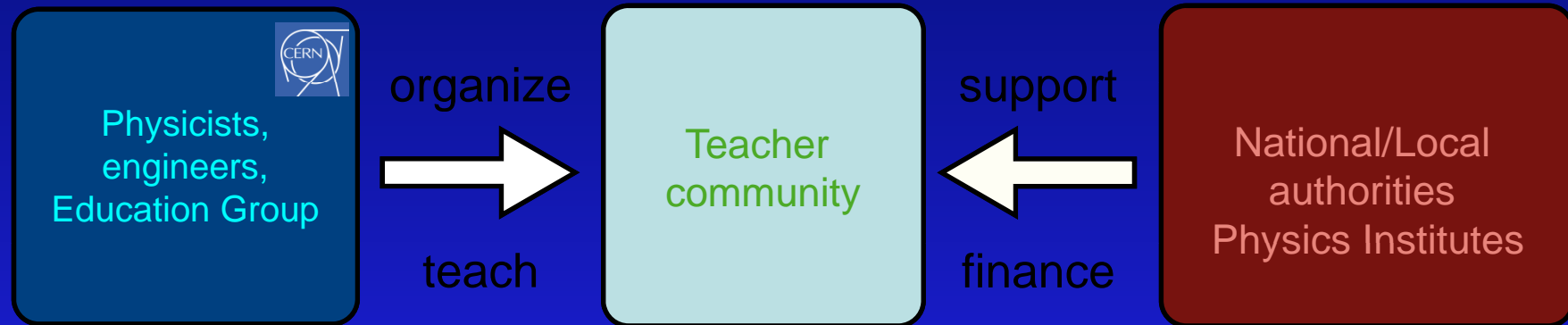
**706 teachers**

**Preview 2008 : ~ 25 sessions, 1000 teachers**



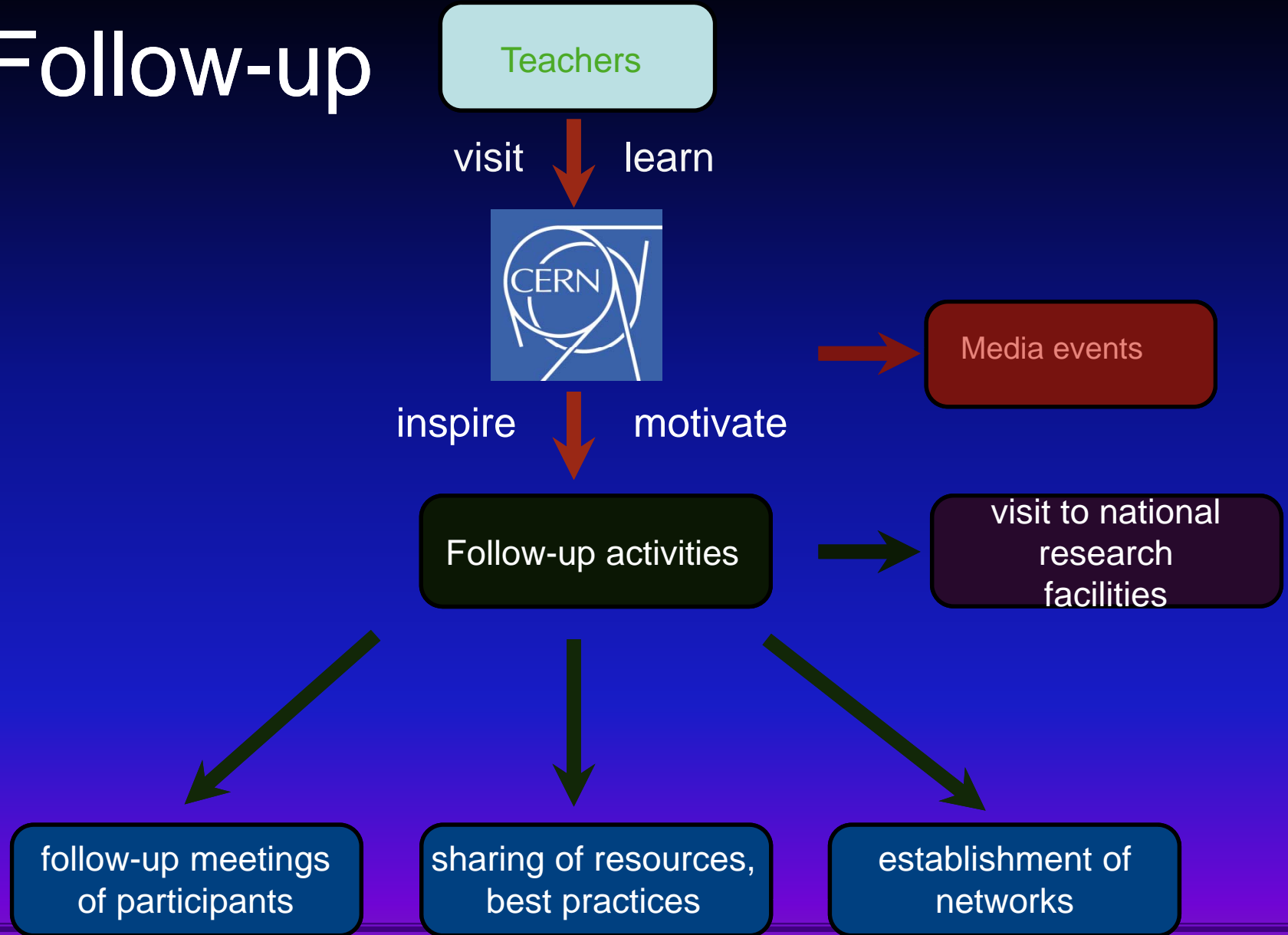


# Partners





# Follow-up





# Outcome

- Newly inspired, motivated and confident teachers
- Inspire and motivate students
- Communicate with their colleagues
- Communicate with the general public
- Act as ambassadors for science, physics, particle physics, CERN

**Excellent examples among many teachers who have attended our programmes**



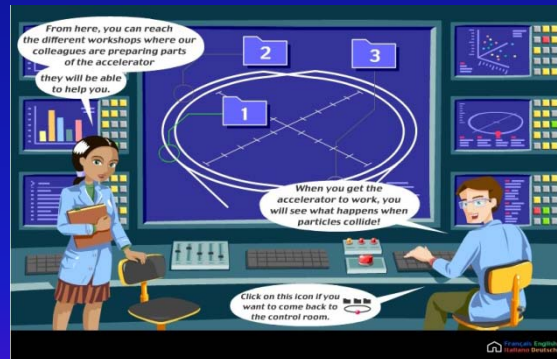
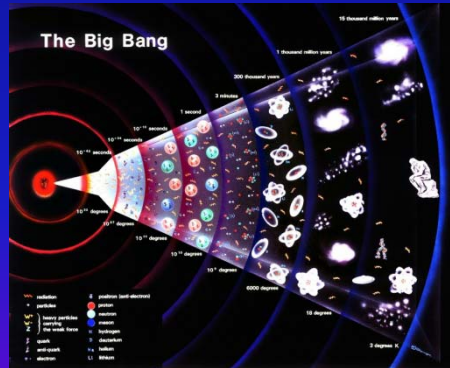
# Teaching resources

All teacher courses and materials are **recorded and archived**

Special school materials, video clips, animations, games are produced

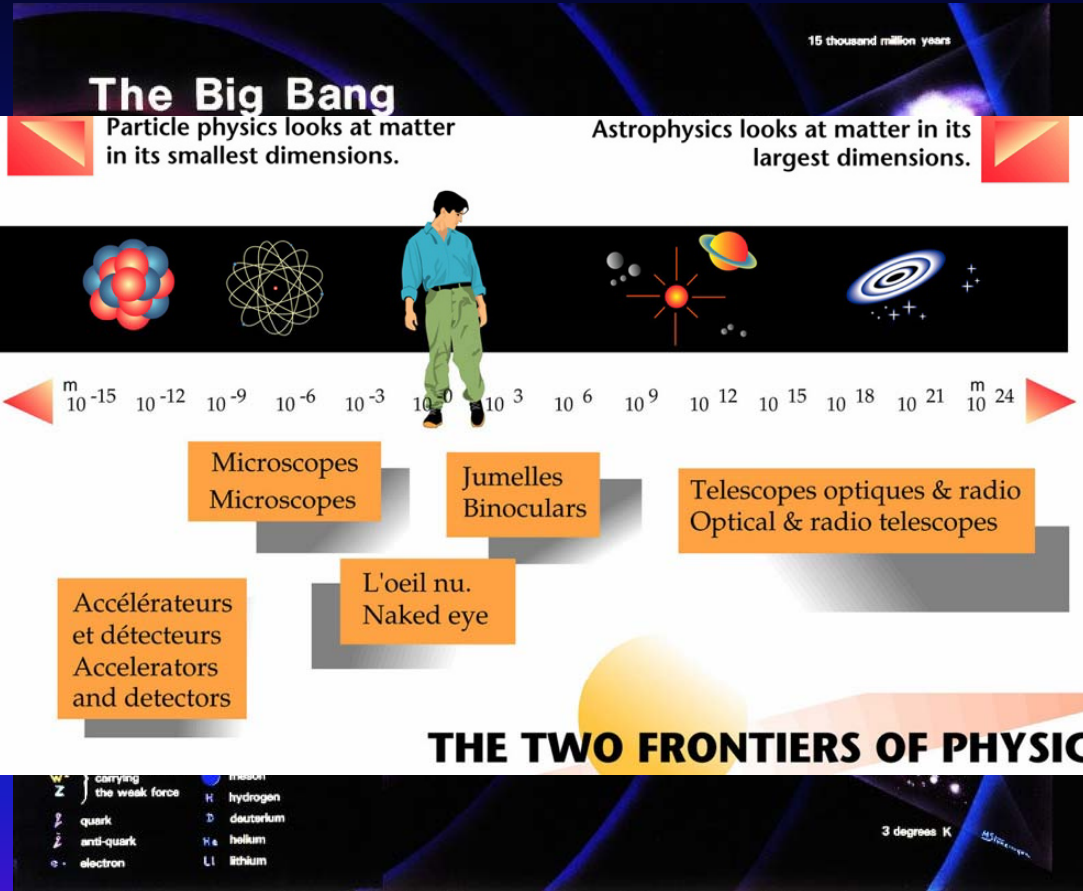
Video-Conferences between school classes and CERN scientists

CERN education website: [education.web.cern.ch/education](http://education.web.cern.ch/education)





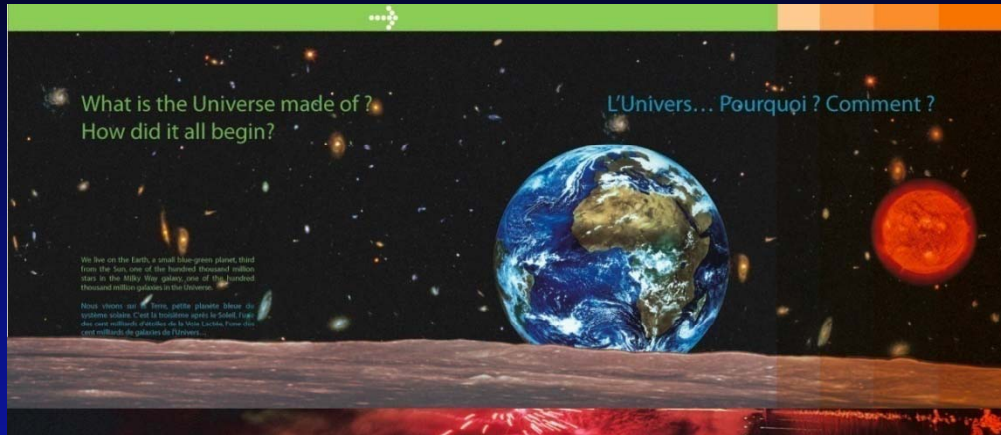
# Graphics



[press.web.cern.ch/press/PhotoDatabase/welcome.html](http://press.web.cern.ch/press/PhotoDatabase/welcome.html)

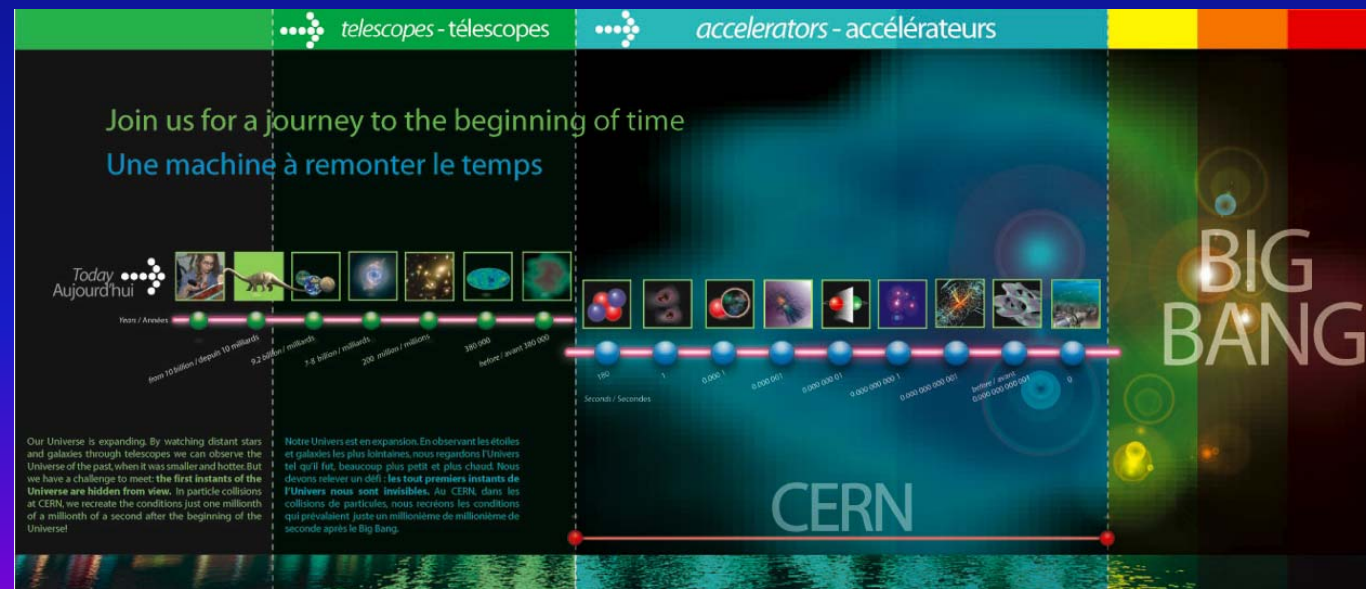


# Posters: Evolution of the Universe



17 posters

Key concepts of the evolution of matter





# Evolution of the Universe (2)

## Life on Earth

### De la matière à la vie

Human-like beings have only existed for a few million years and if we squeezed all the Earth's 4.500 million-year history into one day, human civilization fits easily into the last second - before midnight. Dinosaurs appeared 225 million years ago, the oldest fossils are 540 million years old, and the first life forms are 3500 million years old.

Everything - rocks, plants, animals, humans - is made of the same particles. And these were born 13,700 million years ago at the Big Bang.

Les humains existent depuis quelques millions d'années si nous réduisons l'histoire de la Terre, longue de 4,5 milliards d'années, à une journée, la civilisation humaine représente à peine la dernière seconde avant minuit... Les dinosaures apparaissent quant à eux il y a 225 millions d'années ; les plus vieux fossiles ont 540 millions d'années et les premières formes de la vie 3,5 milliards d'années.

TOUT - minéraux, plantes, animaux, humains - est fait des mêmes particules, celles qui naquirent lors du Big Bang il y a 13,7 milliards d'années.

Fossils - 540 million years / Fossiles - 540 millions d'années

Dinosaurs - 225 million years / Dinosaures - 225 millions d'années

First life forms - 3500 million years / Premières formes de vie - 3500 millions d'années

Humans / Êtres humains

## A star is born / Une étoile est née

Our journey back in time continues... The formation of the Earth and the solar system happened about 4500 million years ago. The Solar System formed from a cloud of interstellar dust made of hydrogen and helium with just 1% of heavier elements.

Revenons encore le fil du temps... Il y a environ 4,5 milliards d'années apparemment la Terre et le système solaire - fruits d'un nuage de poussière interstellaire, constituée d'hydrogène, d'hélium, et de 1% seulement d'éléments lourds.



# Evolution of the Universe (3)

accelerators - accélérateurs

### Seeing in the dark L'âge obscur

Looking all the way back to the beginning of the universe, about 380,000 years after the Big Bang, the universe was a hot, dense plasma of particles. At this time, the universe was so hot that light could not travel freely. Instead, it was constantly being absorbed and re-emitted by the charged particles. This period is known as the 'dark age' because we cannot see anything from this time. It was only after the universe cooled down enough for the first atoms to form that light could travel freely, and the universe became transparent. This event is known as recombination.

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### Les neutrinos, témoins fantômes de la naissance Neutrinos – ghostly messengers from the early Universe

For every one electron from the Big Bang, about 100 neutrinos were produced. These neutrinos are now everywhere in the universe, but they are so elusive that they rarely interact with anything. They are considered 'ghostly messengers' because they can travel through matter without being stopped. They provide a unique window into the early universe, as they were produced in the first few seconds after the Big Bang and have traveled almost unchanged since then.

At the moment of the Big Bang, the universe was so hot that it was filled with a sea of particles. Among these particles were neutrinos, which are very light and interact very weakly with other particles. They were produced in large numbers in the first few seconds after the Big Bang. Today, there are about 100 neutrinos for every electron in the universe. They are everywhere, but they are so elusive that they rarely interact with anything. They are considered 'ghostly messengers' because they can travel through matter without being stopped. They provide a unique window into the early universe, as they were produced in the first few seconds after the Big Bang and have traveled almost unchanged since then.

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### Pushing back the frontiers Repousser les limites

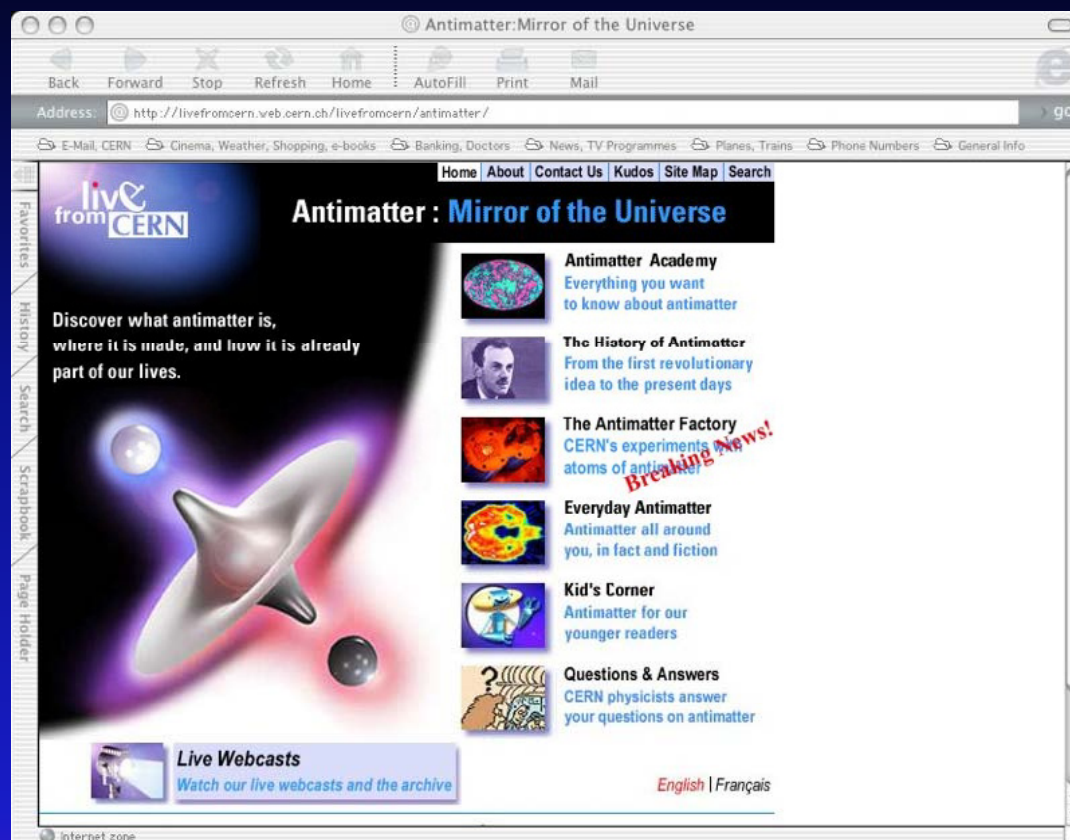
At one trillionth of a second we reach the current frontier of knowledge. There are many things we don't know, and we are working hard to find out. The Large Hadron Collider (LHC) is the most powerful particle accelerator in the world, and it is helping us to understand the universe at a level that was never possible before. We are pushing back the frontiers of knowledge and discovering new things about the universe.

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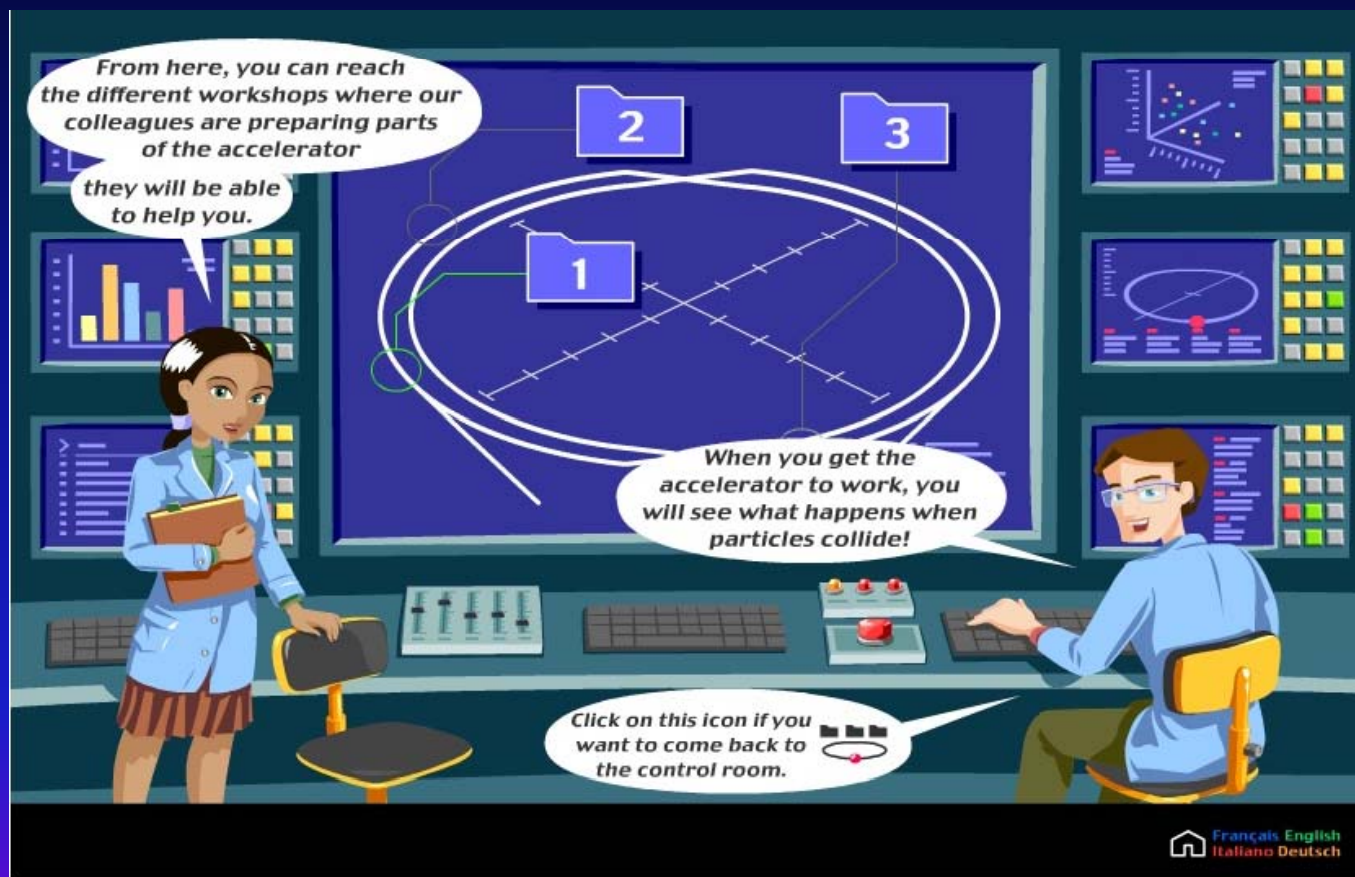
## Topical websites (e.g. Antimatter)



[livefromcern.web.cern.ch/livefromcern/antimatter/](http://livefromcern.web.cern.ch/livefromcern/antimatter/)



# Games



[microcosm.web.cern.ch/microcosm/LHCGame/LHCGame.html](http://microcosm.web.cern.ch/microcosm/LHCGame/LHCGame.html)



## CERN - EIROForum\* Education Programmes

*Science On Stage*

*Science In School journal*

\*EIROForum = CERN + EFDA + EMBL + ESA + ESO + ESRF + ILL



# Science On Stage



**Increase attractiveness of science lessons!**

**Exchange** of successful, innovative teaching methods

Multi-disciplinary **SCIENCE TEACHING FAIR**, workshops

**29 countries organize national events** (~ 2000 participants)

**450 teachers meet at international festival (awards)**

*2005 CERN (Geneva)*

*2007 ESRF/ILL (Grenoble)*

*(Physics on Stage: 2000 CERN, 2002 ESA, 2003 ESA)*





# Science In School journal



Since March 2006 - now at Issue 8

4 issues/year, 88 pages; English (print); articles in 25 languages (website)

30,000 copies; distributed in 38 countries; > 150,000 web visits/month



# Summary

CERN has broad range of education activities

- Information
- Communication
- Education programmes
  - Teachers (multiplicative factor)
- Resources

Under constant review and development

**We are always looking for new partners**