

Present CERN education activities Some thoughts on WP 2.2

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CERN

The CERN teacher programmes

Raise interest of young people in
modern science - physics - particle physics/astrophysics/fusion/...

How?

Introduce modern science topics they find interesting

Once their interest is raised, they will **ask questions** ...

... and are (more) willing to learn 'basic' concepts

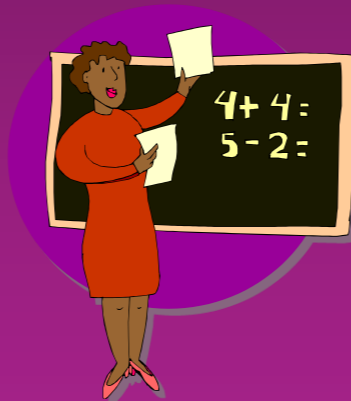
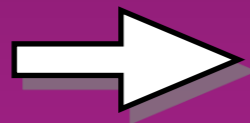
Why teachers?

Teachers are

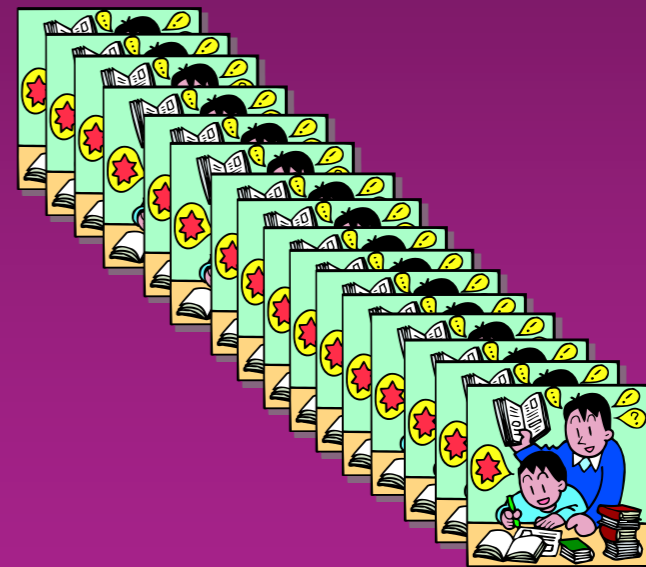
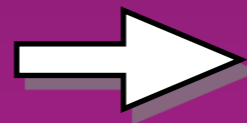
role models

multipliers

crucial link for bringing modern science into school classes



x 1000



CERN 'themes' are attractive for young people:

ANTIMATTER

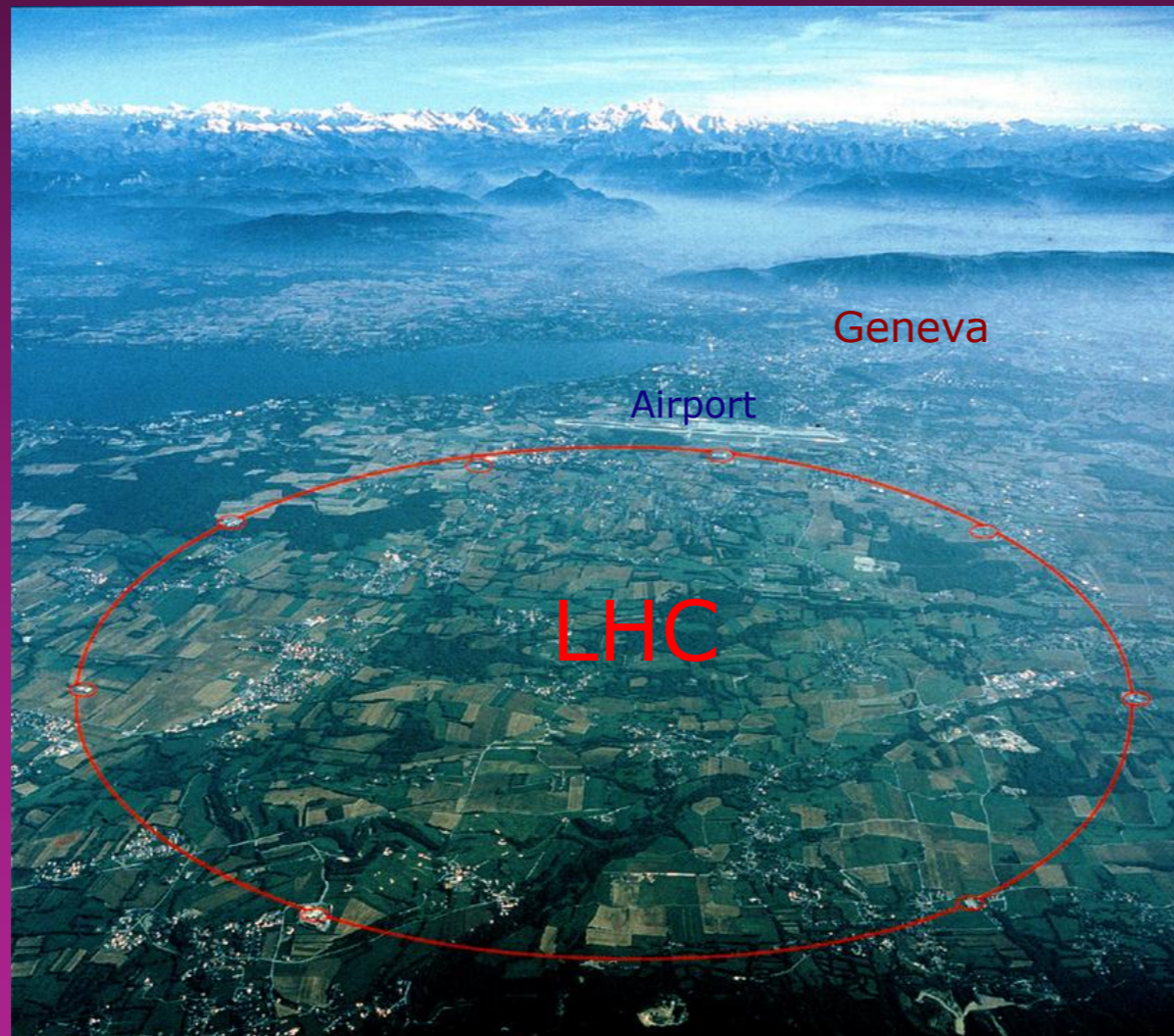
BLACK HOLES

DARK MATTER

THEORY OF
EVERYTHING

WWW

PET SCAN



THE 'GOD' PARTICLE

DARK ENERGY

BIG BANG

EXTRA DIMENSIONS

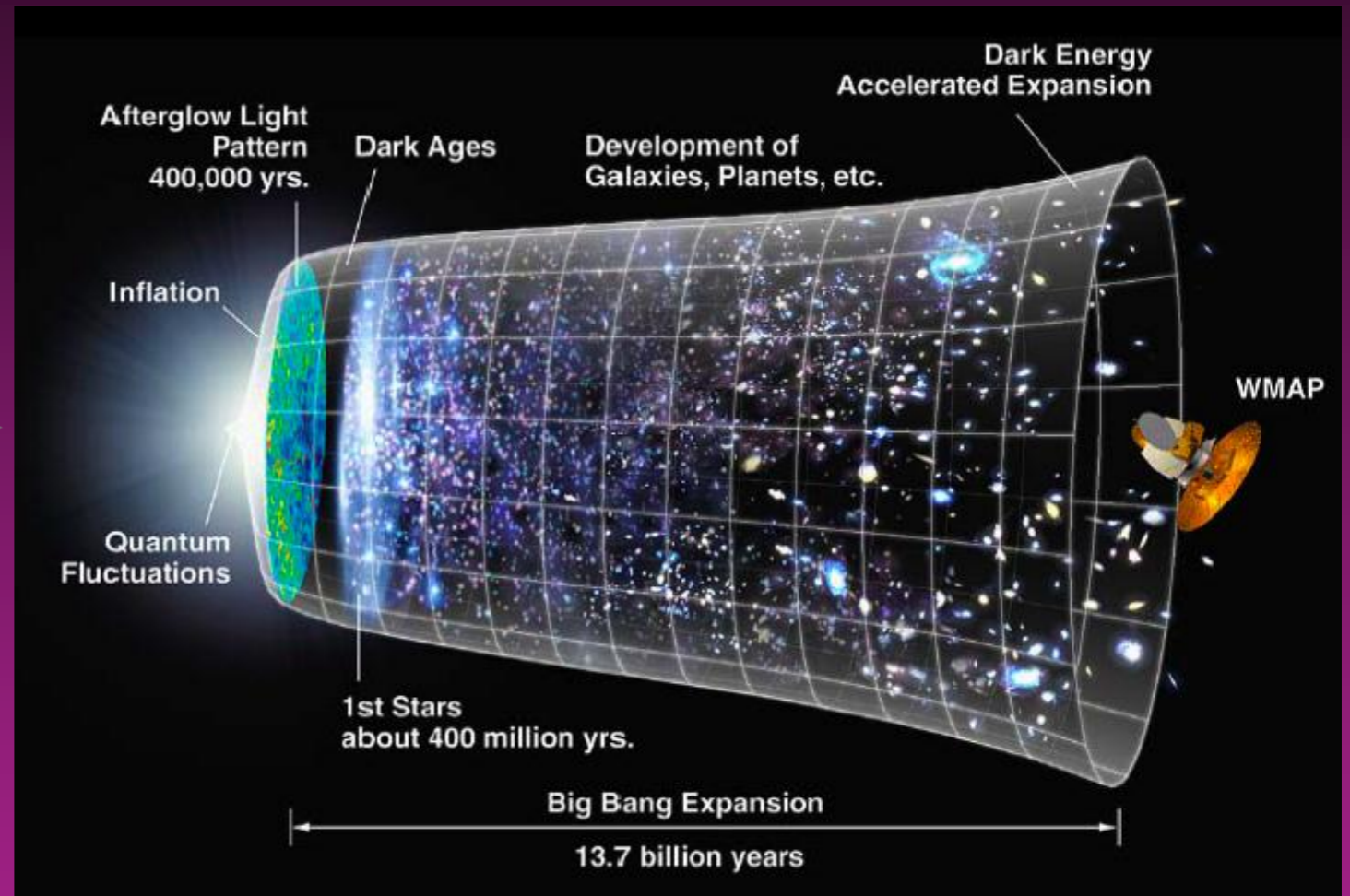
GRID

HADROTHERAPY

CERN means 'science in action'

Theories

- origin of mass
- dark matter
- extra-dimensions



...are **tested experimentally** by
reproducing conditions $\sim 10^{-12}$ sec after the Big Bang

Physics is alive ... !!

CERN teacher programmes

International “High School Teacher” school (3 weeks)

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

Participants from US, Asia, South America (HELEN), Africa (UNESCO) funded externally

In English - 2009: 120 applications from 38 countries

International Weekend school (3 days, 2 per year)

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

In English

National schools (1 week) - 20-25 courses per year

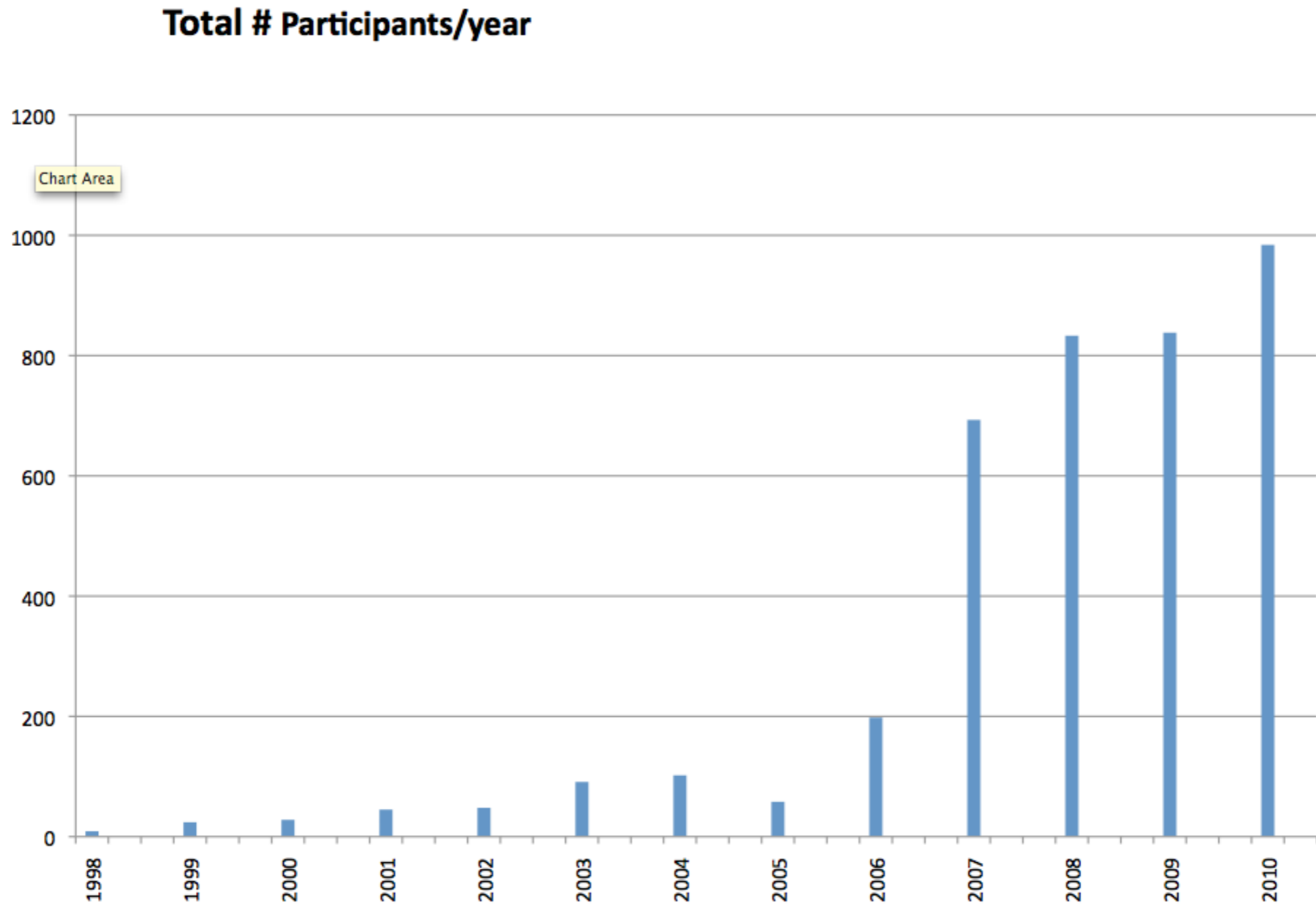
In their mother tongue (speakers from the national science community)

Create teaching resources in national language - important for class room activities

External funding of travel, accommodation

Build networks between teachers and with scientists inside country

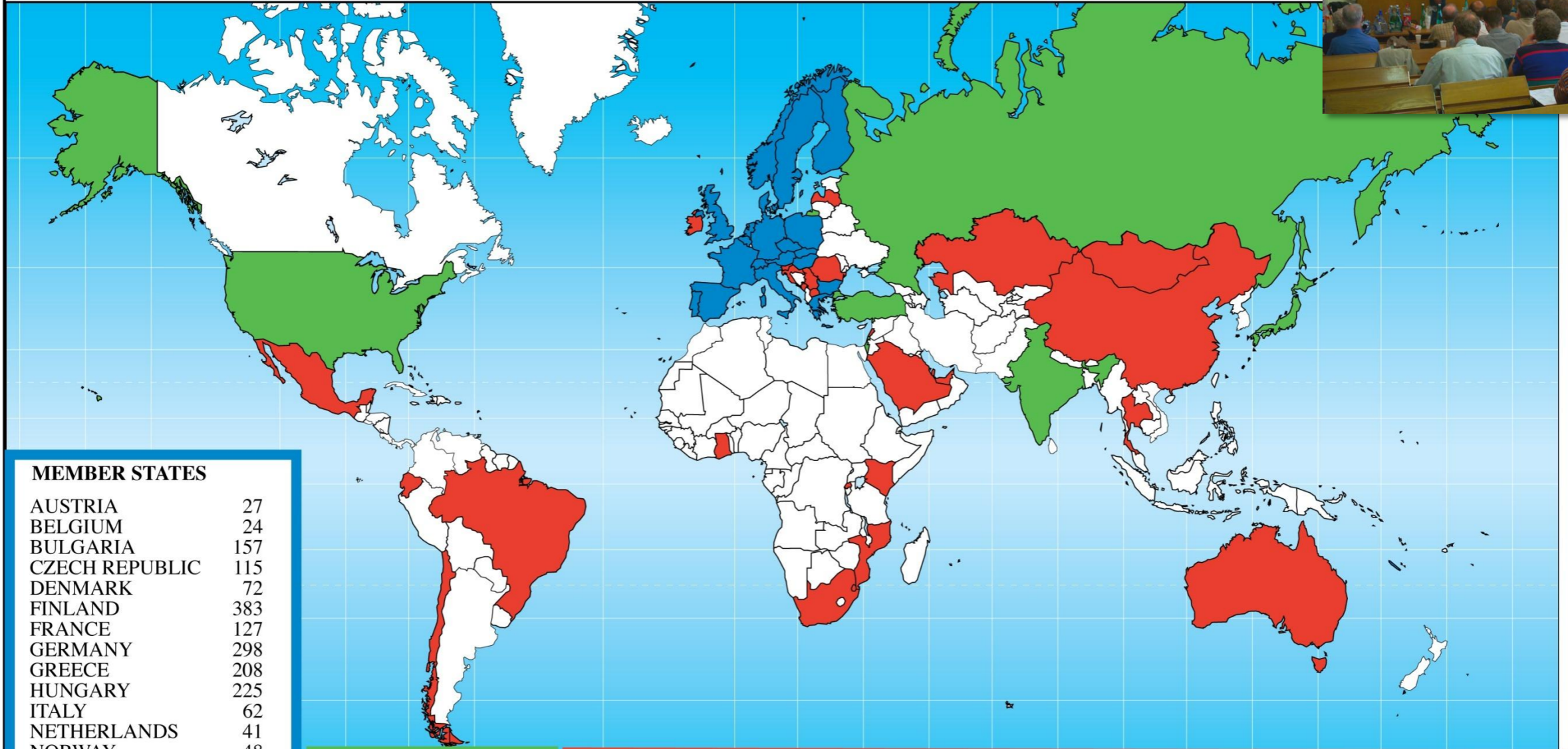
Teacher Programme Participation 1998 – 2010





CERN Teacher Programme

CERN Teacher Programme Participants 1998 - 2010



MEMBER STATES

AUSTRIA	27
BELGIUM	24
BULGARIA	157
CZECH REPUBLIC	115
DENMARK	72
FINLAND	383
FRANCE	127
GERMANY	298
GREECE	208
HUNGARY	225
ITALY	62
NETHERLANDS	41
NORWAY	48
POLAND	485
PORTUGAL	212
SLOVAKIA	189
SPAIN	168
SWEDEN	79
SWITZERLAND	34
UNITED KINGDOM	668

3622

OBSERVER STATES

INDIA	2
ISRAEL	1
JAPAN	2
RUSSIA	84
TURKEY	2
USA	51

142

OTHERS

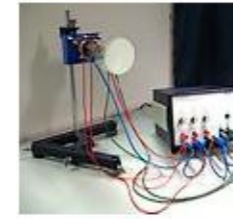
AUSTRALIA	1	GHANA	2	MONTENEGRO	13	SLOVENIA	21
AZERBAIJAN	1	IRELAND	3	MOZAMBIQUE	9	SOUTH AFRICA	6
BRAZIL	32	KAZAKHSTAN	3	QATAR	1	SWAZILAND	1
CAPE VERDE	1	KENYA	1	ROMANIA	7	THAILAND	2
CHILE	3	LATVIA	1	RWANDA	7	F.Y.R.O.M.	11
CHINA	1	LEBANON	1	SAO TOME	1	U.A.E.	1
CROATIA	1	MALTA	36	SAUDI ARABIA	1		
ECUADOR	1	MEXICO	5	SERBIA	10		
		MONGOLIA	1	SINGAPORE	2		

187

Content of teacher programmes

- Lectures
 - Introductions to CERN
 - Particle Physics
 - Cosmology
 - LHC Experiments
 - Particle Accelerators
 - Medical Applications of Particle Physics
 - GRID
- Visits to experimental facilities
- Meet physicists in a variety of informal settings

- Hands-on activities : TEACHER'S LAB
- All lectures are recorded, archived, and publicly available
- Very positive feedback
- But what happens afterwards ... ?



Cathode ray tube

- documentation: [pdf](#) | [doc](#)
- quick reference guide: [pdf](#) | [doc](#)



Electron diffraction tube

- documentation: [pdf](#) | [doc](#)
- quick reference guide: [pdf](#) | [doc](#)



Fine beam tube

- documentation: [pdf](#) | [doc](#)
- quick reference guide: [pdf](#) | [doc](#)



Photoelectric effect

- documentation: [pdf](#) | [doc](#)
- quick reference guide: [pdf](#) | [doc](#)



Electron spin resonance

- documentation: [pdf](#) | [doc](#)
- quick reference guide: [pdf](#) | [doc](#)

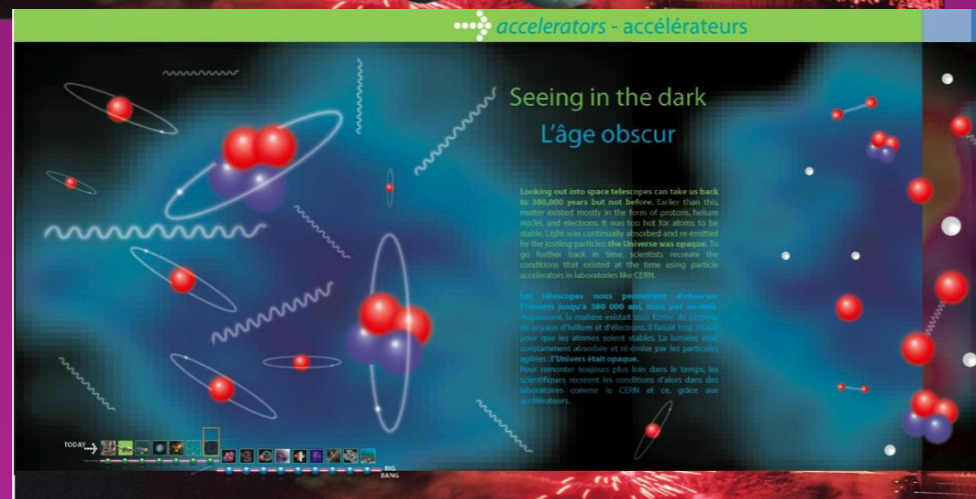
2 Educational resources for schools

Lesson Plans for teaching modern science in schools (14-15 year olds)

First module: ANTIMATTER, available on 'Education' website

<p>Living In the ANTI-Material World</p>	<table border="1"><tr><td>e^-</td><td>ν_e^-</td><td>u</td><td>d</td></tr><tr><td colspan="4">Knowing Anti-Me, Knowing Anti-You</td></tr><tr><td>e^+</td><td>$\bar{\nu}_e$</td><td>\bar{u}</td><td>\bar{d}</td></tr></table>	e^-	ν_e^-	u	d	Knowing Anti-Me, Knowing Anti-You				e^+	$\bar{\nu}_e$	\bar{u}	\bar{d}	<p>Operation: Annihilate!</p>  <p>APPLE → KABOOM!!! ← ANTI-APPLE</p>
e^-	ν_e^-	u	d											
Knowing Anti-Me, Knowing Anti-You														
e^+	$\bar{\nu}_e$	\bar{u}	\bar{d}											
<p>? <i>The</i> Mother <i>Of All</i> Conundrums ?</p>	<p>Dammit Jim, I'm a DOCTOR, not a PARTICLE PHYSICIST!!</p>  <p>MEDICINE THE NEXT GENERATION</p>		 <p>ENERGY'S SPAWN</p>											
 <p>IT CAME FROM OUTER SPACE</p>	<p>Boys With Toys</p> 													

Posters: Evolution of the Universe



On 17 posters:

Key concepts of the evolution of matter and the Universe

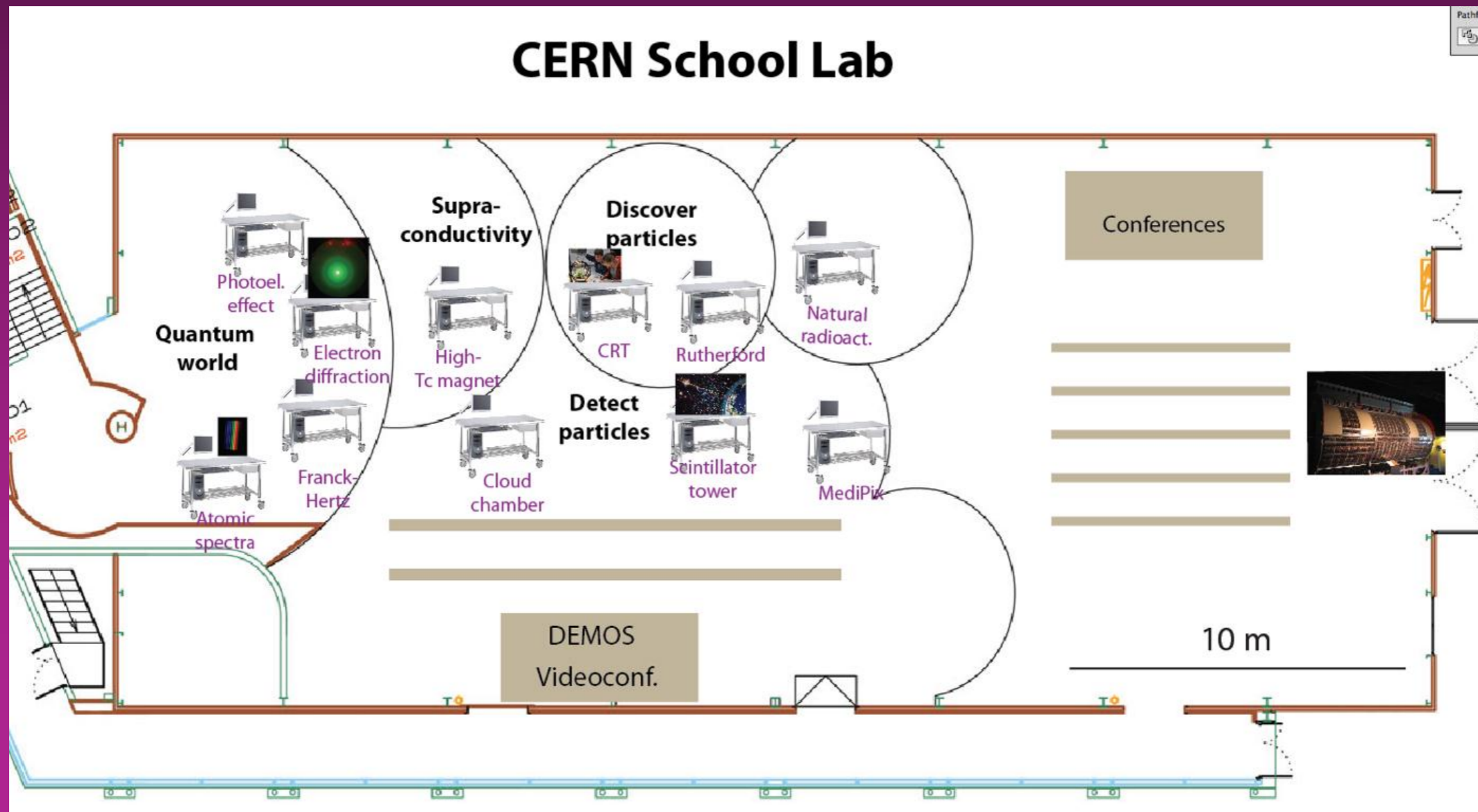
back to the Big Bang and the questions that LHC will address

School laboratory and extended visits

No. 1 demand from schools + teachers:

extended visit with practical activities; under supervision by 2-3 guides

CERN School Lab will be implemented in 2012 (lower part of Microcosm)



Increasingly used:

Video-Conferences between CERN and schools/teachers

(with Europe, US, Asia, and Africa)

BEST: via high speed Internet (plus Polycom/Tandberg)

o.k. with EVO, Skype, etc.

WP 2.2: Review of eScience Applications

Task: Identify & review existing eScience applications in particle physics and astronomy

SOFTWARE TOOLS, ARCHIVES, DATA BASES

1) IPPOG data base

Useful data base about eScience applications available in HEP:

<http://ippog.web.cern.ch/ippog/IPPOGdatabase.html>

**At present (1 September 2011) a collection of 278 documents
(including an overview about HEP/cosmology presence
in the curricula of ~ 8 countries)**

2) ATLAS LHC event analysis

[MINERVA](#) - (Masterclass INvolving Event Recognition Visualised with Atlantis) is a project by the Rutherford Appleton Laboratory and University of Birmingham, UK.

[HYPATIA](#) - ([Hybrid](#) Pupil's Analysis Tool for Interactions in Atlas) is a project by the University of Athens, Greece.

[LPPP](#) - Lancaster [P](#)article Physics Package is a project by the University of Lancaster, UK.

[AMELIA](#) - A Berkeley [y based](#) program is under construction and will be linked here when completed.

3) EPPOG Masterclasses

www.physicsmasterclasses.org/



International Masterclasses

8th International Masterclasses 2012

Each year about 6000 high school students in **24 countries** come to one of about 110 nearby universities or research centres for one day in order to unravel the mysteries of particle physics. Lectures from active scientists give insight in topics and methods of basic research at the fundamentals of matter and forces, enabling the students to perform measurements on real data from particle physics experiments themselves. At the end of each day, like in an international research collaboration, the participants join in a video conference for discussion and combination of their results.

The **International Masterclasses 2012** will be held from **27.2. - 24.3.2012**. Each day up to six out of about 100 institutes participated, see **schedule 2011**. In addition, several institutes will hold a teachers day (click **here** for dates). A parallel program in **US** will include about 20 more institutes, see **schedule 2011**.

Discover the world of Quarks and Leptons with real data



- get out of school for one day and come to a nearby university or research centre
- get insight into topics and methods of basic research at the fundamentals of matter and forces
- perform measurements on real data from particle physics experiments at CERN
- participate in an international video conference for discussion of results

4) Learning with ATLAS

www.learningwithatlas-portal.eu/

ATLAS@CERN Repository

Learning with ATLAS@CERN Repository contains educational material in the form of **educational content** (photos, videos, animations, exercises, graphs, links) and of **learning missions** (structured lesson plans organized according to specific pedagogical models such as inquiry based Learning and Guided Research). Users can search for the educational materials in the "Explore Learning with ATLAS@CERN" section or to upload their own materials to the Learning with ATLAS@CERN Repository, using the "Share your Content" section.



ATLAS@CERN Repository goes mobile! Now ATLAS@CERN Educational Content is available for mobile and handheld devices. Visit **Mobile ATLAS@CERN** and explore the repository through your mobile phone.

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Search for Educational Content (131)



Search for Learning Missions (43)

