

The impact of international collaborations in “heavy physics” for strengthening relations between countries

« Heavy-physics »

What is it? Why such studies?

Relation to war and Peace ?

Examples from an historical perspective

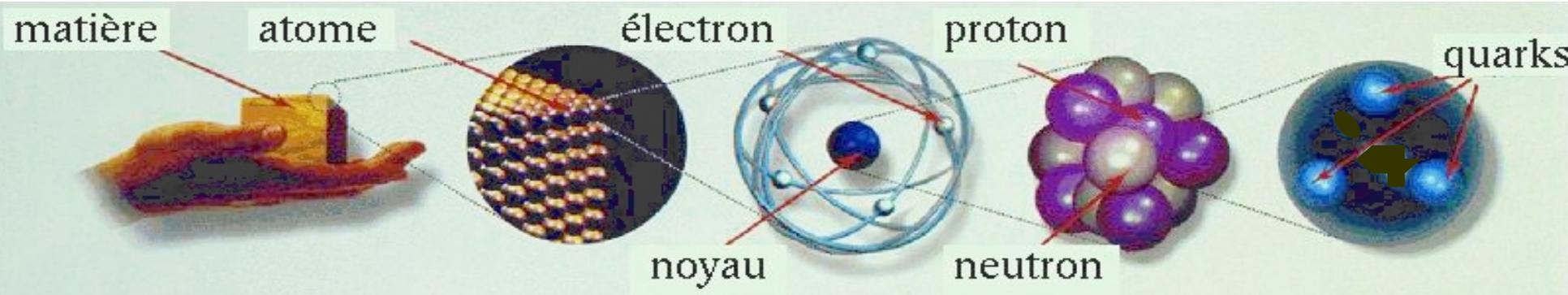
Future directions

Next generations of researches

Heavy physics : what and why ?

Matter « Paradox »

Size 1 1 / 100000 1 / 1 million 1/...



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Energy 1 1 million 1 billion 1000 billions



Physicists 1-10 10-100 1000

The smaller the object, the bigger the hammer to analyse it !

Big (huge) complex experiments ... Large (huge) collaborations

« Dans un atome il y a foule » G. Bachelard

The nuclear race

From World War II to « Peaceful » competition

The « Manhattan » Project (1942-1945)

Scientists from Europe and USA
vs Germany and Japan



The quest for superheavy nuclei

USA vs Europe vs USSR

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Ha	Sg	Ns	Hs	Mt	110	111	112						
Lanthanides			Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
Actinides			Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	

The quest for elementary constituents of matter

From USA vs Europe vs USSR competition to worldwide projects

Larger and larger energies ...
larger and larger experiments

CERN

SPS, LEP...

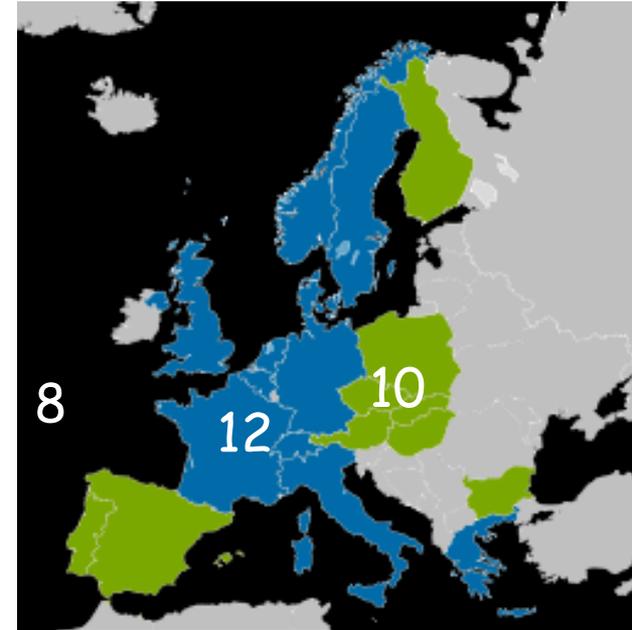
Origin of masses:

LHC vs SSC ... to LHC

And a few « byproducts »

Technological developments

WWW started at CERN in 1990



A few future directions

From CERN-LHC to ILC (International Linear Collider)

Direct worldwide initiative

Computing GRID's

And their many applications in physics (!),
biology, medicine, weather/climate, geology...

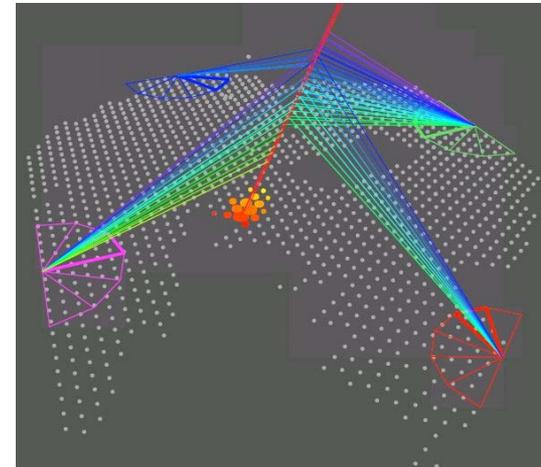
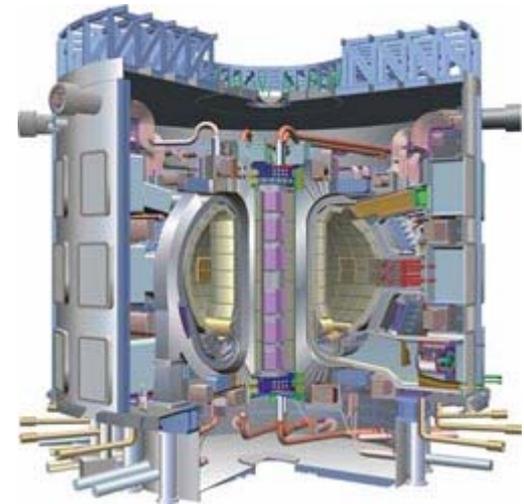
ITER (International Thermonuclear Experimental Reactor)

Reproduce nuclear fusion on earth...

Europe, Japan, China, India, Korea, Russia, USA.

High energy cosmic rays

Auger : 1600 detectors, 16 countries, 3000 km² ...



Final remarks

Globally speaking

From individual to collaborative research...

The only way to understand constitution of matter ...

If two persons have, each, one object and exchange them, each person has one object. If two persons have, each, one idea and exchange them, each person has two ideas. Chinese proverb

Benefits

Fundamental research

Applications

War/peace : softening of cultural barriers,
focusing of energies...

But...

Towards a single experiment ... and a single (valid ?) result...