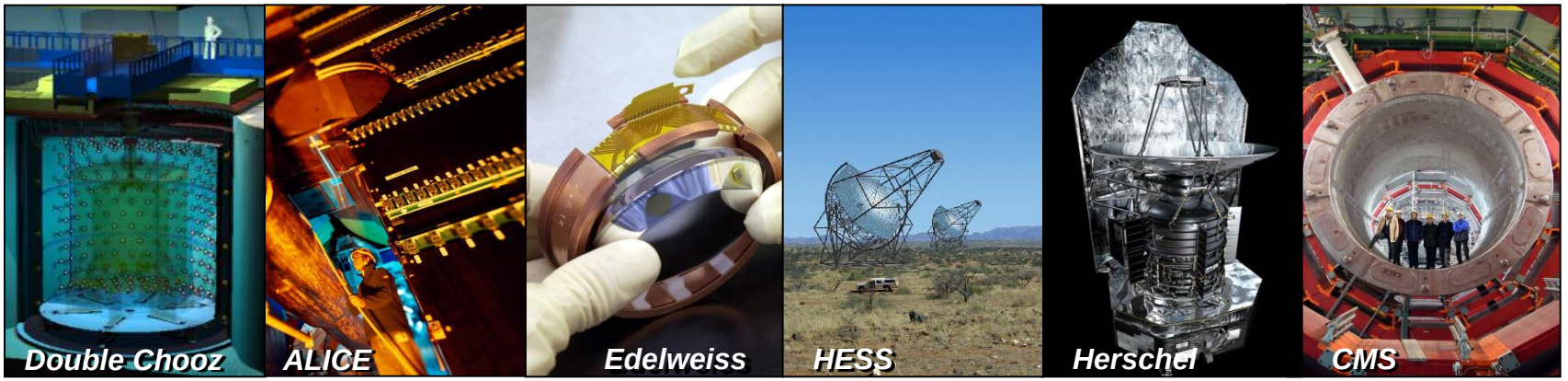
Institut de Recherche sur les lois Fondamentales de l'Univers

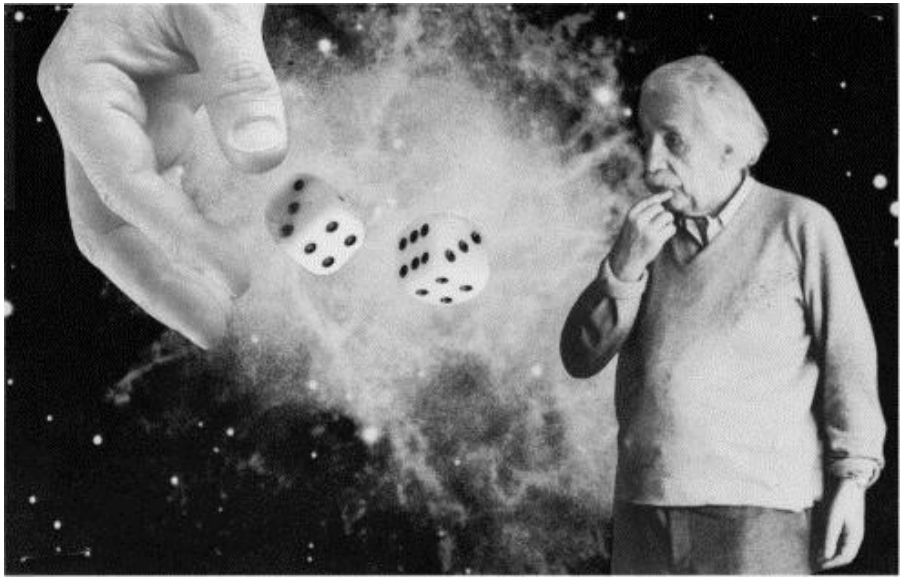
Philippe CHOMAZ
Chef d'Institut

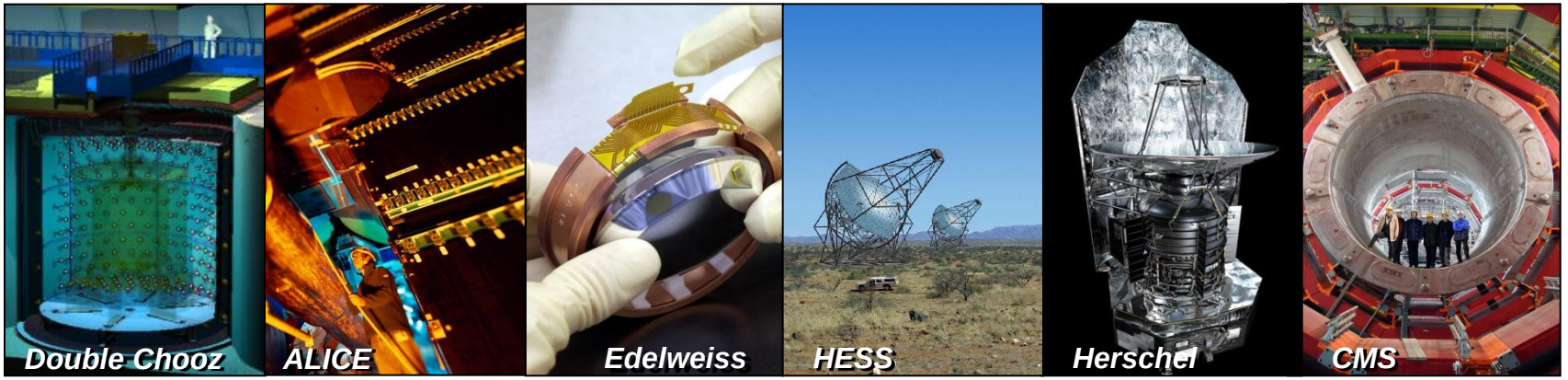


Detecting radiations from the Universe.

1 Univers
2 Infinis
4 grandes questions

Philippe CHOMAZ
Chef d'Institut





Detecting radiations from the Universe.

Irfu: the largest institute of CEA

French Alternative Energies and Atomic Energy Commission

16 000 Employees

3 900 M€ Budget

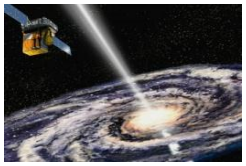
Defense and Security

Energies

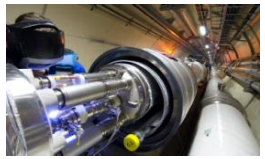
Technologies for Information and Health

Basic Research

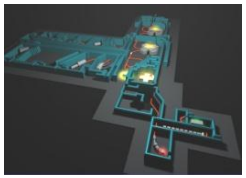
Institut de recherche sur les lois fondamentales de l'Univers



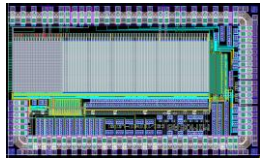
SAp
Astrophysique



SACM
Accélérateurs,
Aimants Supra

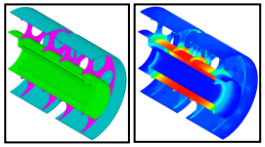


SPhN
Physique Nucléaire

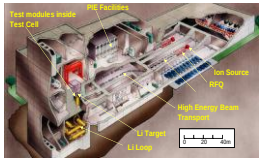


SEDI
Electronique, Détecteurs
Informatique

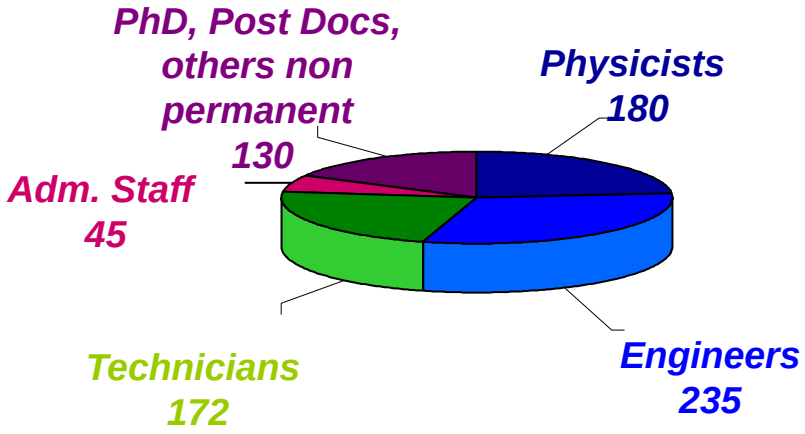
SPP
Physique Particules



SIS
Ingénierie des Systèmes



SIIEV
IFMIF EVEDA

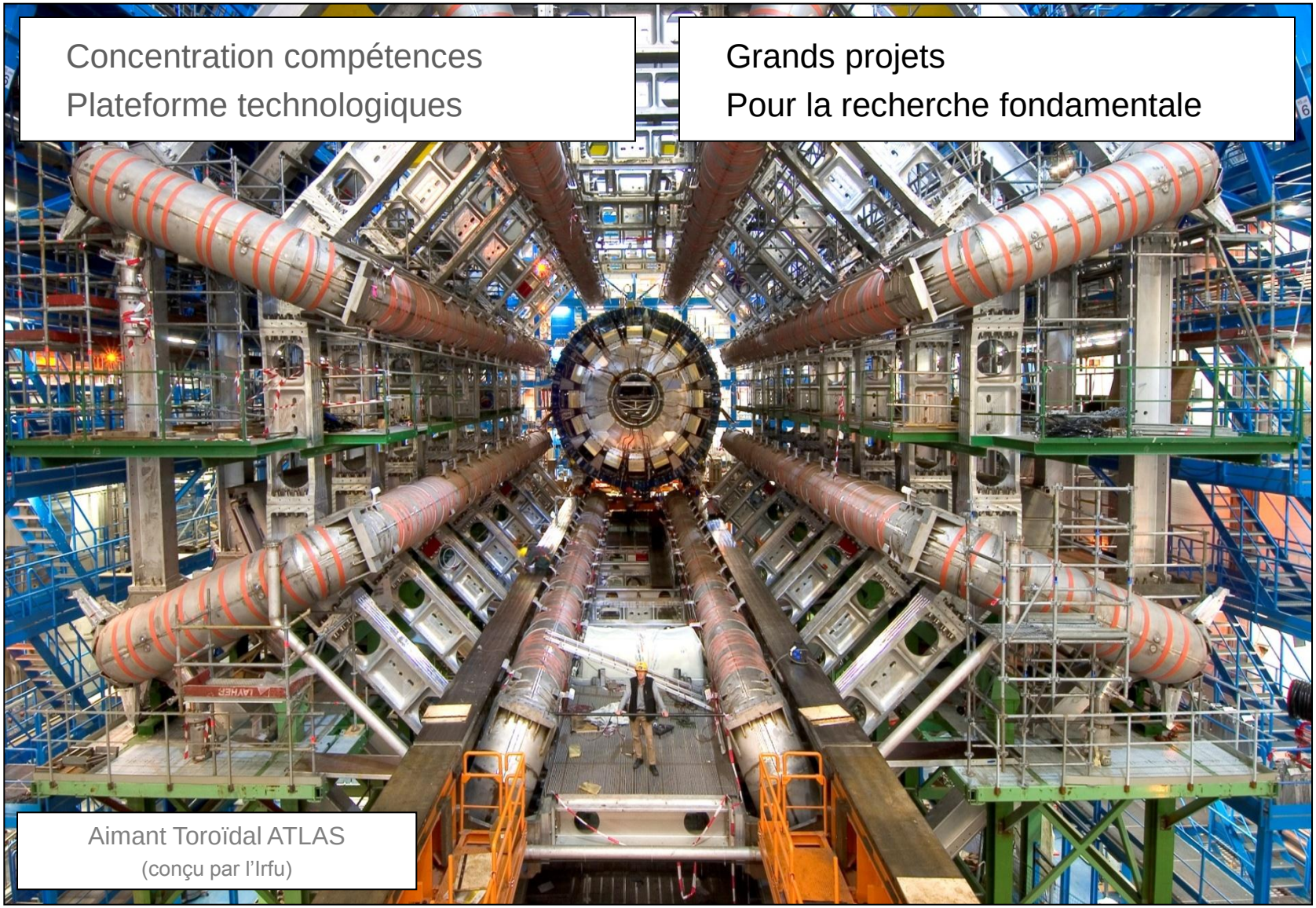


L'Irfu :
recherche et technologie

Positionnement stratégique : Grands projets

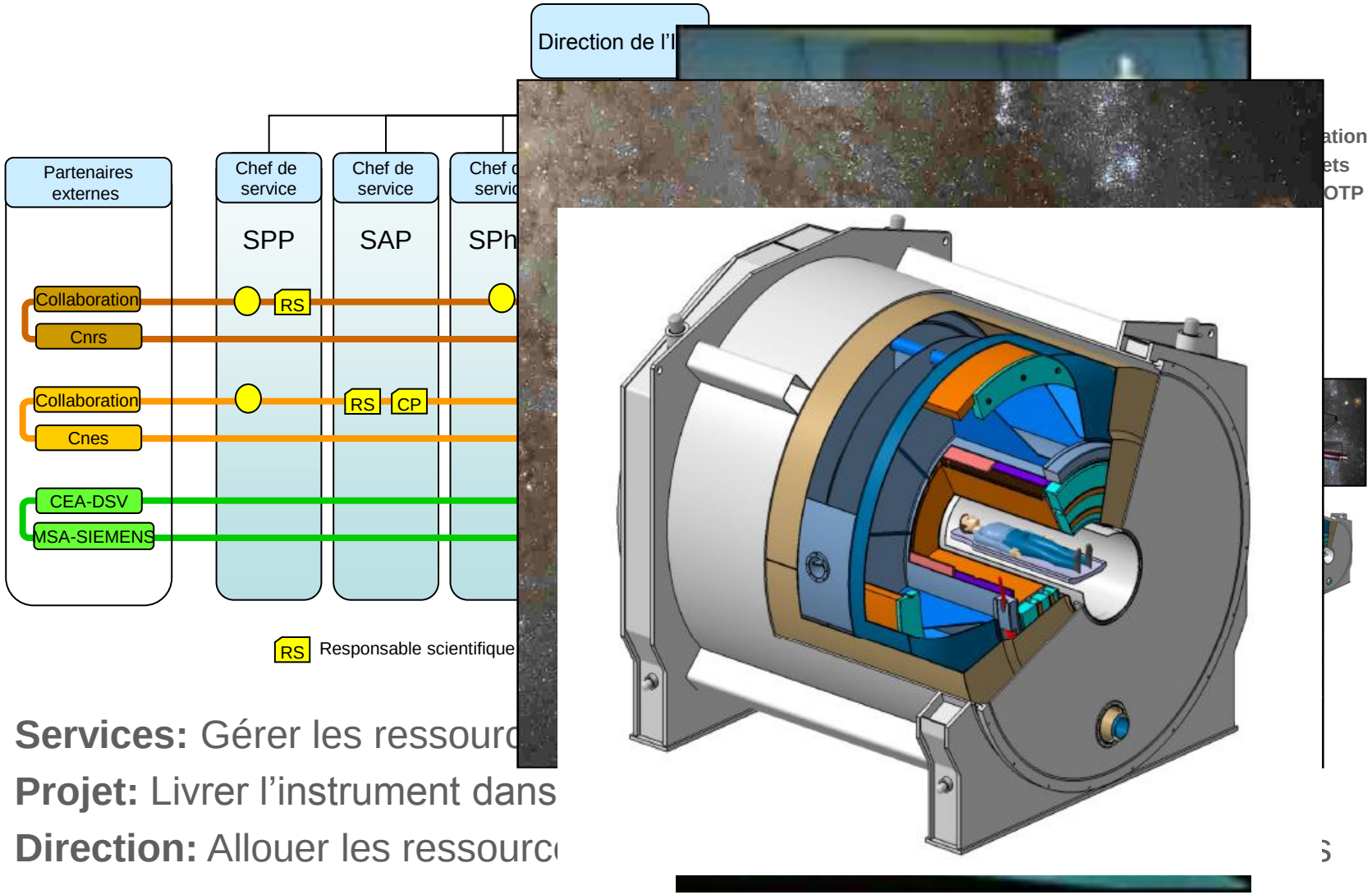
Concentration compétences
Plateforme technologiques

Grands projets
Pour la recherche fondamentale



Aimant Toroïdal ATLAS
(conçu par l'Irfu)

Une organisation matricielle de l'institut



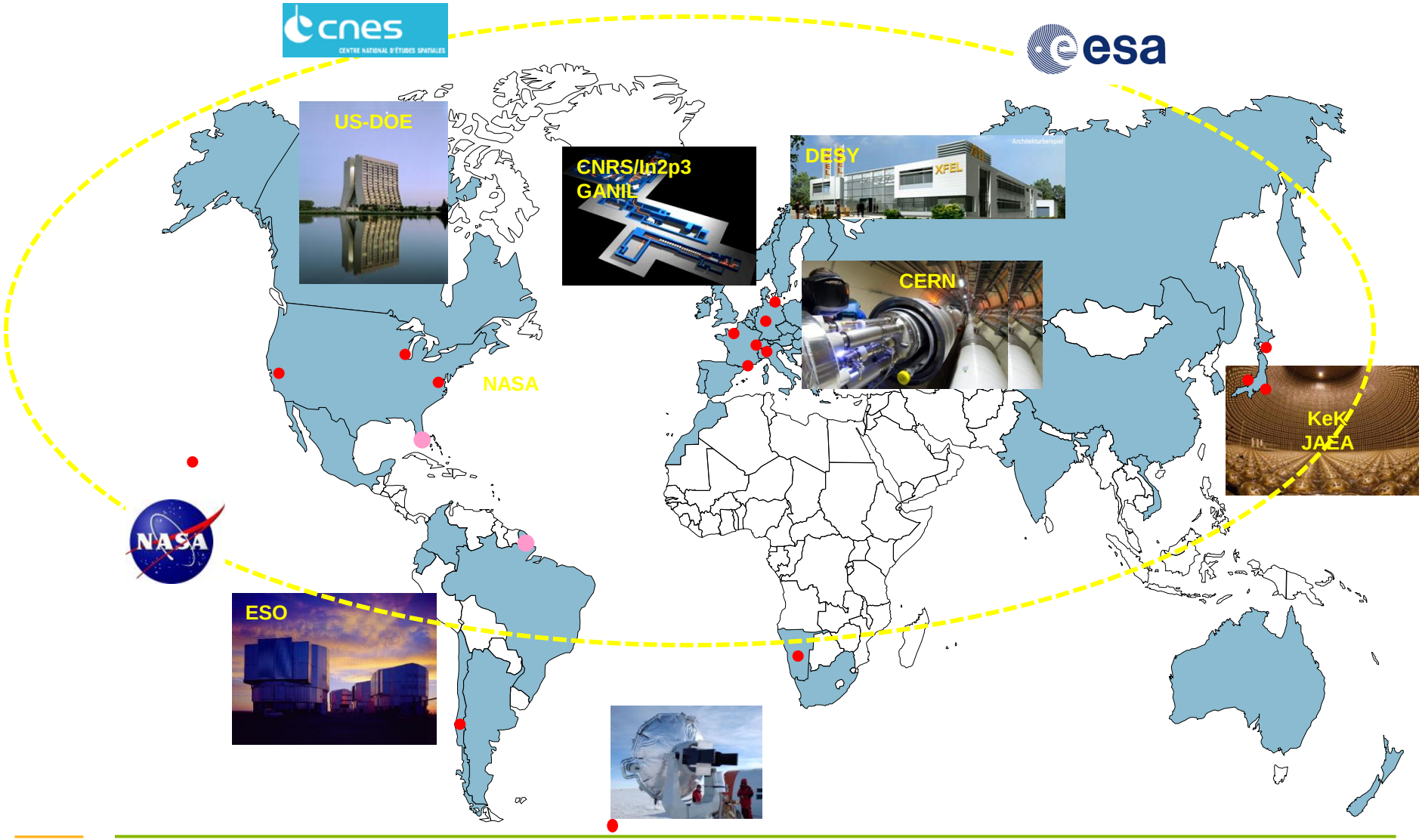
Services: Gérer les ressourc

Projet: Livrer l'instrument dans

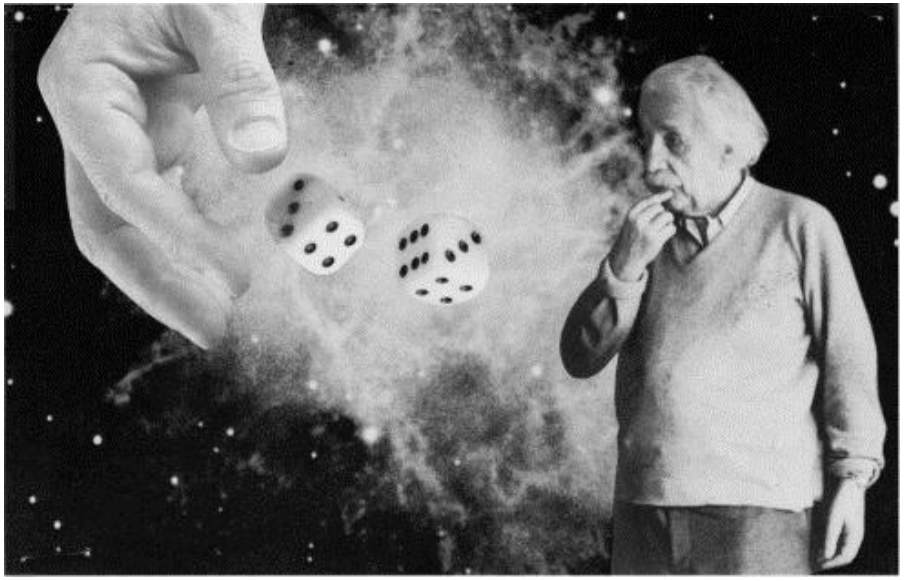
Direction: Allouer les ressourc

Think global…

Research projects inside large international programs
implying a collaboration with other French and foreign institutions

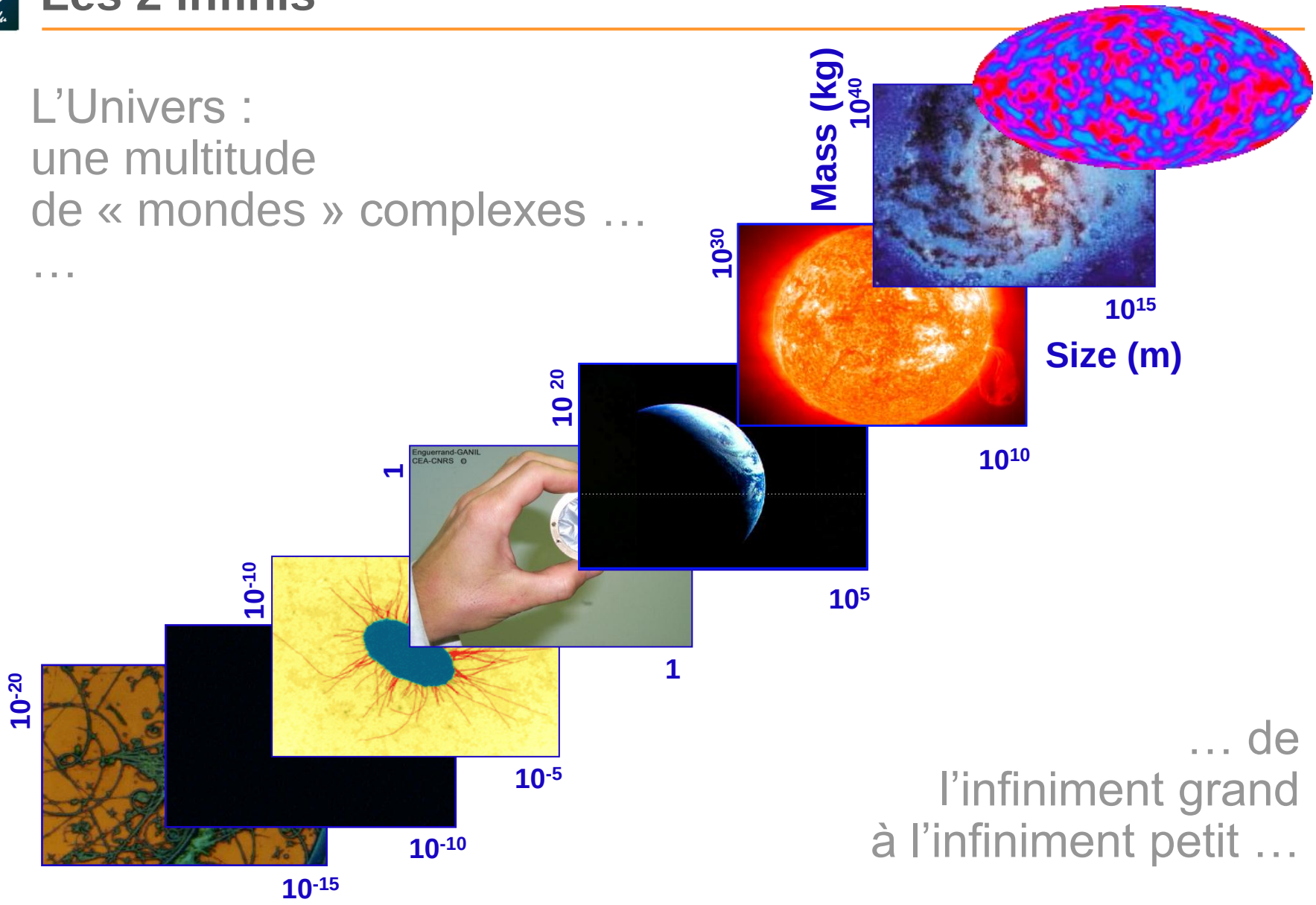


1 Univers
2 Infinis
4 grandes questions



Les 2 infinis

L'Univers :
une multitude
de « mondes » complexes …
…

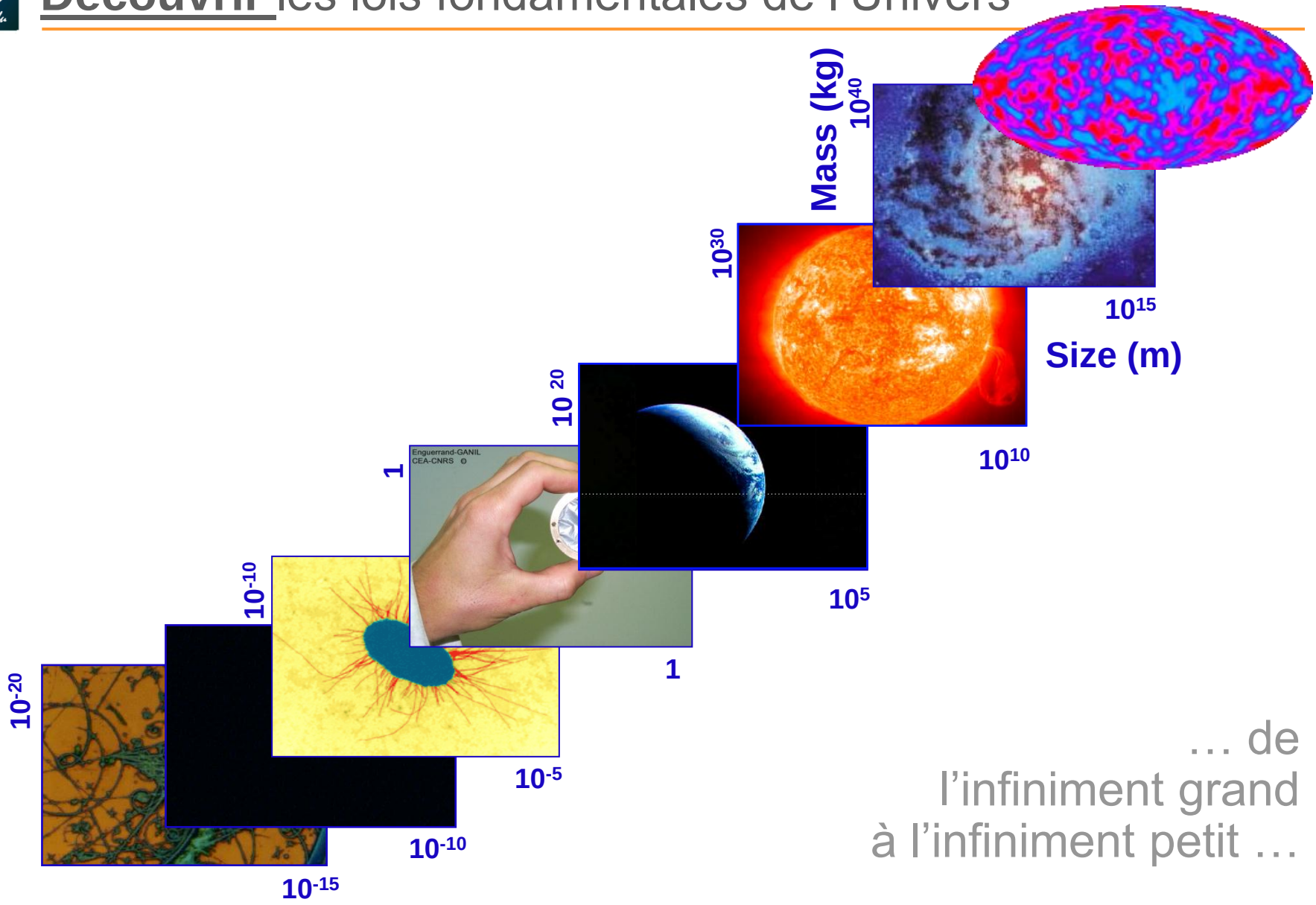


… de
l'infiniment grand
à l'infiniment petit …

Les 2 infinis

… qui évoluent sous l'action de 4 forces.

Découvrir les lois fondamentales de l'Univers



… de
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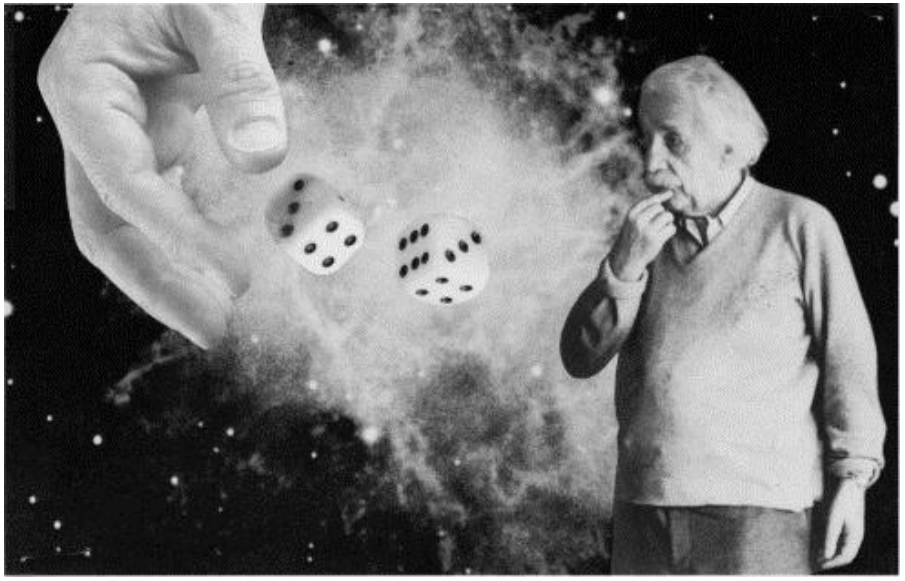
1 Univers

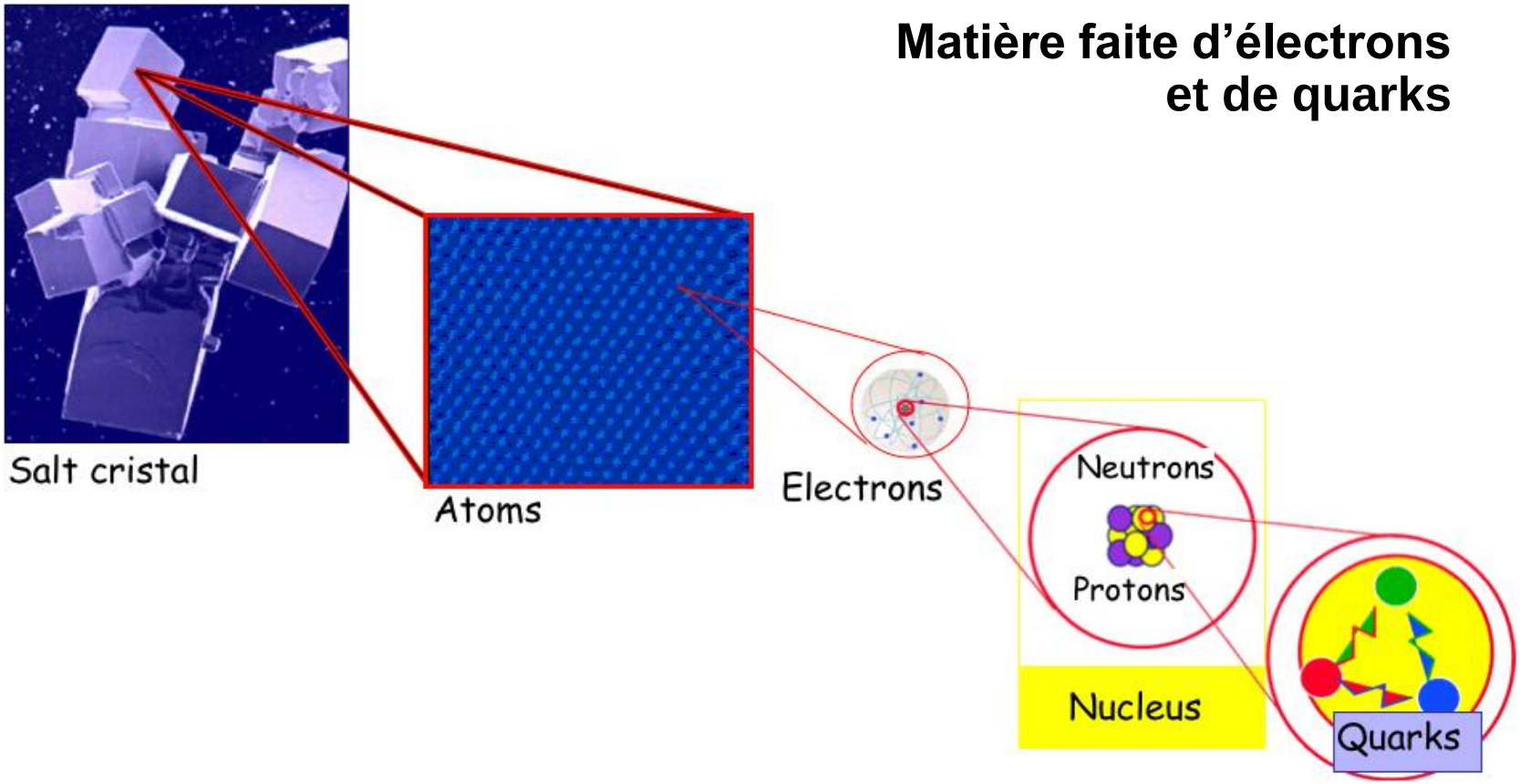
2 Infinis

4 grandes questions

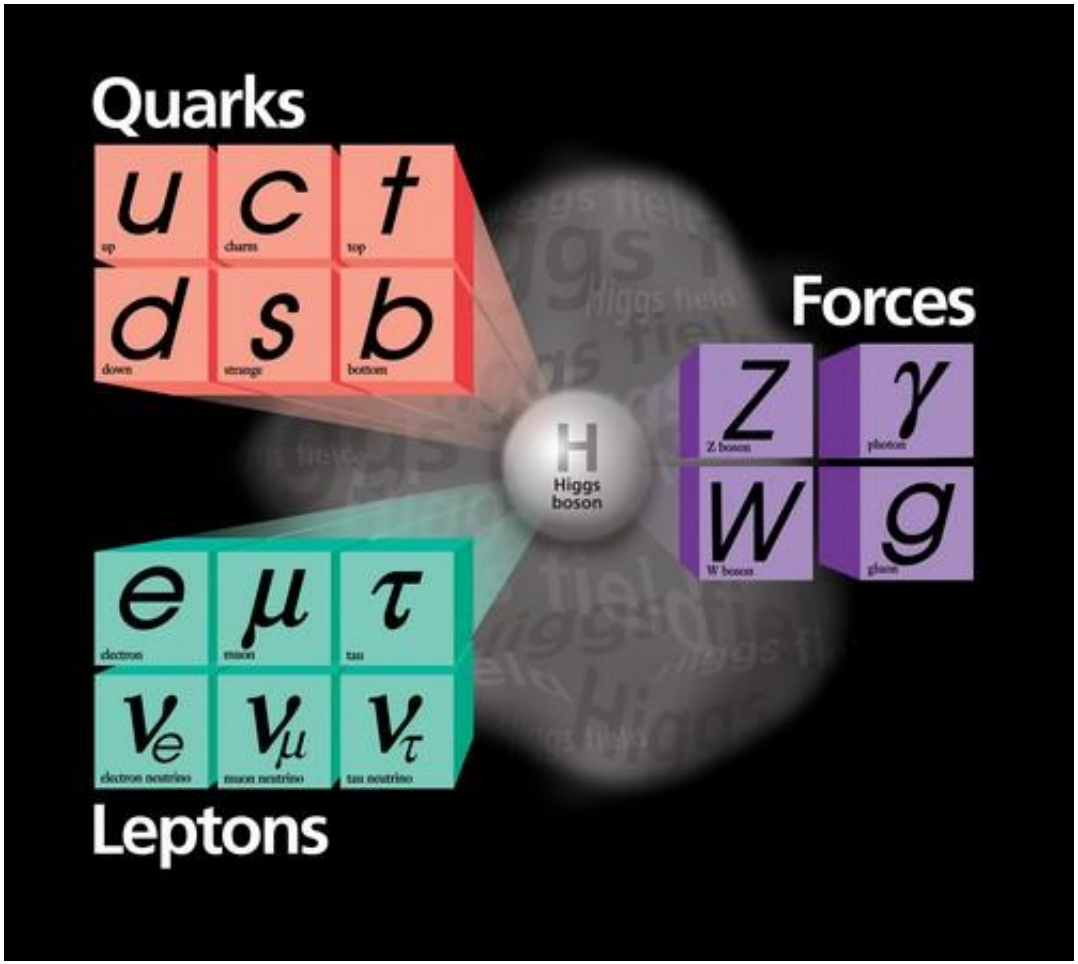


1) Quels sont les constituants élémentaires ?

Matière faite d'électrons et de quarks

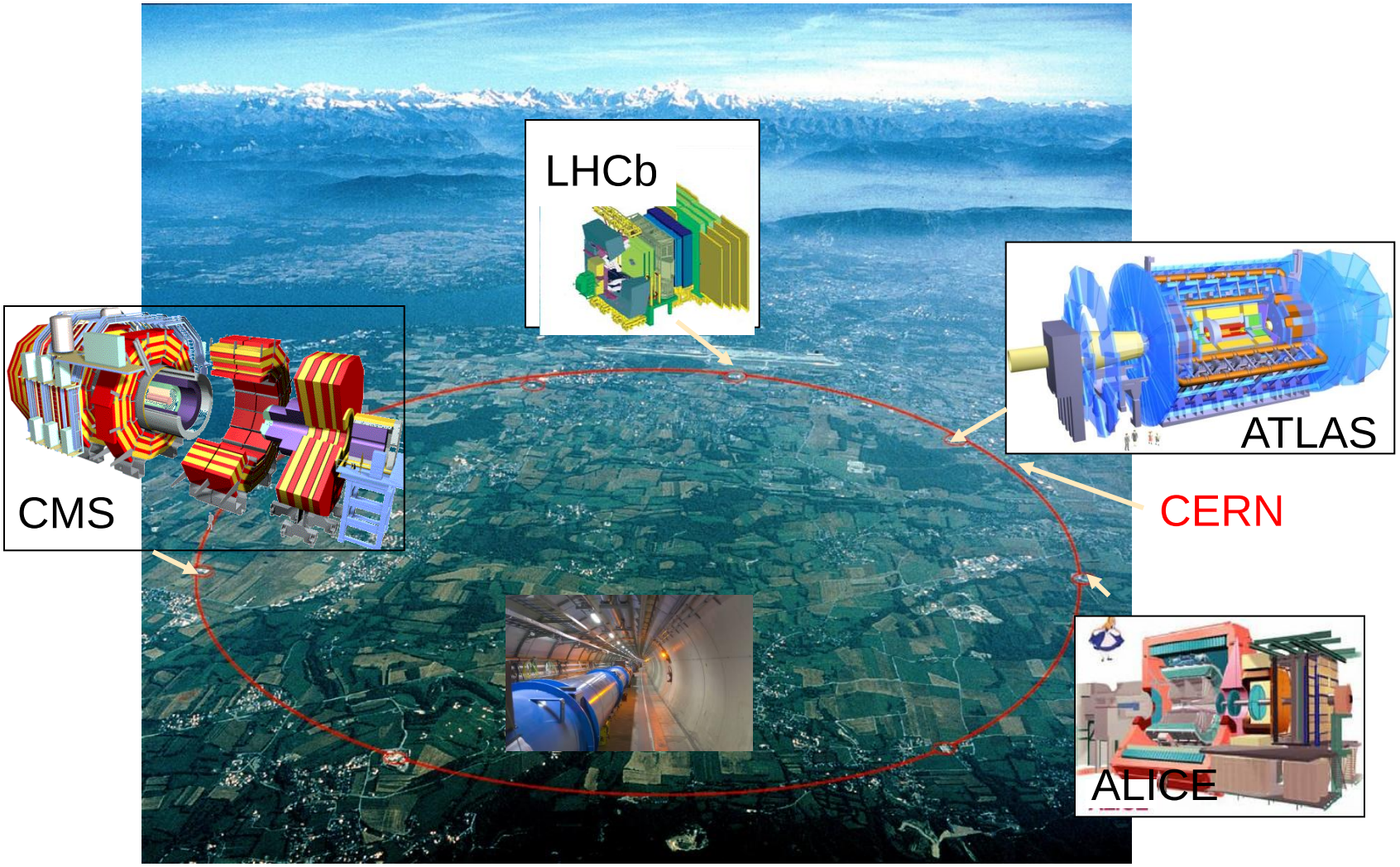


1) Quels sont les constituants élémentaires ?

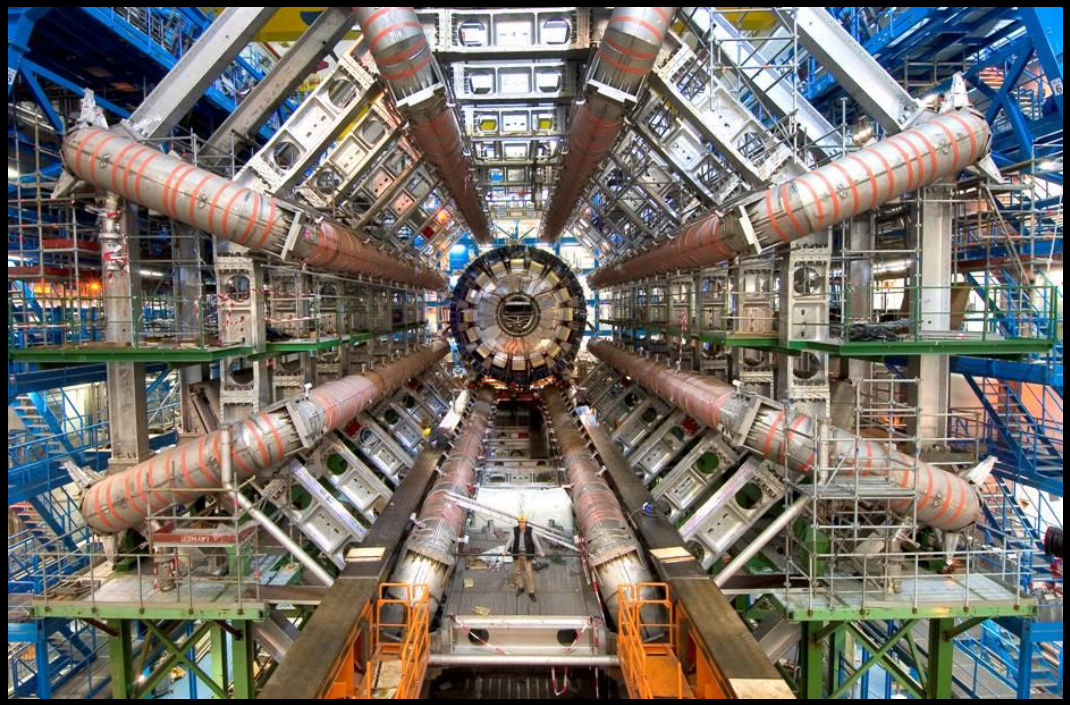


- Model Standard et boson de Higgs
- Propriétés des neutrinos

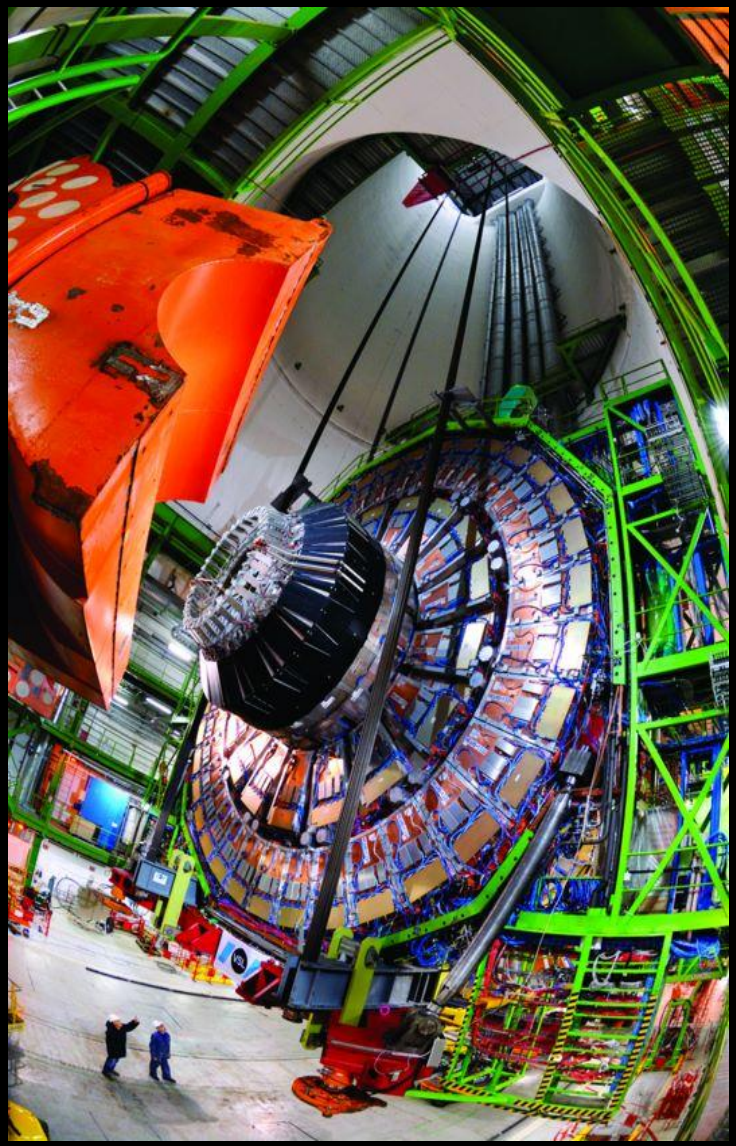
Le LHC



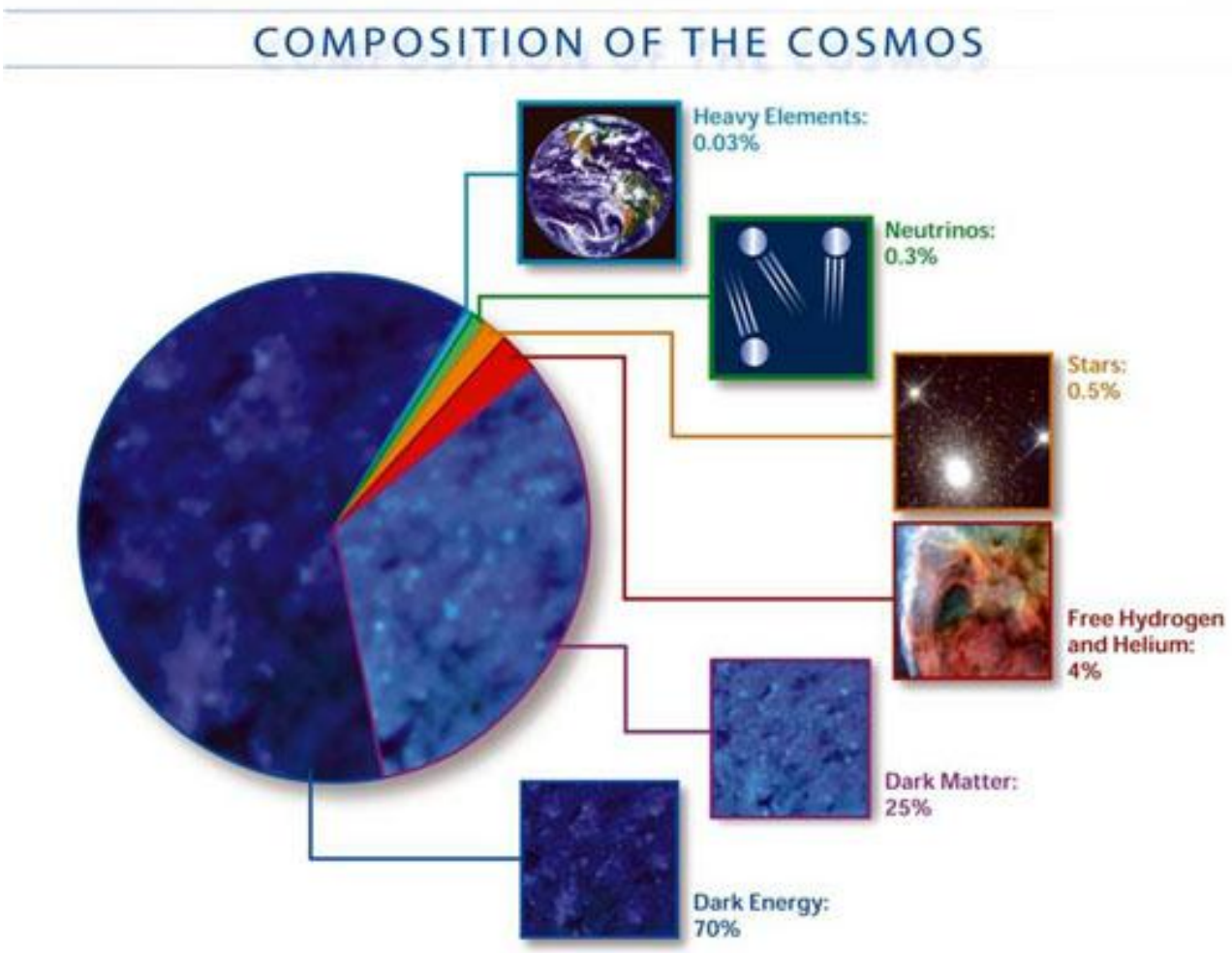
ATLAS



CMS



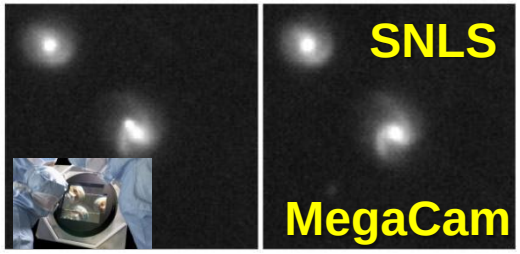
2) Quel est le contenu énergétique de l'Univers ?



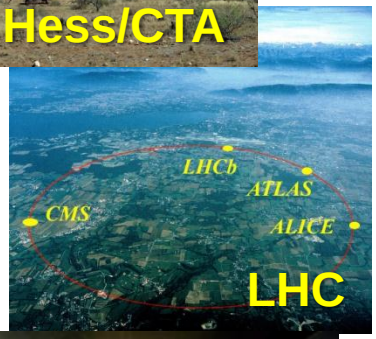
- Univers sombre : matière noire, énergie noire
- Asymétrie matière / antimatière

Univers sombre : une priorité pour la recherche

Supernovae :
Vitesses d'expansion

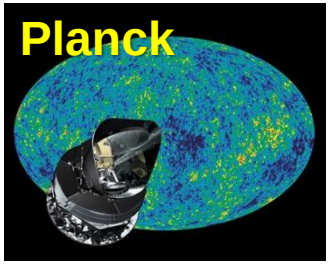


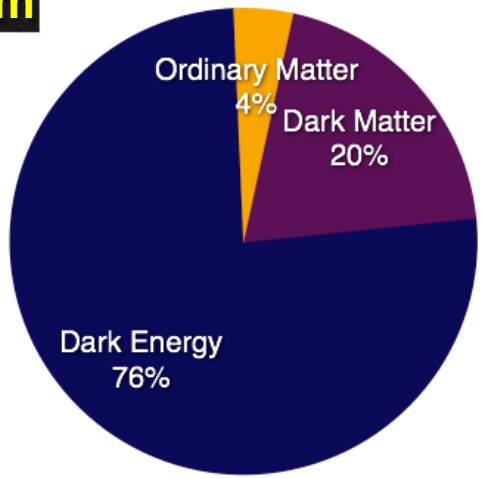
Collision de matière noire dans l'Univers



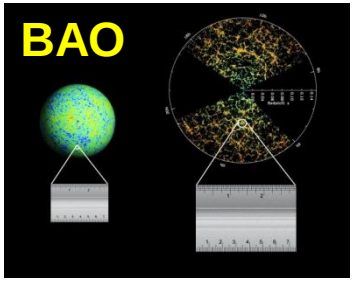
Nouvelles particules

Rayonnement fossile :
Fluctuations, géométrie

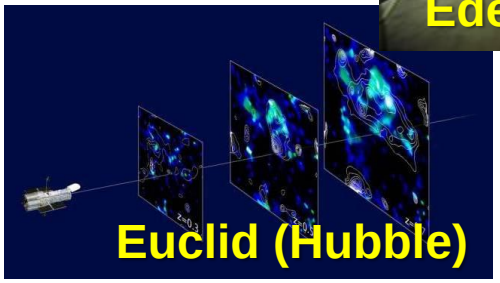




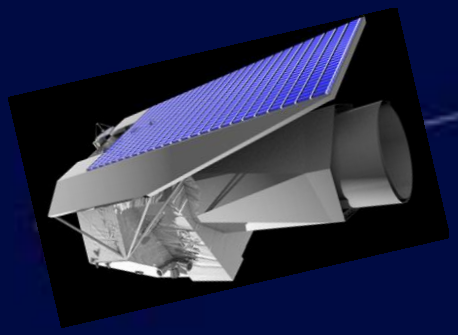
Particules cosmiques massives interagissant faiblement

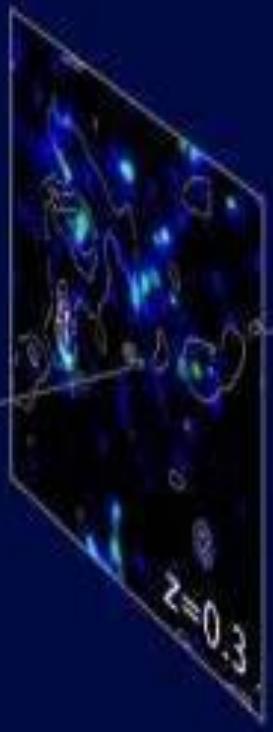


Oscillation acoustiques : Géométrie



Lentilles gravitationnelles : Distribution de matière noire

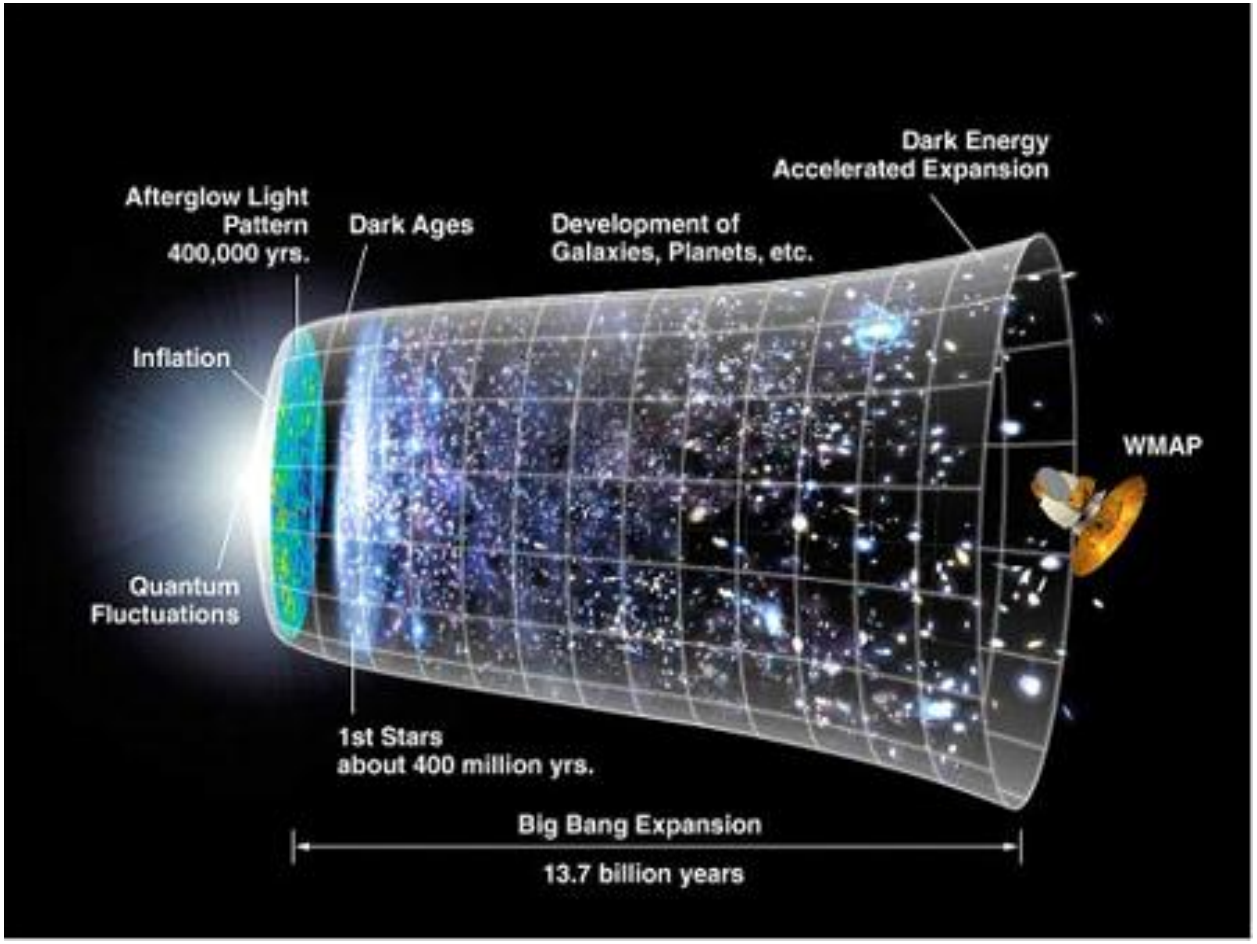



z=0.3

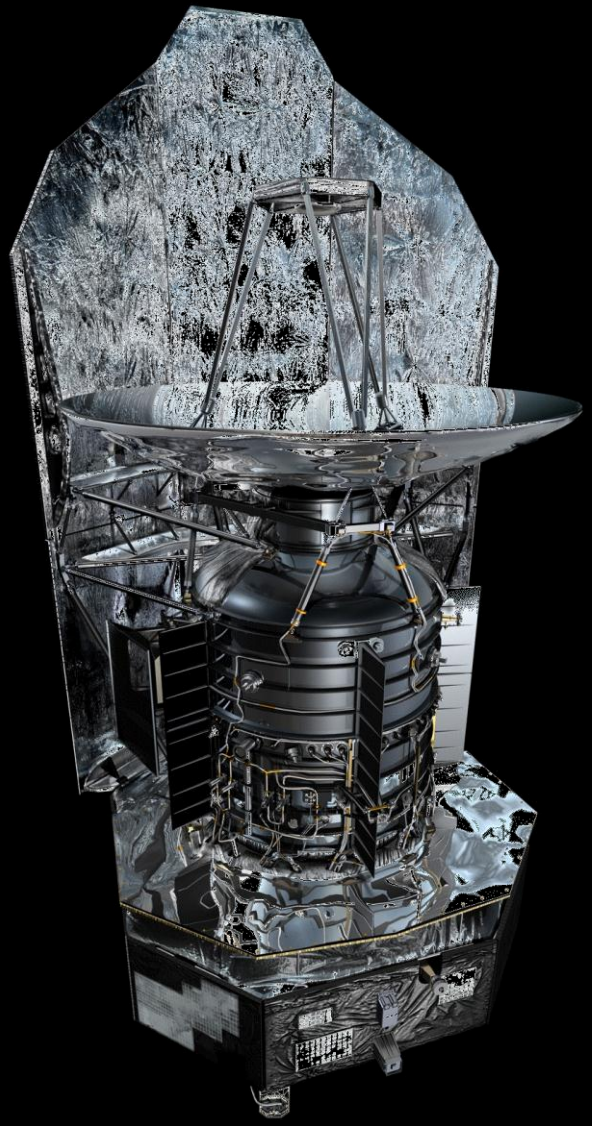

z=0.5


z=0.7

3) Comment l'Univers est-il structuré ?



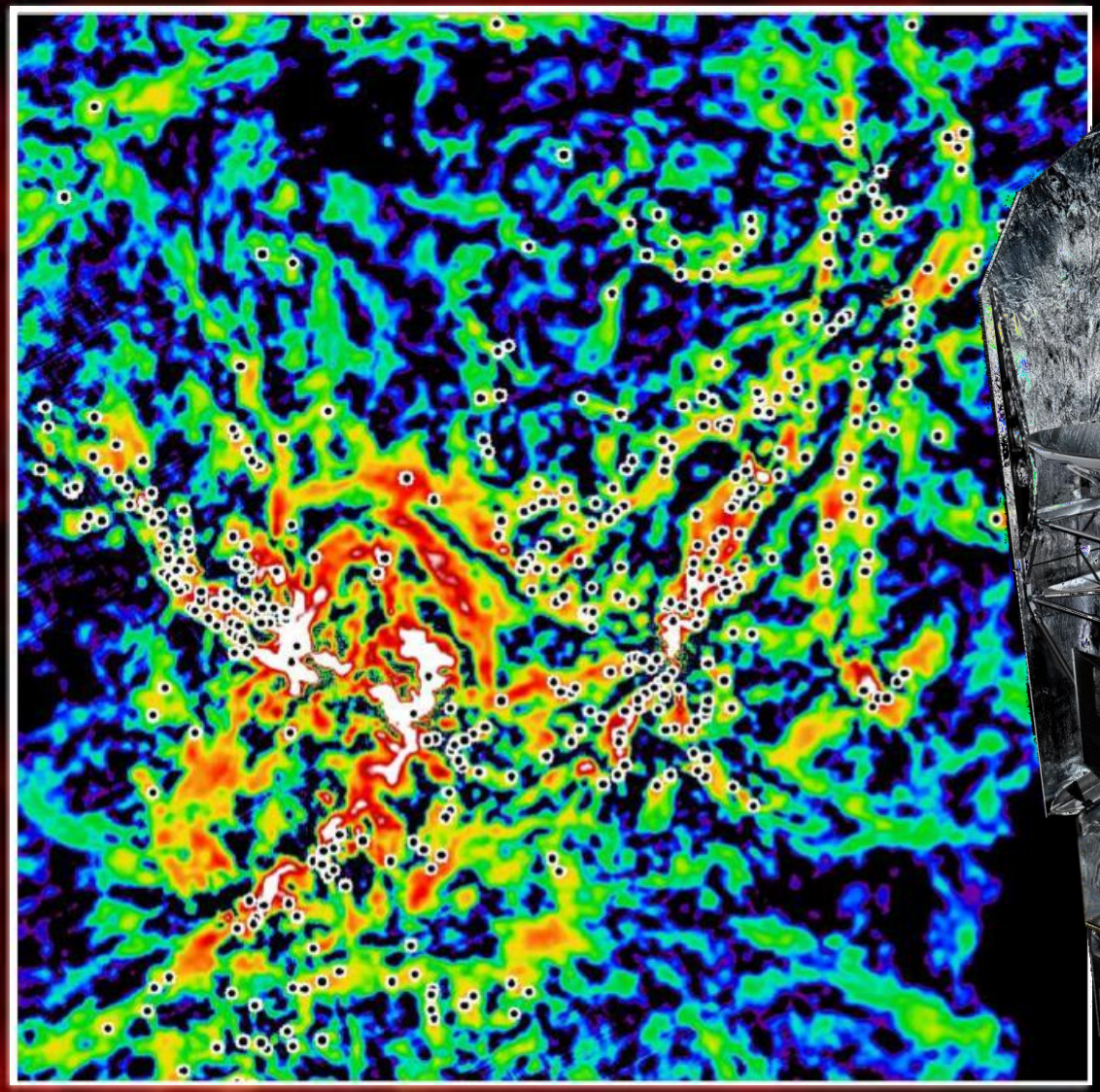
- Etoiles et galaxies
- Univers violent et trous noirs
- Rayons cosmiques

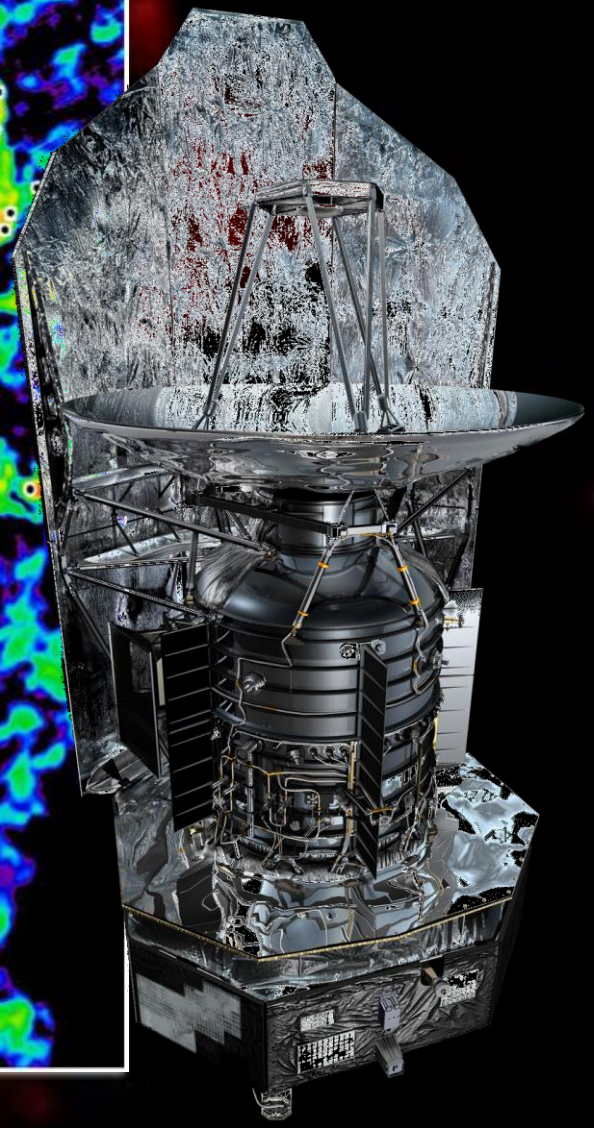


Naissance des étoiles dans des Filaments

Aquila as seen by Herschel

Naissance des étoiles dans des Filaments

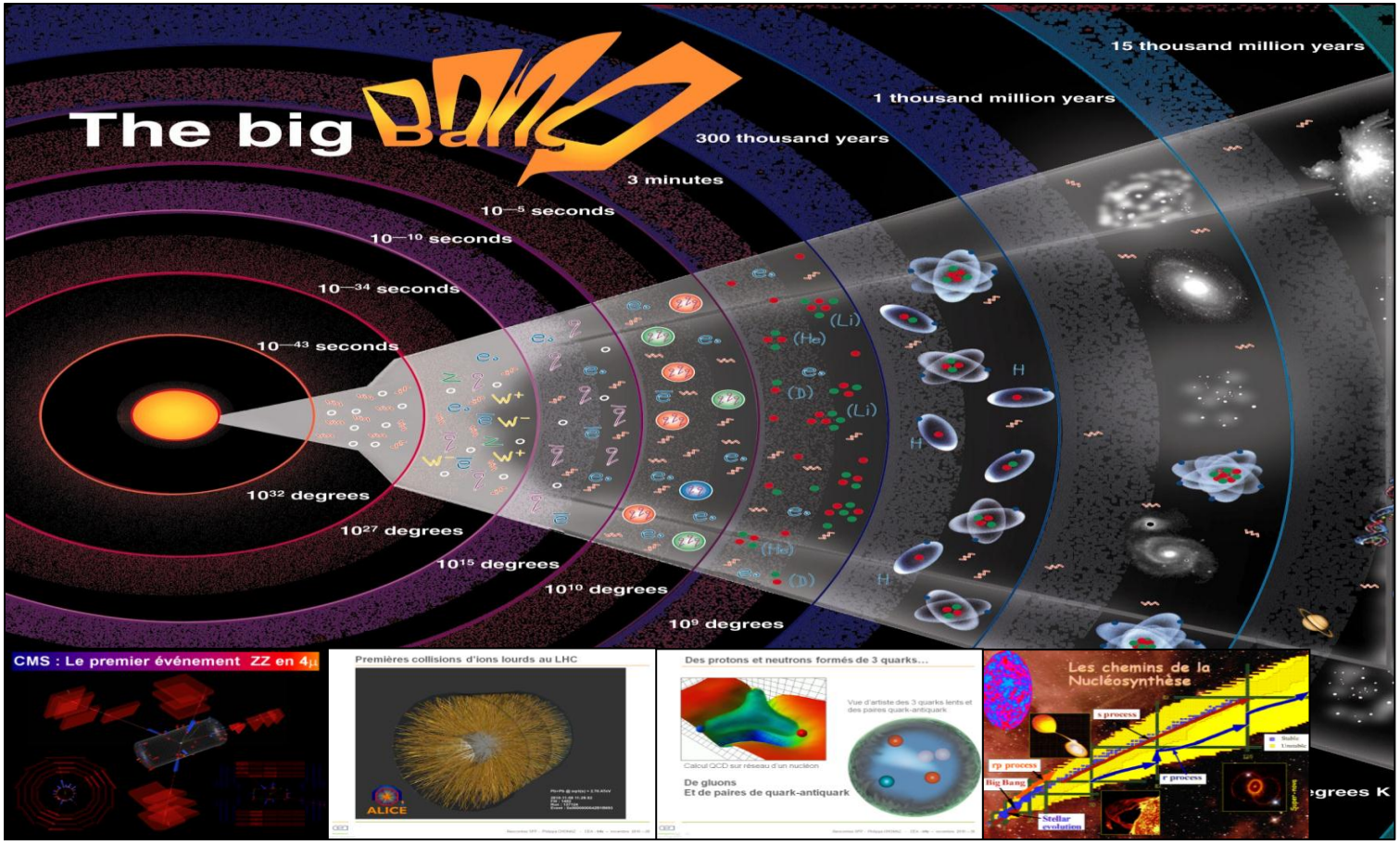




Aquila as seen by Herschel

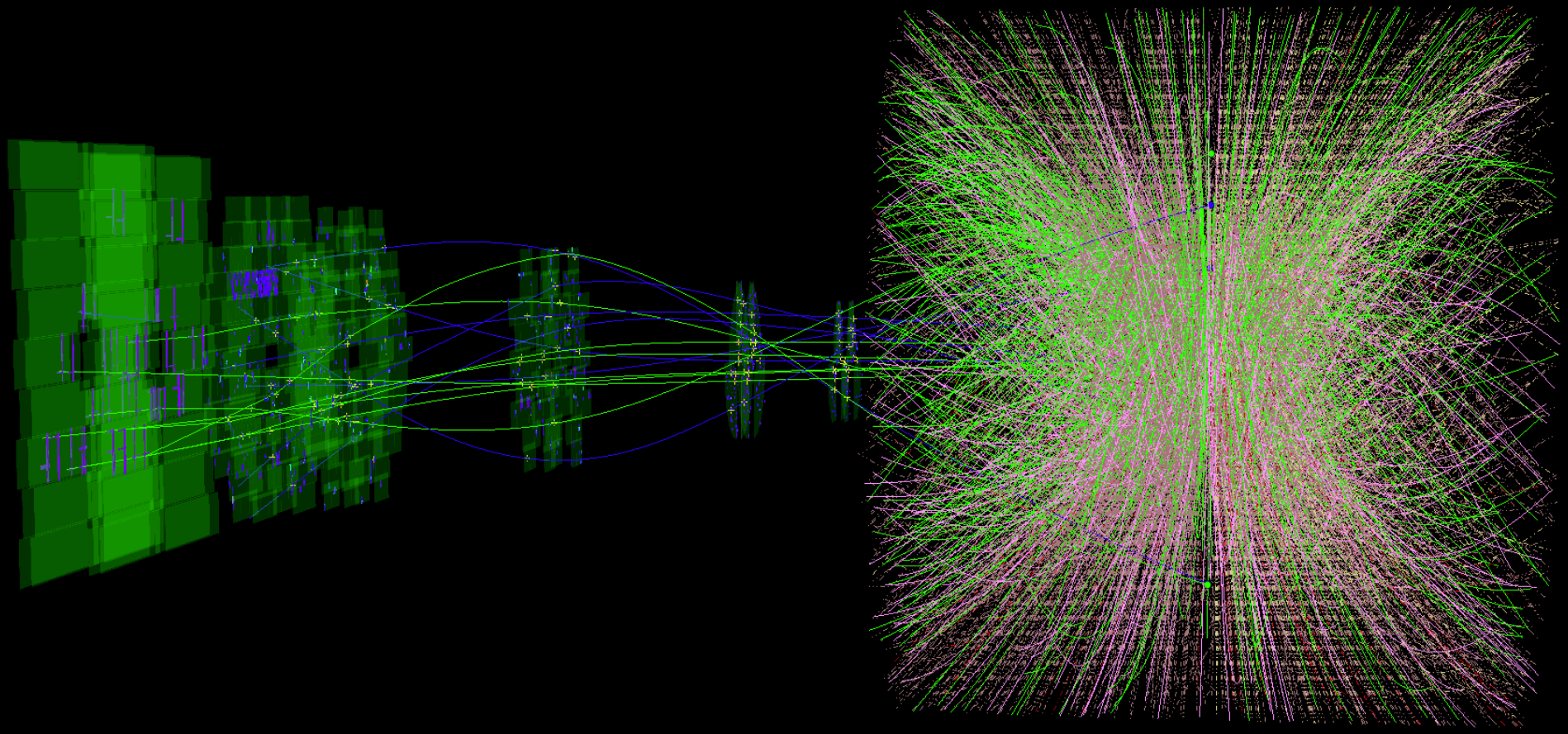
Simulation de collision de galaxies

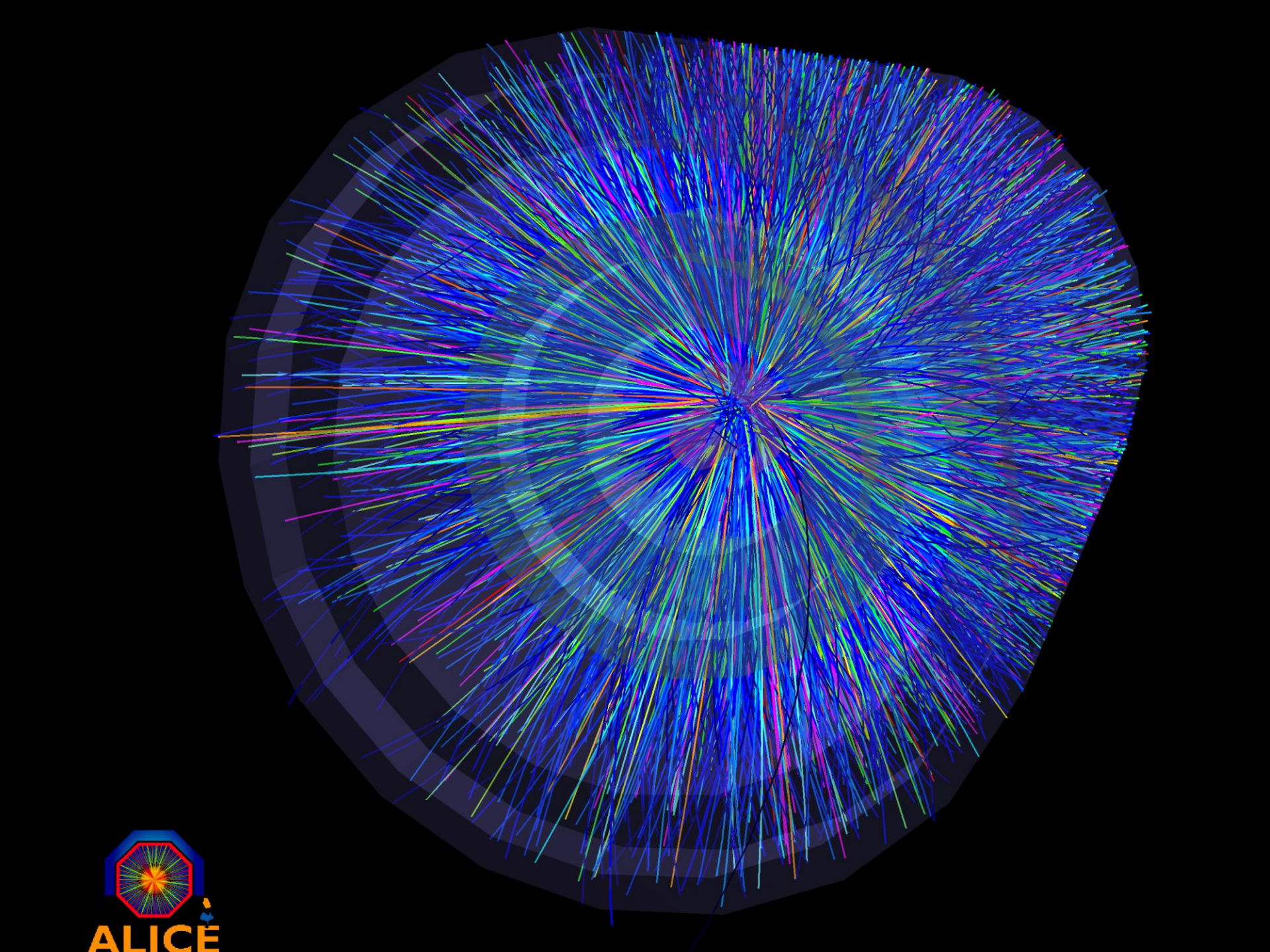
4) Comment les noyaux et particules sont-ils formés ?



- Plasma de quarks et de gluons
- Noyaux exotiques

Alice 2010 Pb+Pb LHC




ALICE

4 grandes questions fondamentales

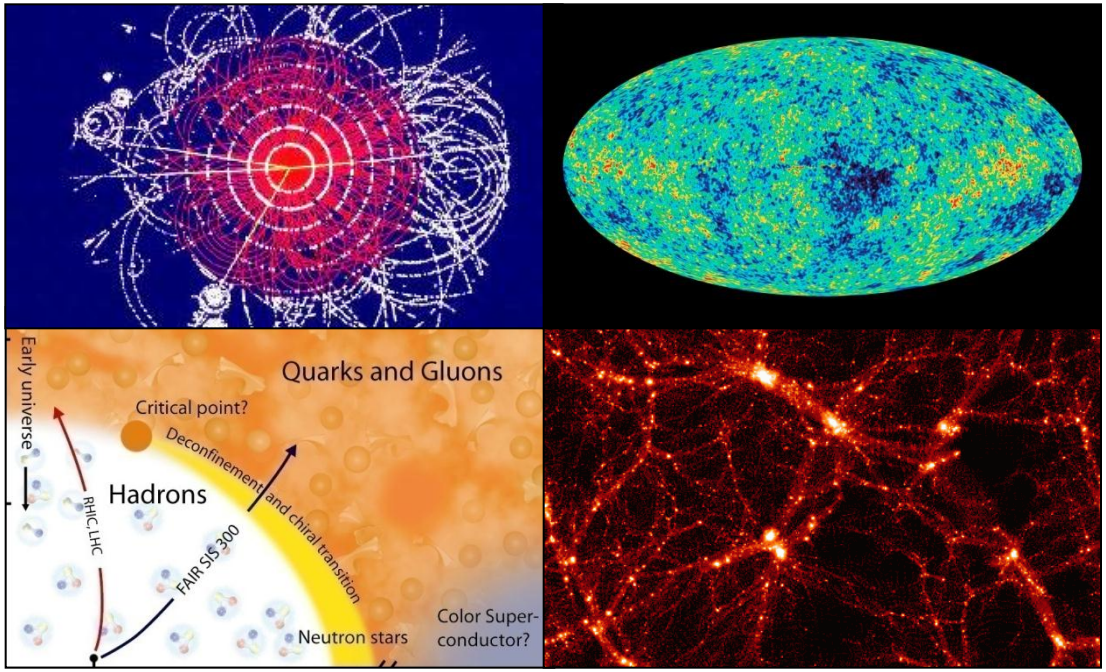
Quels sont les constituants ultime de la matière ?

Quel est le contenu énergétique de l'Univers ?

Infiniment petit → *Infiniment grand*

élémentaire

Complexe



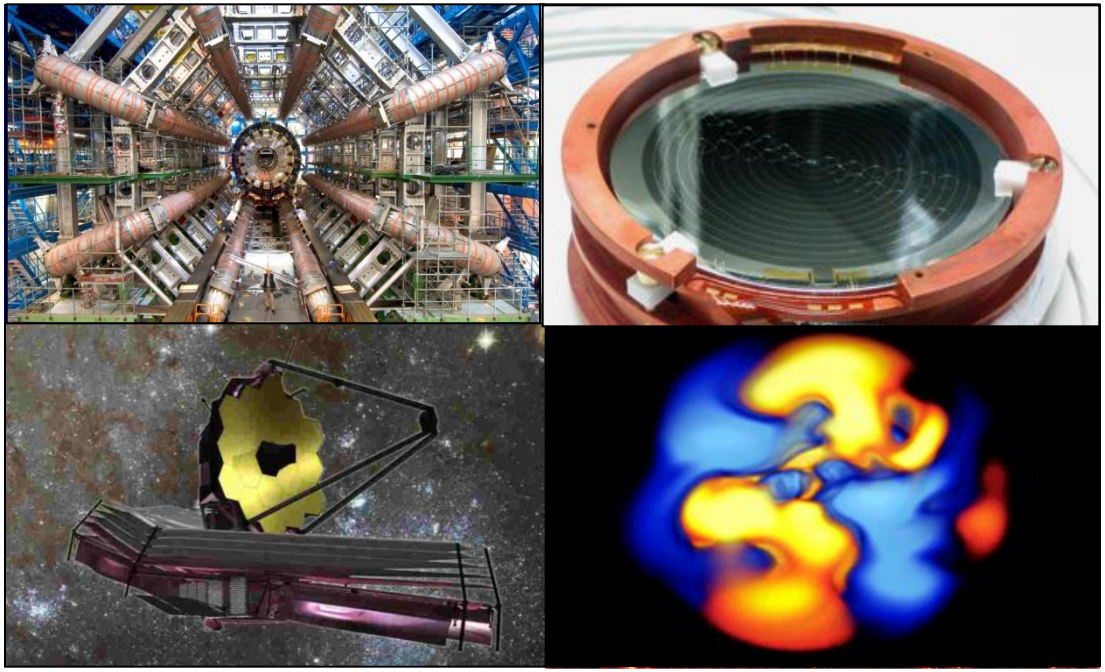
Comment les particules et noyaux se sont-ils formés ?

Comment l'Univers s'est-il structuré ?

Quatre axes technologiques

Manipuler les rayonnements

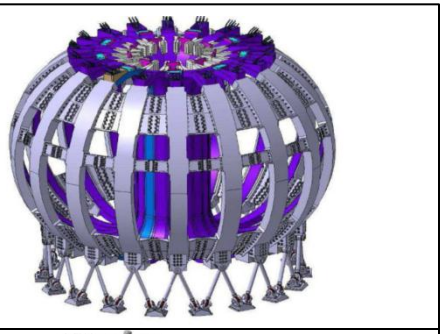
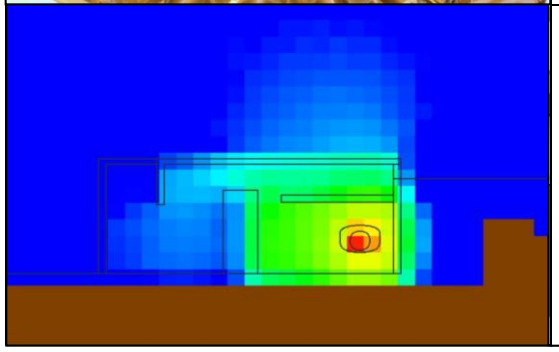
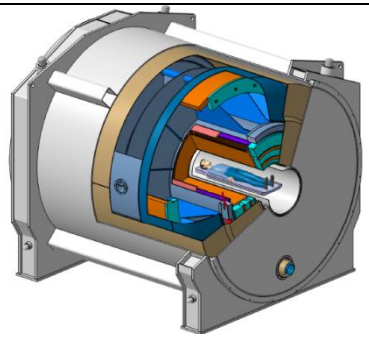
Détecter les rayonnements

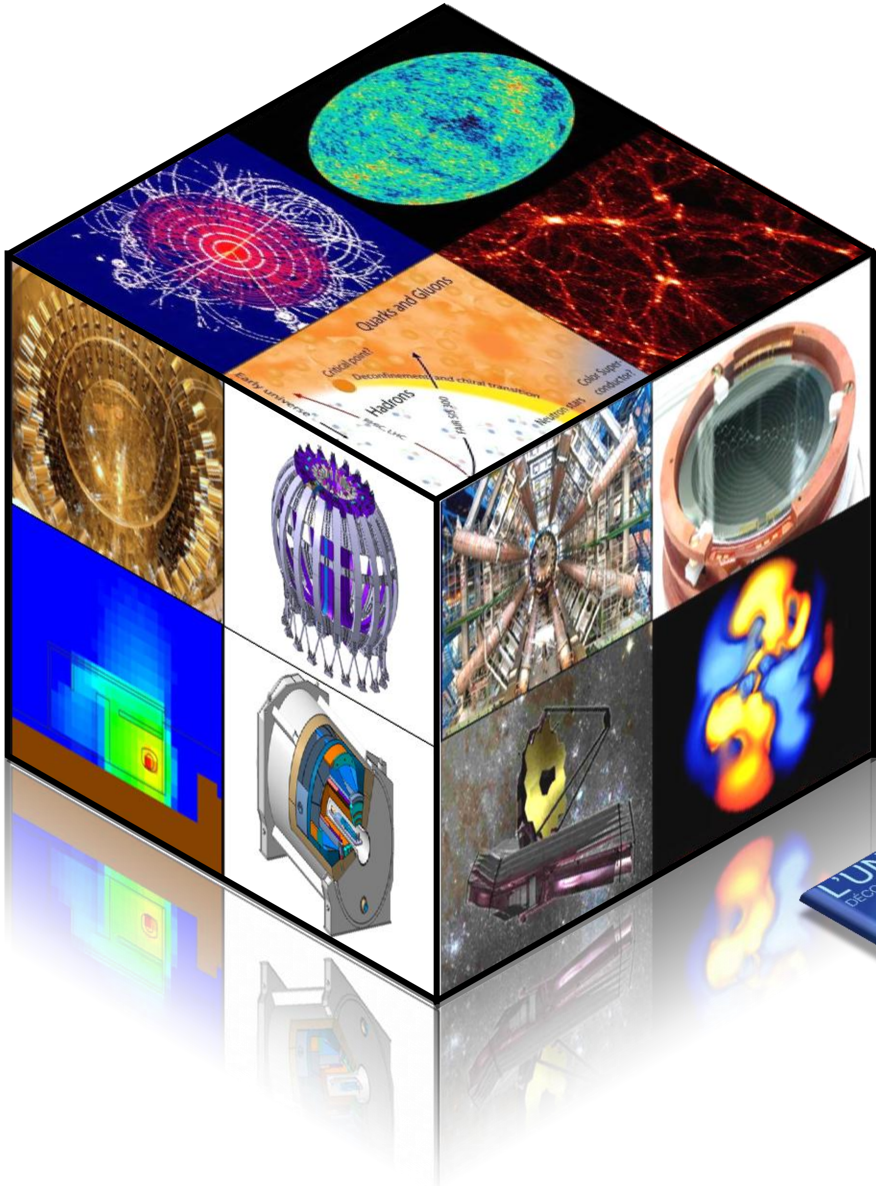


Observer l'Univers

Simuler l'Univers

Physique et technologie au service d'autres sciences

	Savoir	Savoir-Faire
Energie		
Très grands Equipements		


Quarks and Gluons
Critical point!
Hadrons
Early universe
Neutron stars
Color Super-conductor!


L'UNIVERS
DÉCOUVREZ SES MYSTÈRES
ANNÉE MONDIALE DE
L'ASTRONOMIE
2009

Irfu

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Institut de recherche
sur les lois fondamentales
de l'Univers