

Space as Cosmic Laboratory

Andrea V. Macciò

New York University Abu Dhabi



جامعة نيويورك ابوظبي
NYU ABU DHABI

Dubai, November 7th 2017



NYU



Densities

Velocities

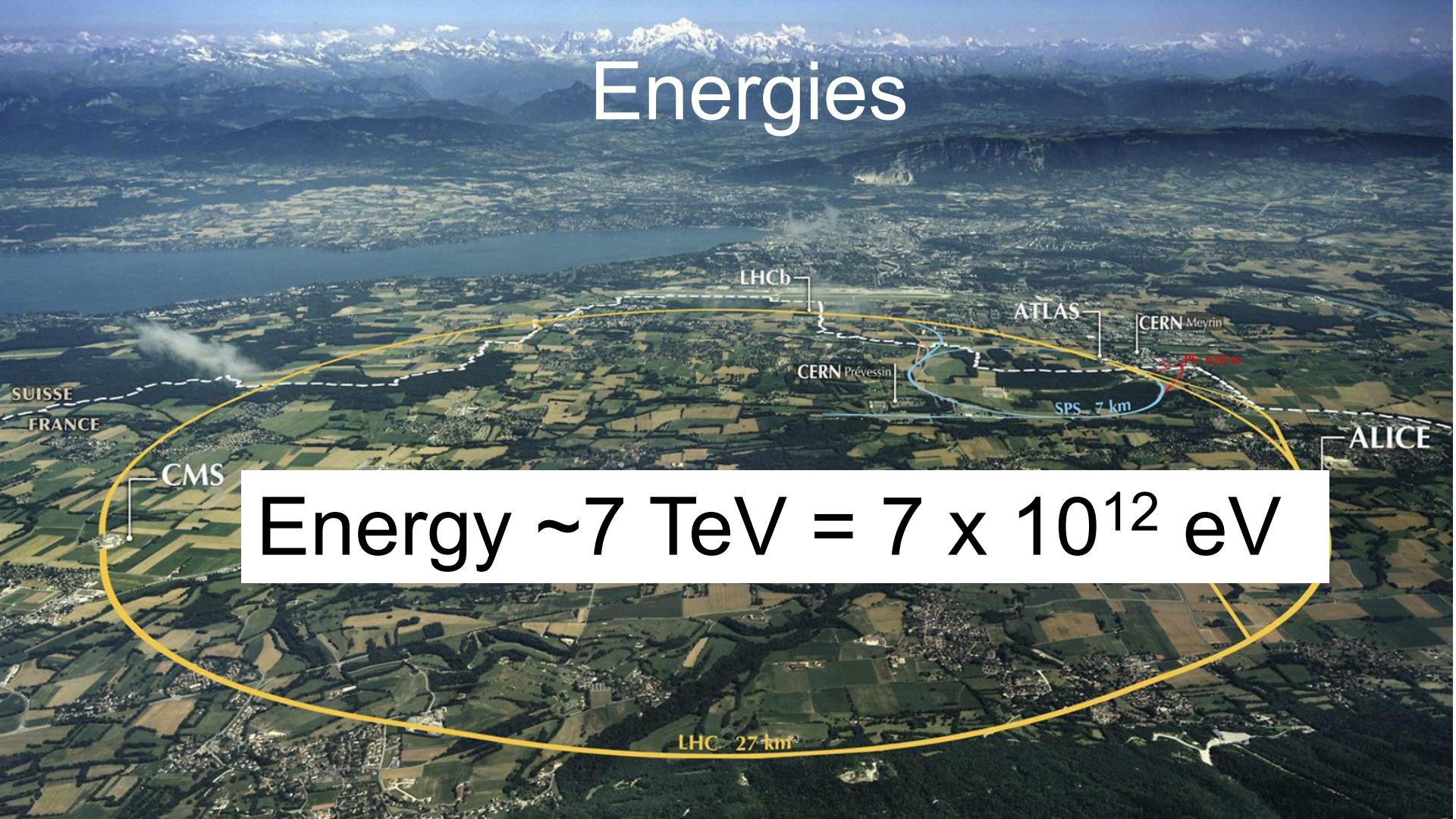
Energies

Masses

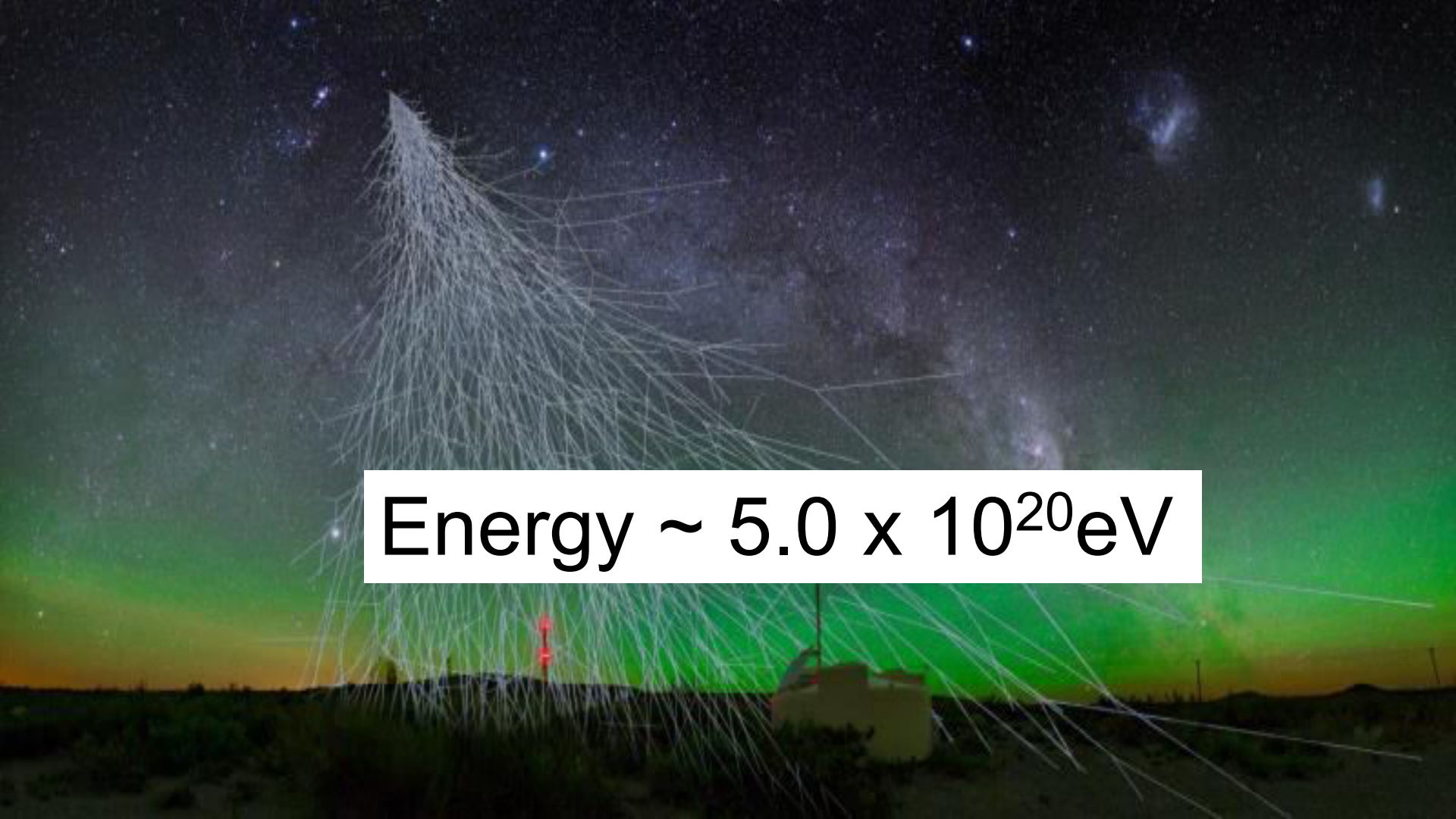
Magnetic Fields

Accelerations

Energies



Energy $\sim 7 \text{ TeV} = 7 \times 10^{12} \text{ eV}$

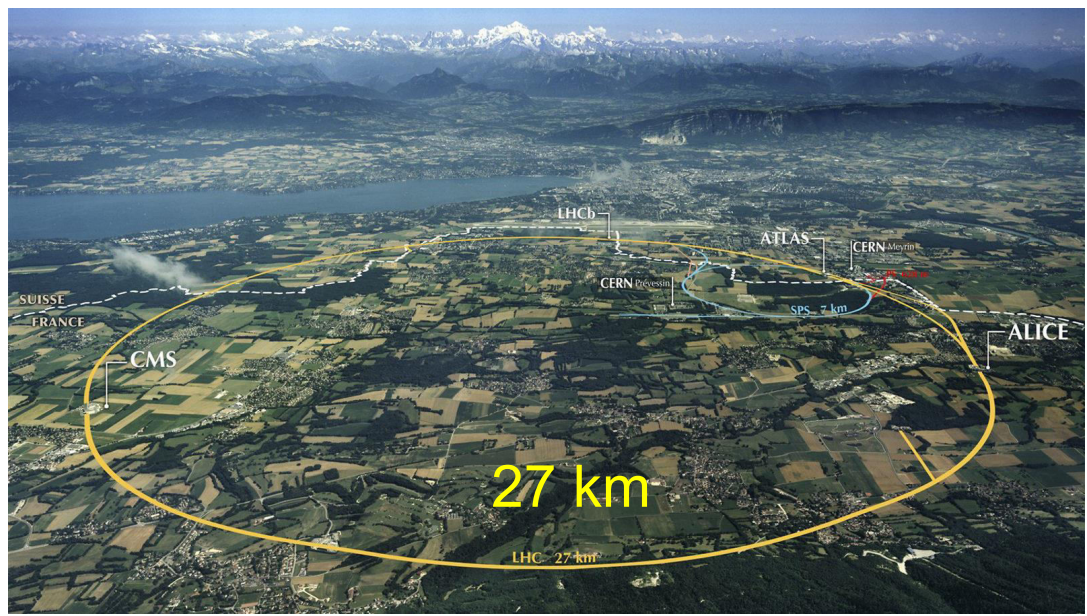


Energy $\sim 5.0 \times 10^{20}$ eV

Earth: 7×10^{12} eV

Space: 5×10^{20} eV

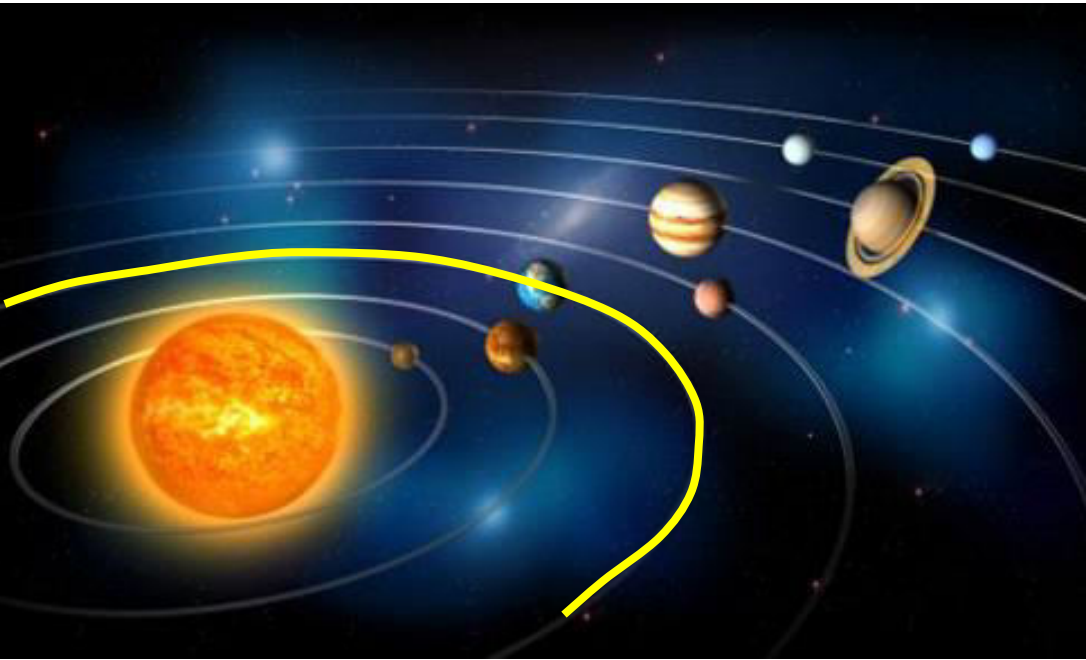
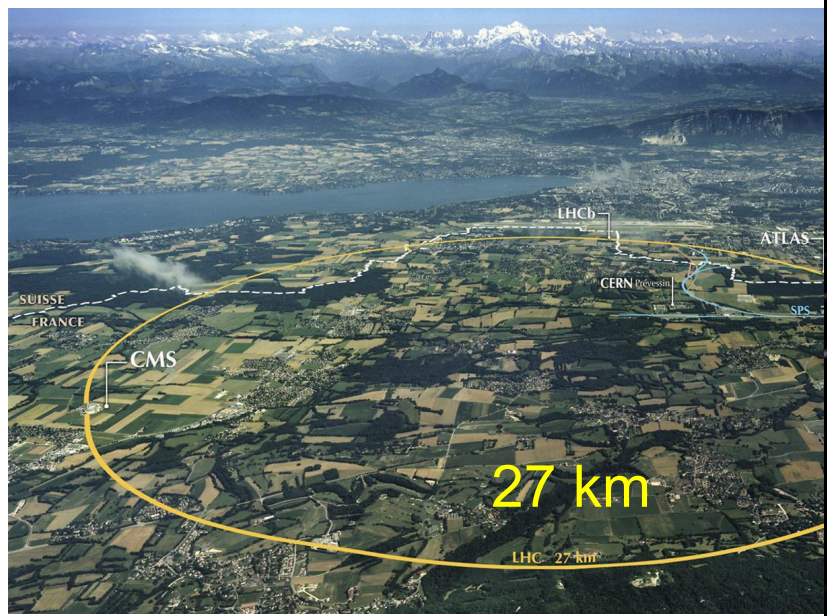
8 orders of magnitude



Earth: 7×10^{12} eV

Space: 5×10^{20} eV

8 orders of magnitude



Earth: 7×10^{12} eV

Space: 5×10^{20} eV

8 orders of magnitude



Densities

Velocities

Basic Research should

be at the core of space exploration/exploitation

Magnetic Fields

Energies

Masses

Accelerations

A deep field image of the universe, showing a vast field of galaxies and stars against a black background. The galaxies are of various shapes and colors, including yellow, orange, and blue. The stars are small, bright points of light, some with diffraction spikes. The overall scene is a rich, multi-colored tapestry of cosmic objects.

Basic Research should
be at the core of space
exploration/exploitation

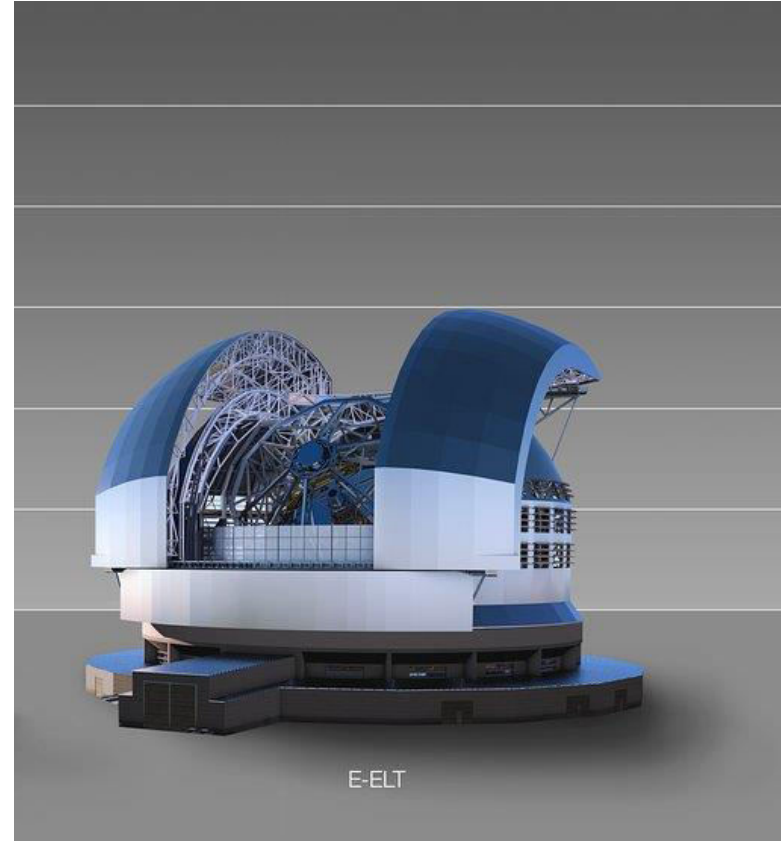
Ignorance is NOT a blessing!

A deep field image of the universe, showing a vast field of galaxies and stars against a black background. The galaxies are of various shapes and sizes, some appearing as bright, glowing clouds, while others are more distant and faint. The stars are scattered throughout the field, some appearing as bright, multi-pointed sources of light.

We know the nature of less
than 5% of the content of our Universe
Dark Matter and Dark Energy

Gravitational Waves
Origin of Cosmic Rays
Black Holes

Extreme Technological Challenges



Extreme Technological Challenges



SKA will generate 160 TByte
of data per second
(35,000 DVD per second)

Larger than current traffic
of **ALL** internet per second
(50 TByte/sec)

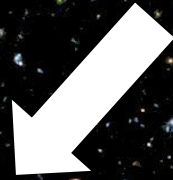
Square Kilometer Array (SKA)
Australia & South Africa

A deep field image of the universe, showing a vast field of galaxies and stars against a black background. The galaxies are of various shapes and sizes, including spiral, elliptical, and irregular forms, scattered across the frame. The stars appear as bright points of light, some with diffraction patterns. The overall scene is a rich, multi-colored tapestry of cosmic objects.

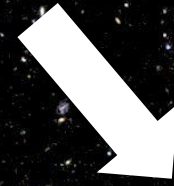
Basic, not 'applied' science,
is the driver for breakthrough discoveries
(and ROI)

Space Programs

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graph TD; A[Space Programs] --> B[Applied Science  
Space agencies  
Engineering]; A --> C[Basic Science  
Pure research  
Universities];
```



Applied Science
Space agencies
Engineering



Basic Science
Pure research
Universities

New York University Abu Dhabi



CubeSat
MBRSC & UAESA



Large observational
facilities



Galaxies & Black Holes

New York University Abu Dhabi

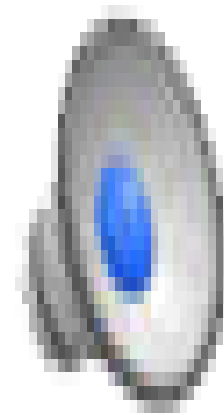
0.00 Gyr



NIHAO project - NYUAD / MPIA

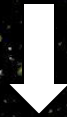
Galaxy in the making

Gas Temperature (Red=hot, Blue=cold)



Galaxy today

Basic Science
Pure Research

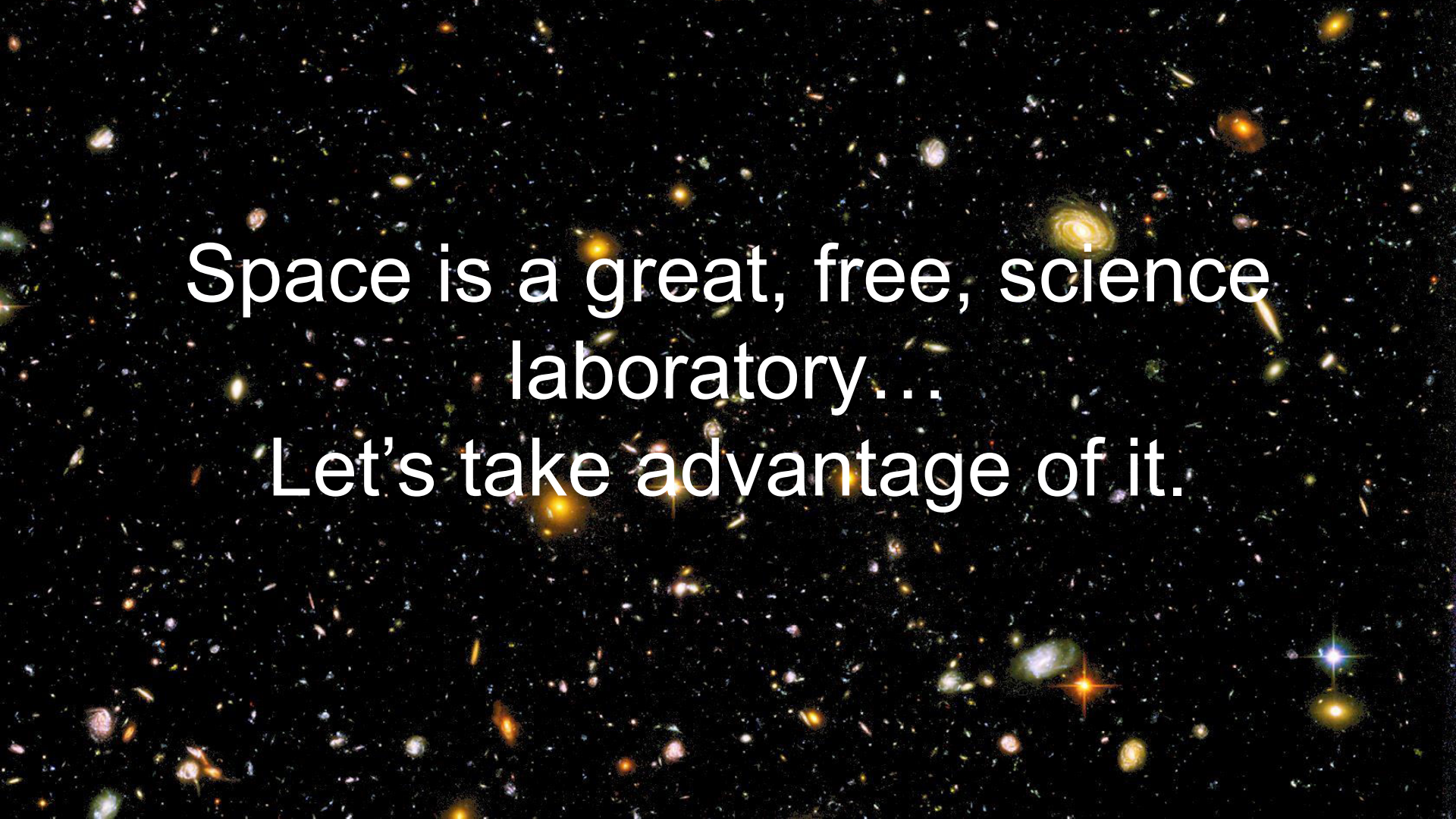


Educational training



Business opportunities

(besides the pride of participating in great discoveries)

A deep field image of the universe, showing a vast field of galaxies and stars against a black background. The galaxies are of various shapes and colors, including yellow, orange, and blue. The stars are small, bright points of light, some with diffraction spikes. The overall scene is a rich, multi-colored tapestry of cosmic objects.

Space is a great, free, science
laboratory...
Let's take advantage of it.

A vast field of galaxies, including spirals, ellipticals, and irregular shapes, in various colors like yellow, orange, blue, and purple, set against a black background. The galaxies are scattered across the frame, with some appearing larger and more detailed than others.

Thank you

A vast field of galaxies, including spirals, ellipticals, and irregular shapes, in various colors like yellow, orange, blue, and purple, set against a dark background. The galaxies are scattered across the frame, with some appearing larger and more detailed than others.

Thank you