

*L'Universo in Tasca - INFN
Racconti di fisica per la scuola sec. I grado*

12 maggio 2020

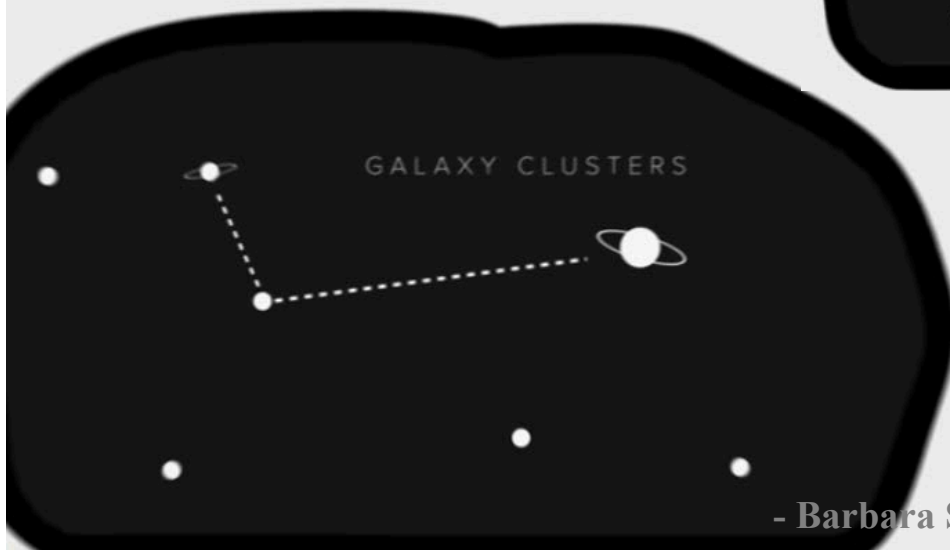
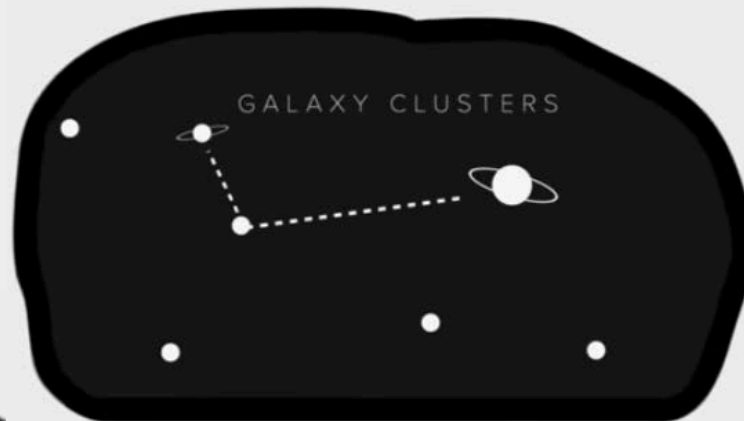
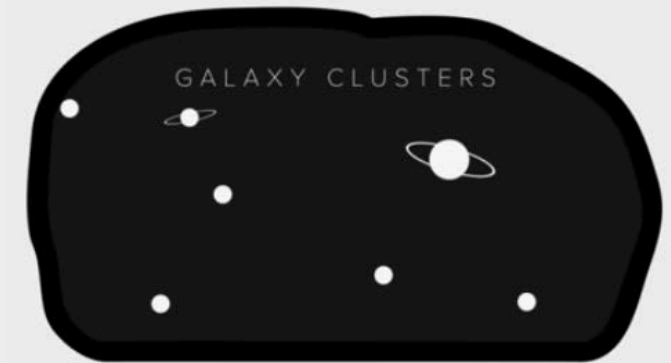
Sole e dintorni

*e del pianeta che ospita la vita come la
conosciamo e delle ricerche per trovarne altri*



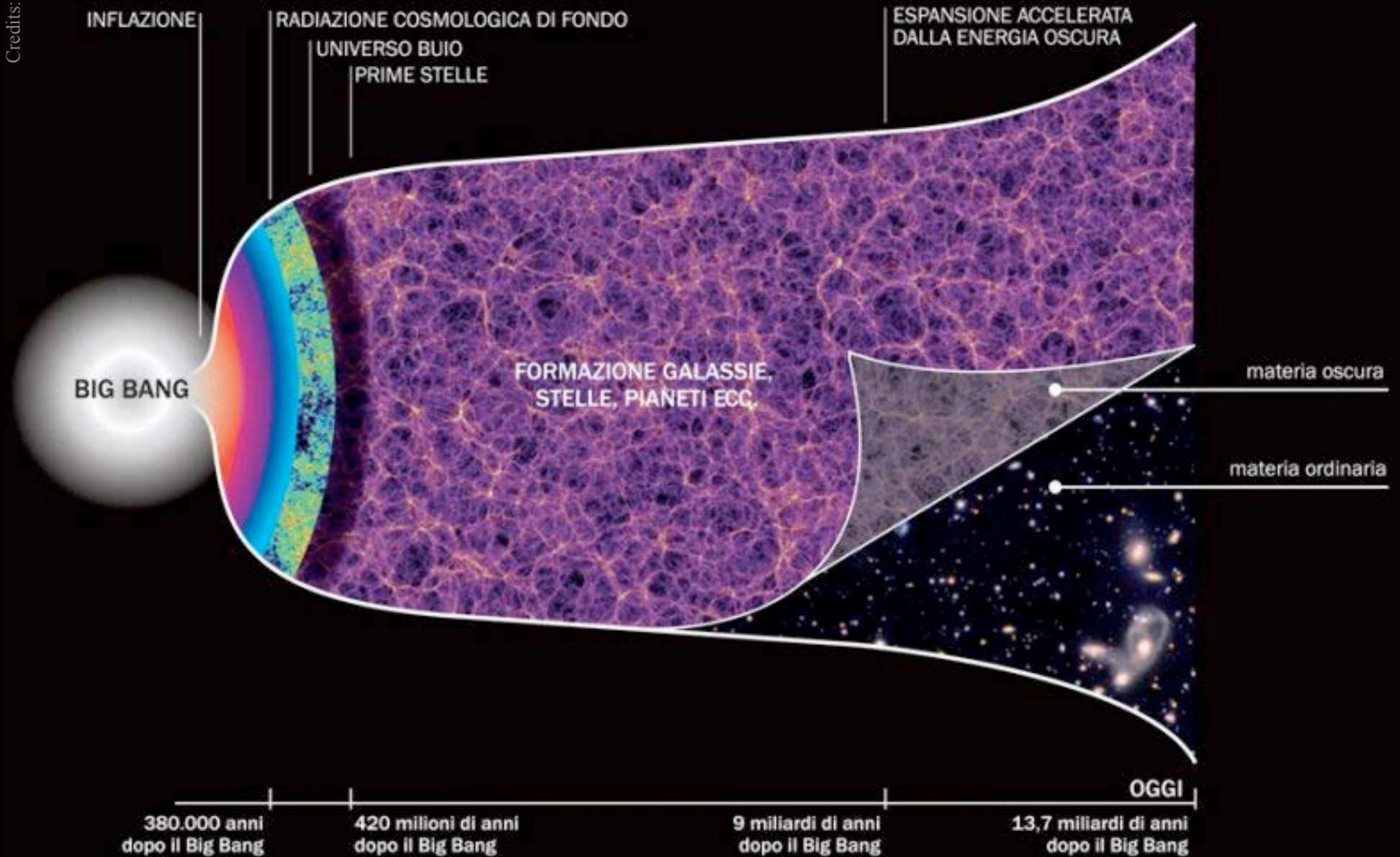


Espansione dell'Universo

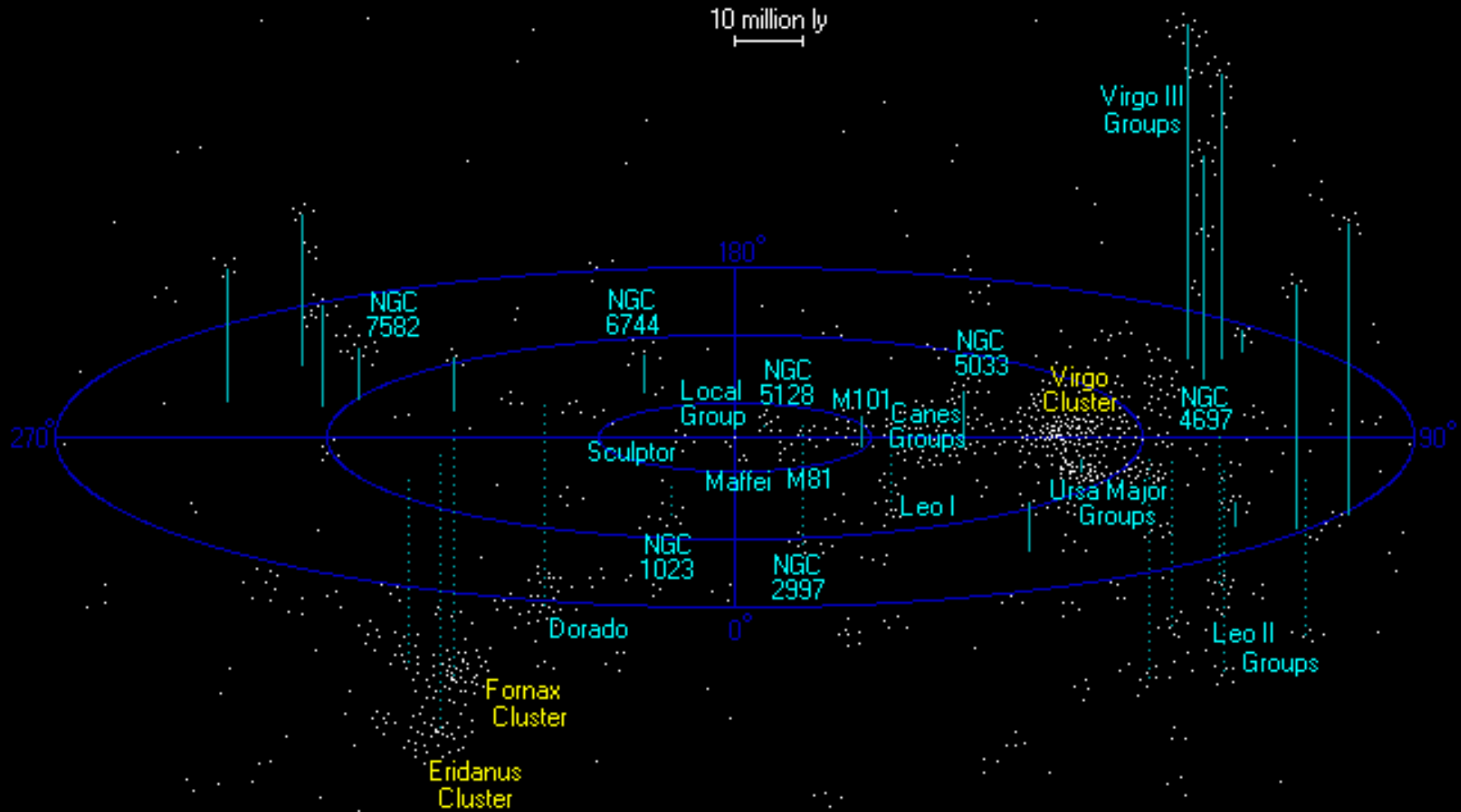


Modello Standard Cosmologico

Credits: Asimmetrie



Virgo supercluster



By Richard Powell, CC BY-SA 2.5, <https://commons.wikimedia.org/w/index.php?curid=4873071>

rpowell

Virgo cluster

By Chris Mihos (Case Western Reserve University)/ESO - <http://www.eso.org/public/images/eso0919a/>



- Barbara Sciascia (INFN) -

Gruppo locale

https://it.wikipedia.org/wiki/Gruppo_Locale



M 110

NGC 147

NGC 185

Andromeda



Milky Way



Triangulum



NGC 6822



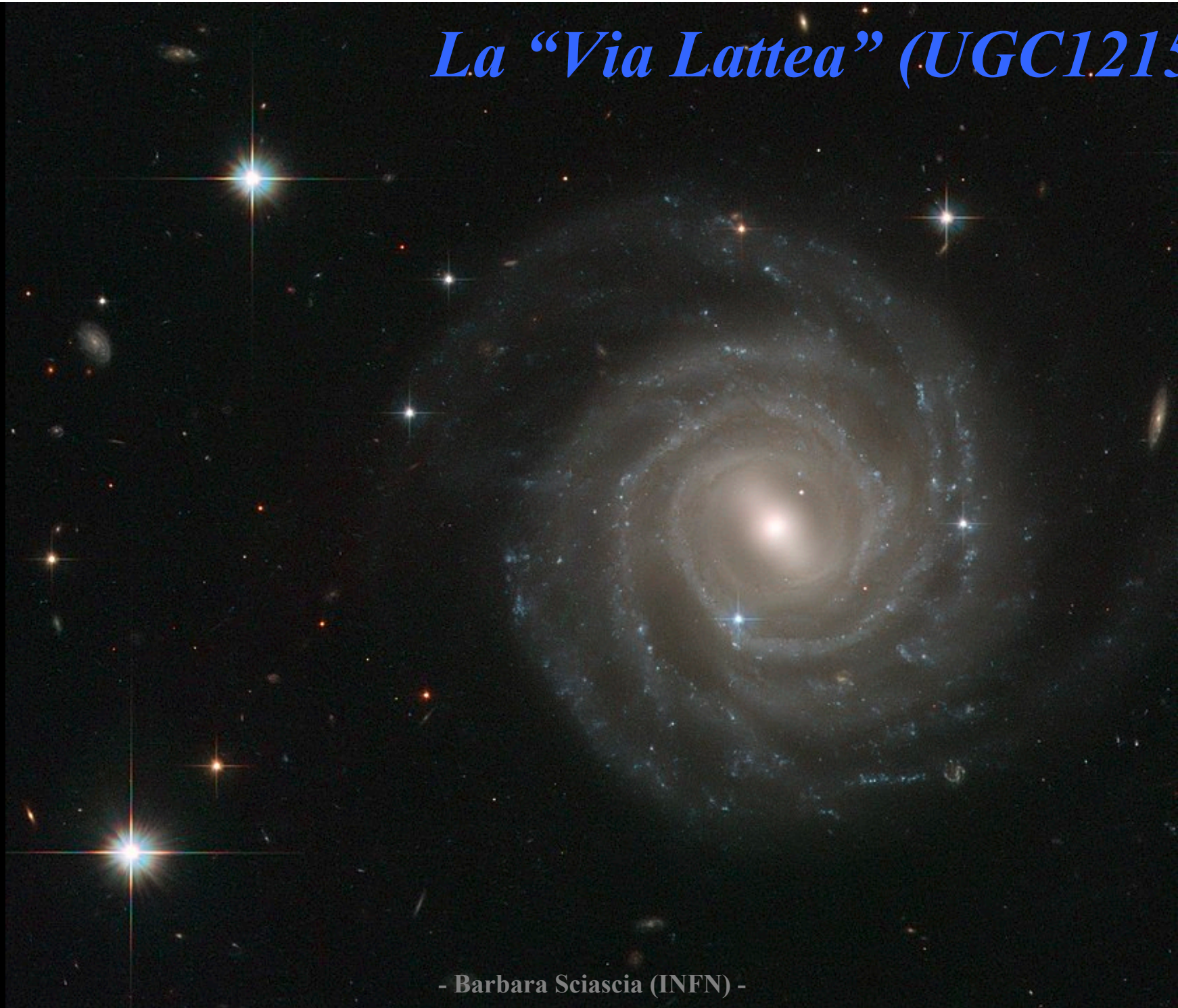
SMC



LMC

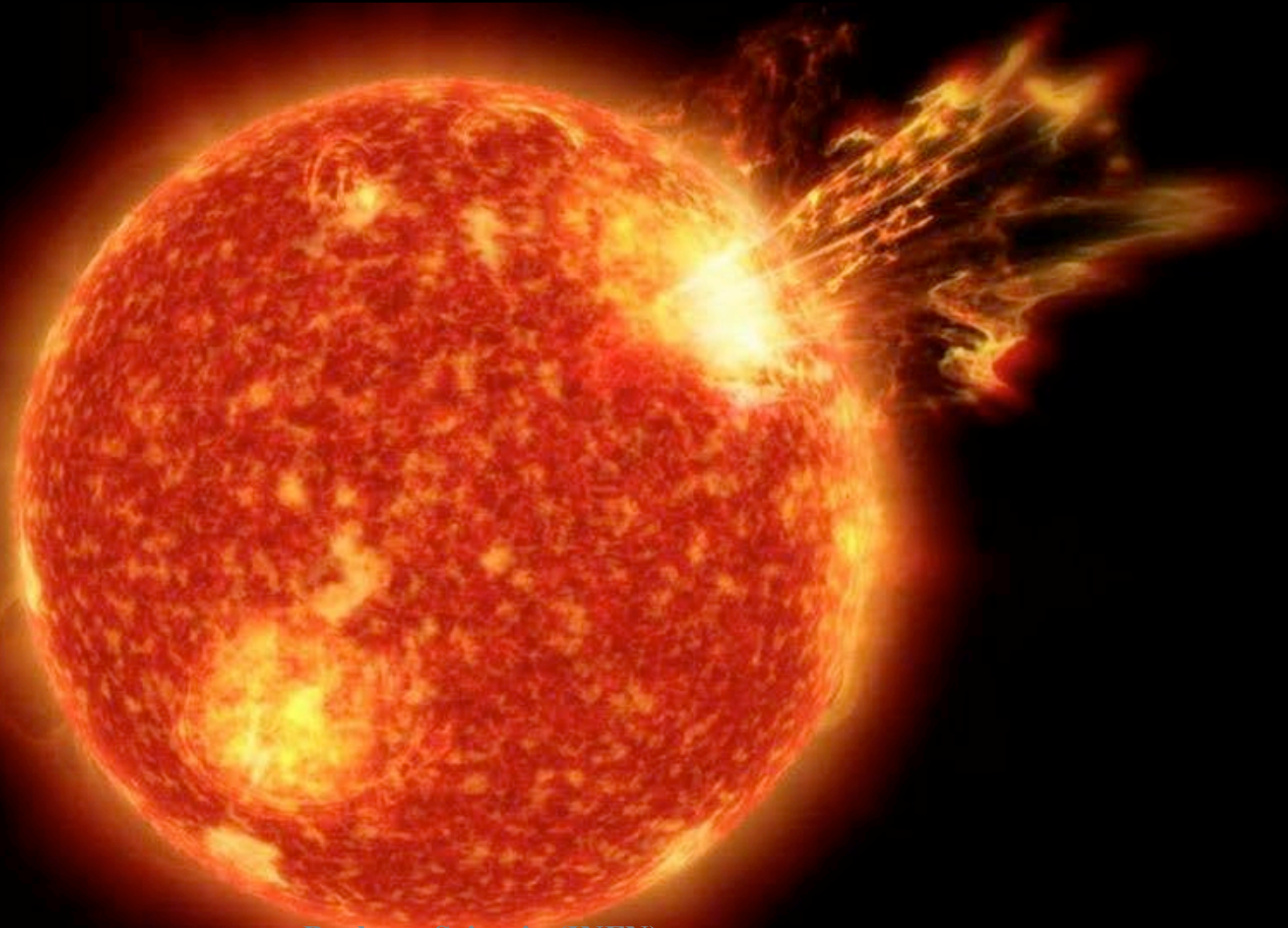
La “Via Lattea” (UGC12158)

By ESA/Hubble & NASA - <http://www.spacetelescope.org/images/potw1035a/>



- Barbara Sciascia (INFN) -

Sole



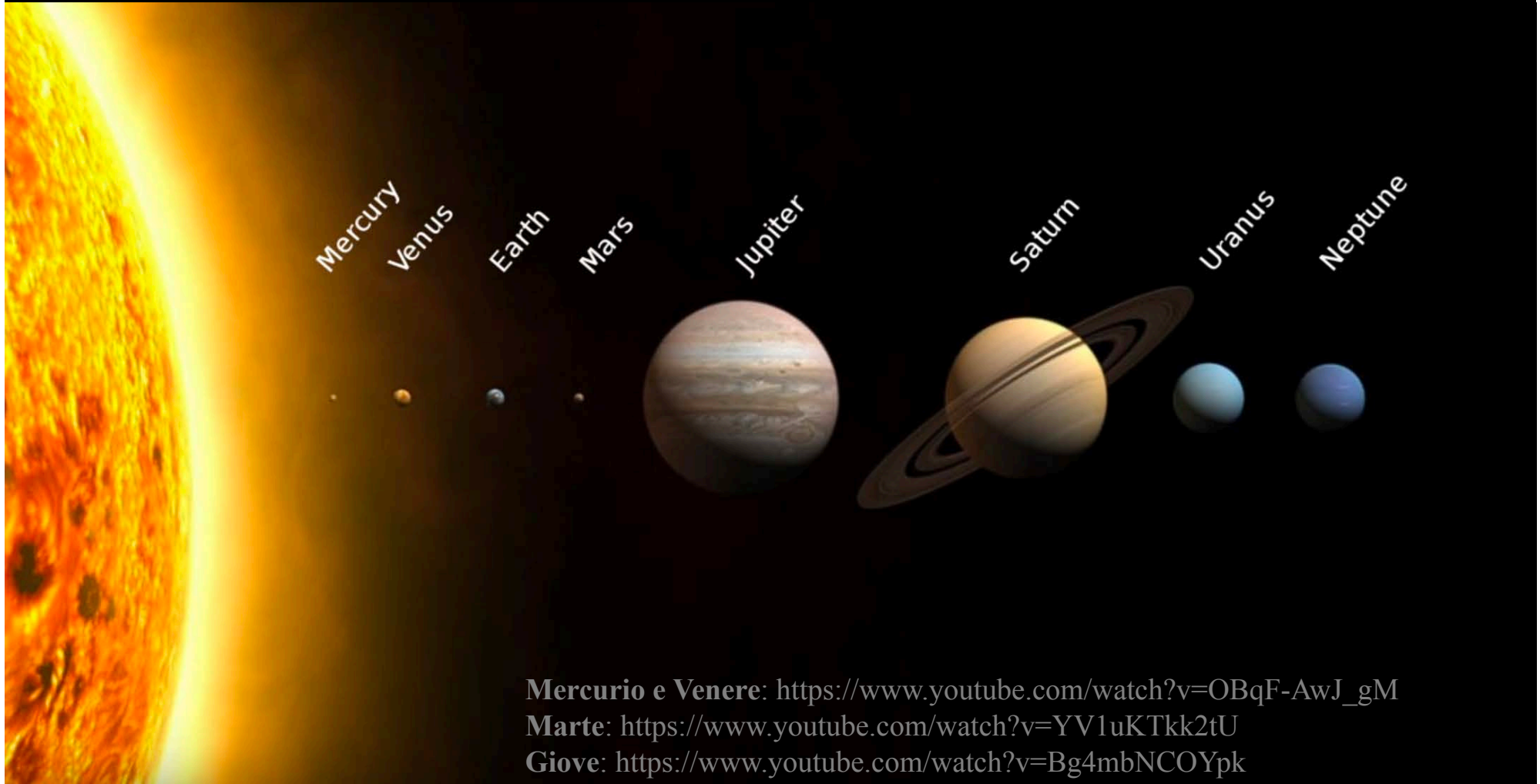
Disco protoplanetario [HL Tauri]



By ALMA, CC BY 4.0, <https://commons.wikimedia.org/w/index.php?curid=36643860>

Pianeti del sistema solare

<https://www.youtube.com/watch?v=MD7Zt2cGXRc>



Mercurio e Venere: https://www.youtube.com/watch?v=OBqF-AwJ_gM

Marte: <https://www.youtube.com/watch?v=YV1uKTkk2tU>

Giove: <https://www.youtube.com/watch?v=Bg4mbNCOYpk>

Saturno dalla sonda Cassini: <https://www.youtube.com/watch?v=QbQM7-1yIU0>

Pianeti gioviani: <https://www.youtube.com/watch?v=cpipS1xAGPw>

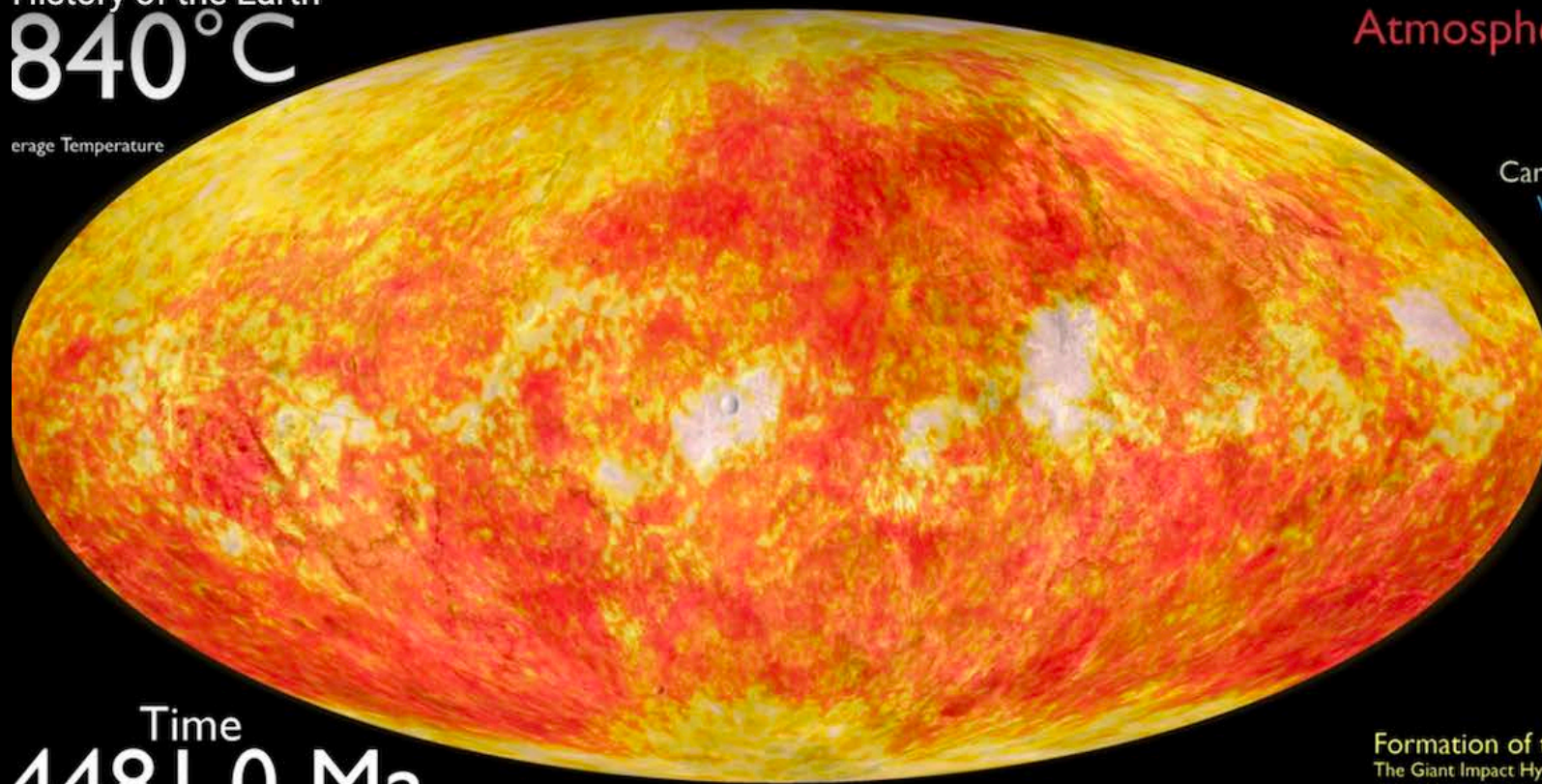
Urano e Nettuno: <https://www.youtube.com/watch?v=pO-kubG95hc>

Storia della Terra da 4.5 miliardi di anni fa a oggi

History of the Earth

840°C

Average Temperature



Atmospheric Composition

Nitrogen	7%
Oxygen	0.00%
Argon	0.00%
Carbon Dioxide	59%
Water Vapor	21%
Methane	0.82%
Ammonia	3%
Hydrogen	7%
Helium	2.3%

Length of Day

4hr 14m

Time
4481.0 Ma

Hadean
Precambrian

Eon: Hadean
Era: -
Period: -
Epoch: -

Formation of the Earth -
The Earth forms from a protoplanetary disk around a young Sun.

Formation of the Moon -

The Giant Impact Hypothesis postulates that a Mars-sized planet named Theia collided with the Earth in a glancing blow, depositing iron in the Earth while the debris coalesced to form the Moon. The Moon would stabilize Earth's rotation and introduce tides to the oceans.

Formation of the primordial soup -

The oceans of the early Earth are thought to have contained many complex organic molecules, brought to the surface by meteorite impacts.

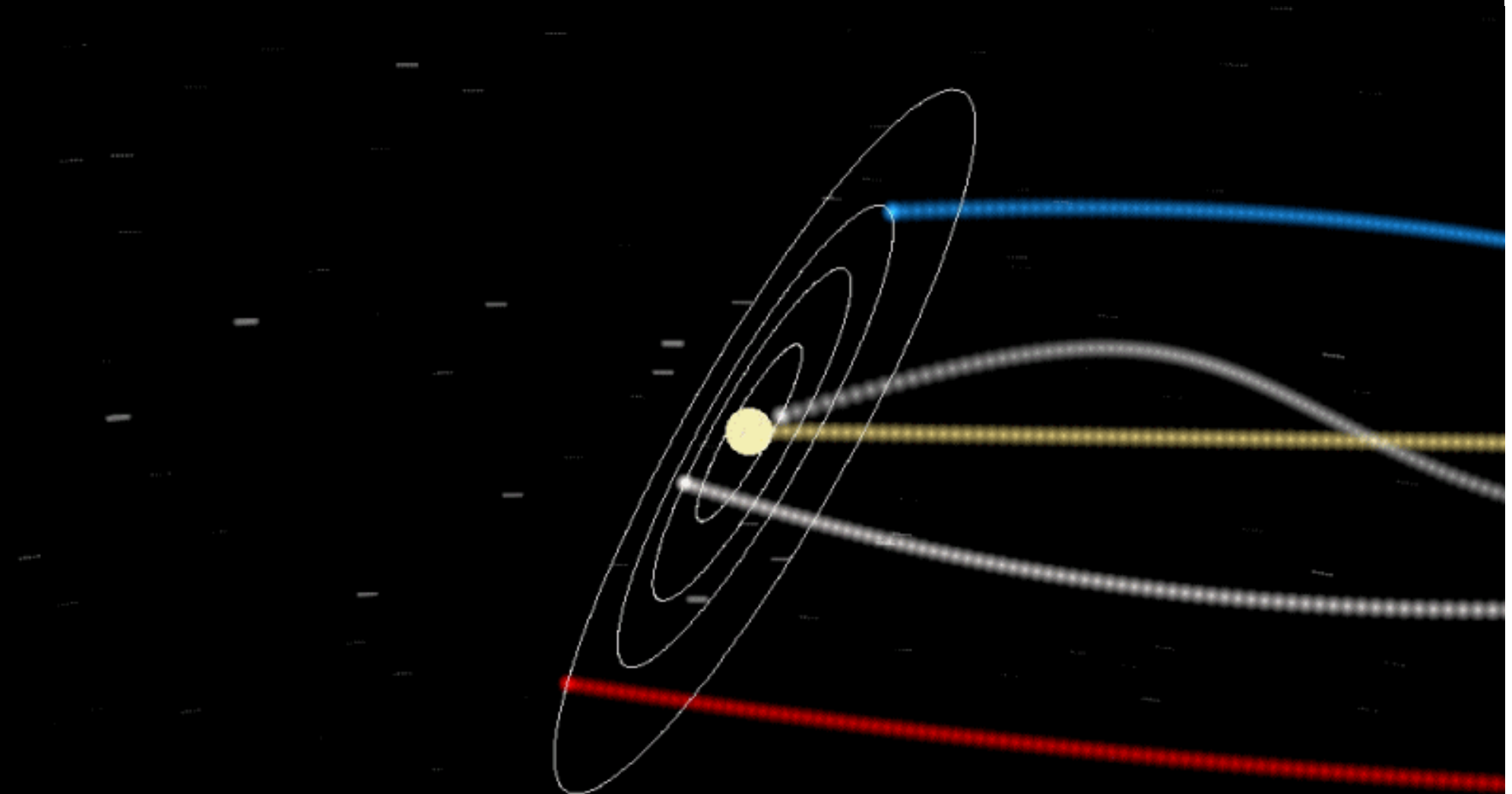
0.5 km/s [giorno/notte]

Quanto veloci?



*0.5 km/s [giorno/notte]
+ 30 km/s [anno, Sole]*

Quanto veloci?



www.rhysy.net

Quanto veloci?

0.5 km/s [giorno/notte]

+ 30 km/s [anno, Sole]

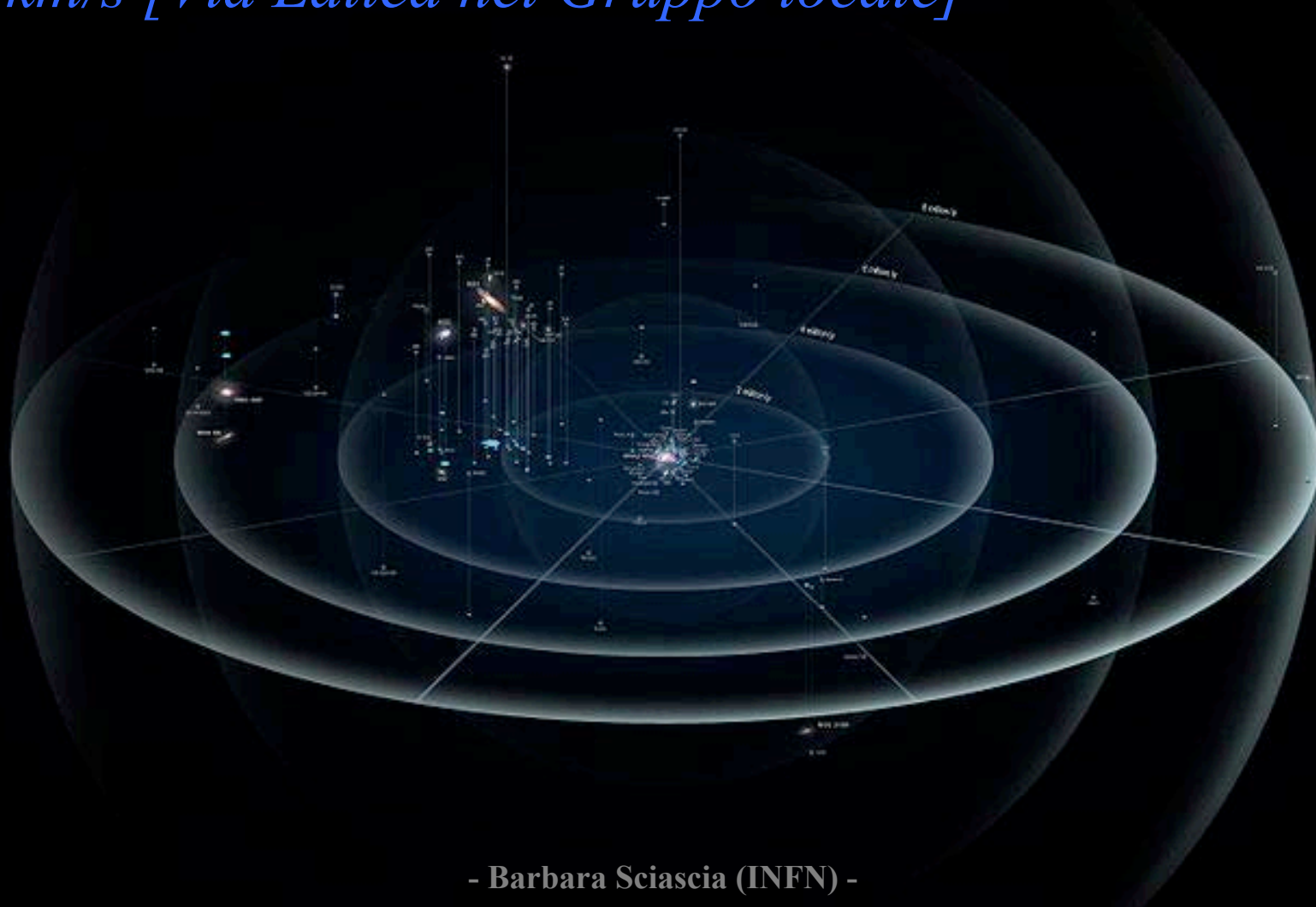
+ 200-220 km/s [Sole nella Via Lattea]



Image Credit: NASA/ESA/Hubble Heritage Team

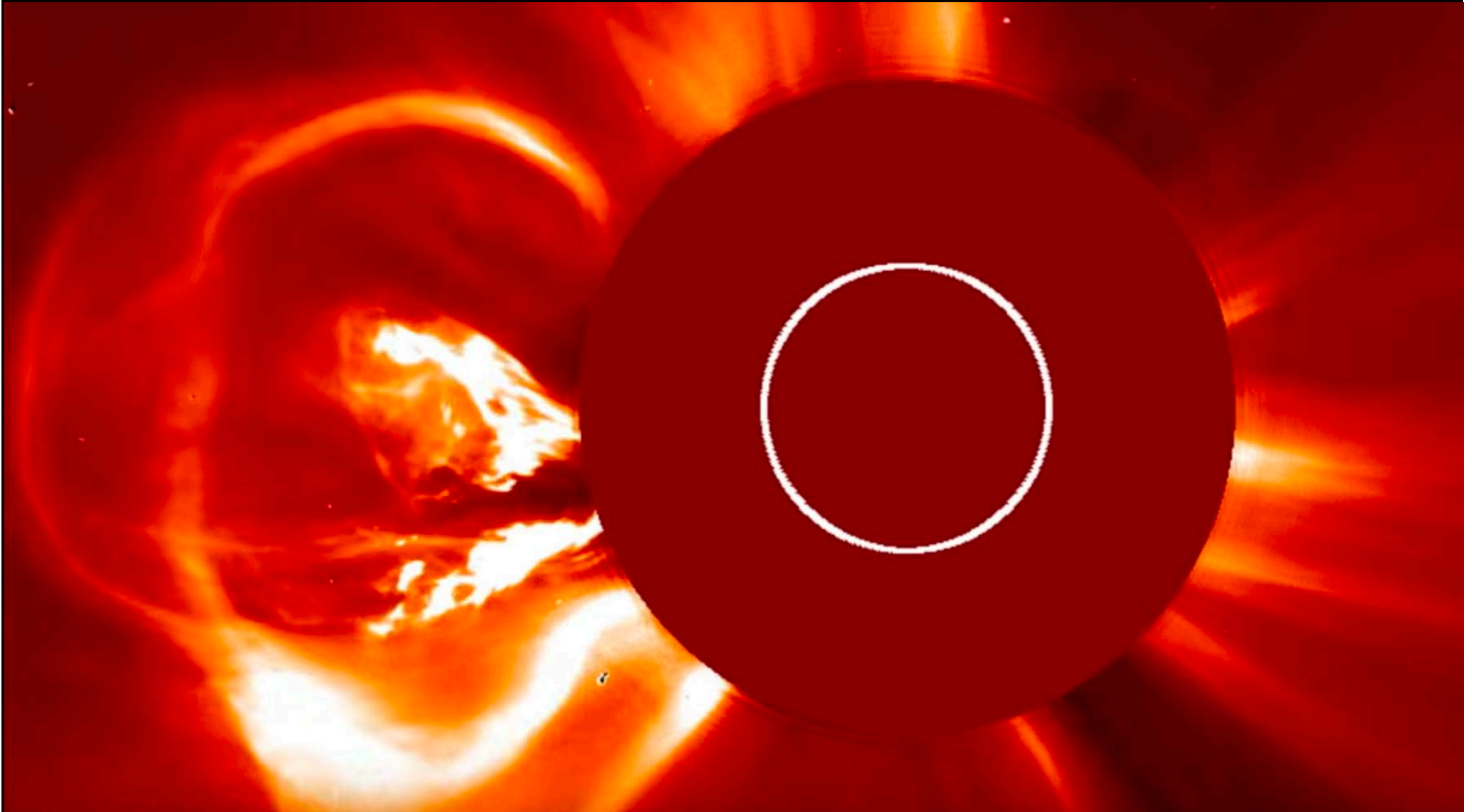
Quanto veloci?

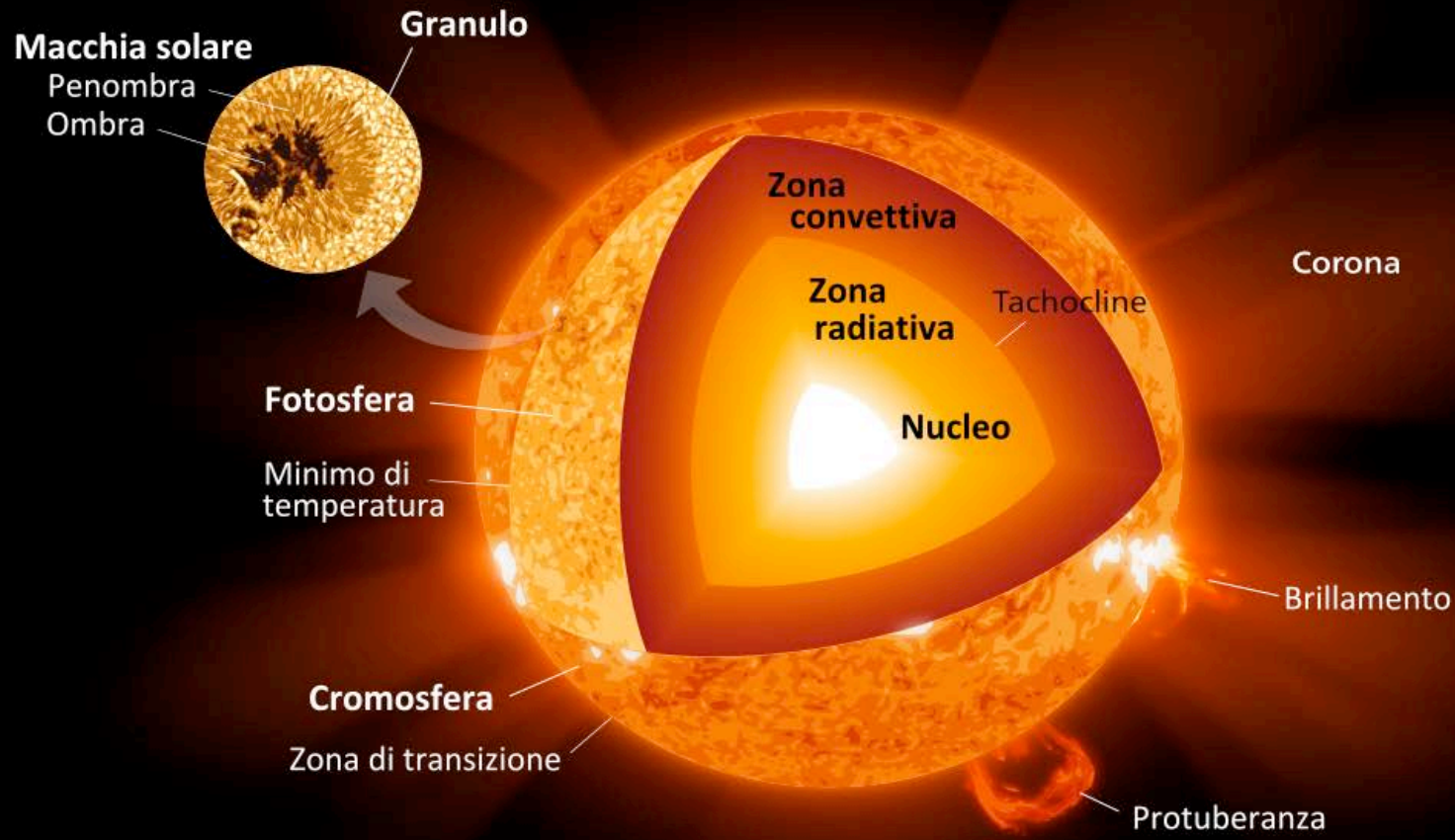
- 0.5 km/s [giorno/notte]*
- + 30 km/s [anno, Sole]*
- + 200-220 km/s [Sole nella Via Lattea]*
- + 627 km/s [Via Lattea nel Gruppo locale]*



https://it.wikipedia.org/wiki/File:Local_Group_and_nearest_galaxies.jpg

Video, NASA: <https://www.youtube.com/watch?v=GrnGi-q6iWc>



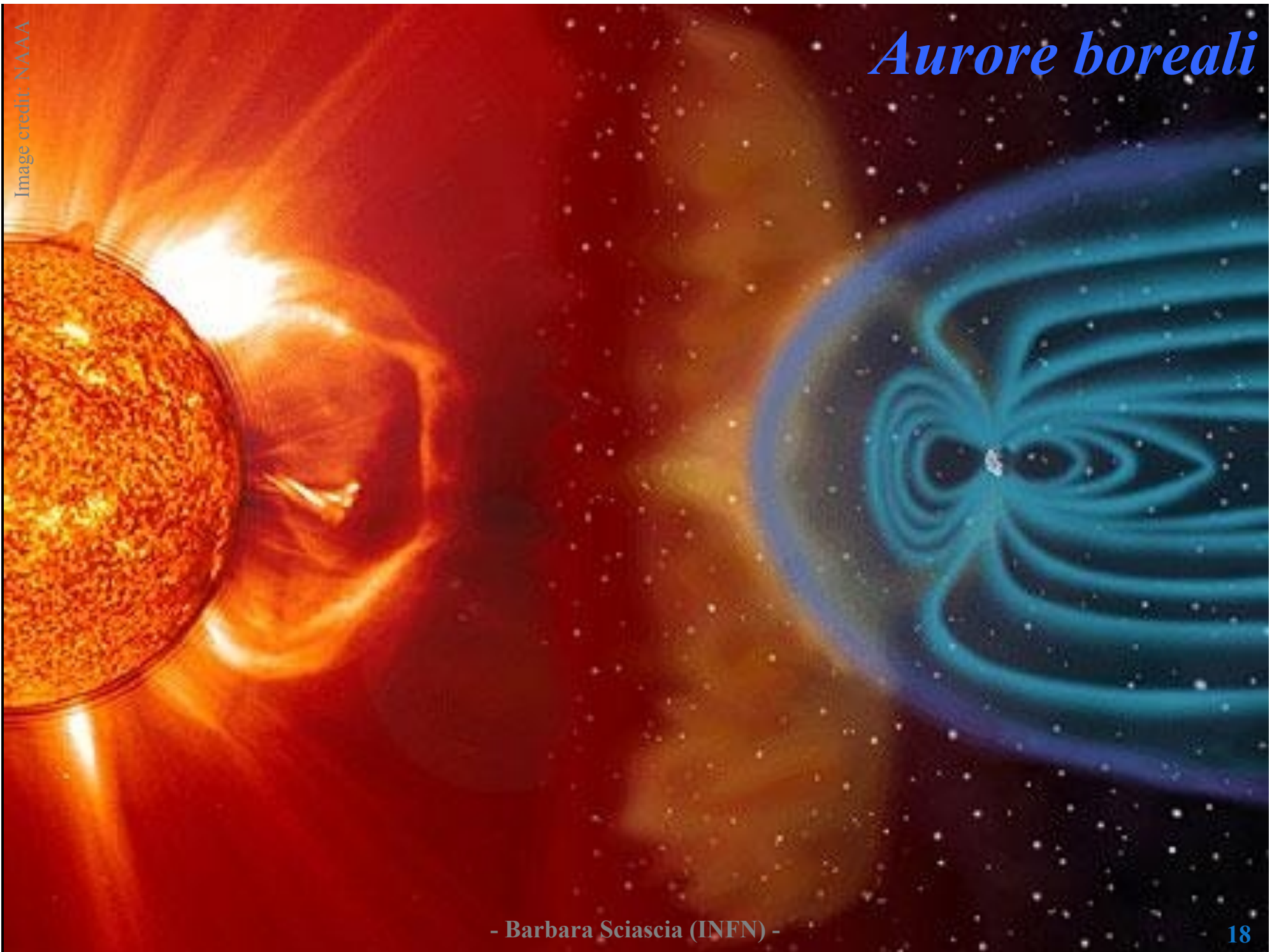


Di Kelvinsong; translated by Henrykus - Questo file deriva da: Sun poster.svg; CC BY-SA 3.0,

Il Sole
Strutture in scala

Aurore boreali

Image credit: NASA



Aurore boreali

[https://en.wikipedia.org/wiki/Aurora#/media/File:Aurora_Borealis_and_Australis_Poster.jpg]



Aurore boreali

[Image Credit: NASA/JSC]



Viste dalla ISS: <https://www.youtube.com/watch?v=ts5DPEnAnLU>

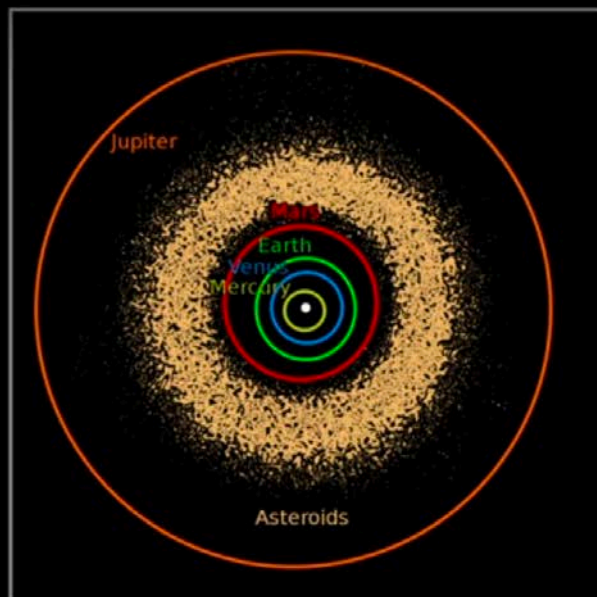
Stelle cadenti

Credits: Photograph by Steve Gifford, MyShot

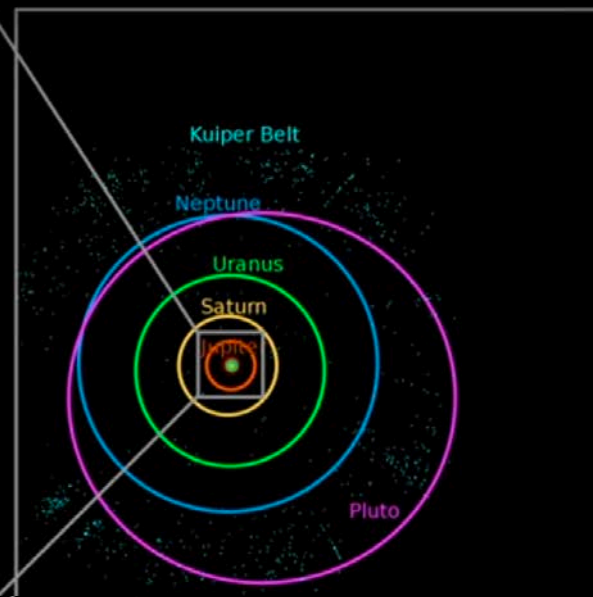
Panoramica del sistema solare

<https://www.youtube.com/watch?v=MD7Zi2cGXRC>

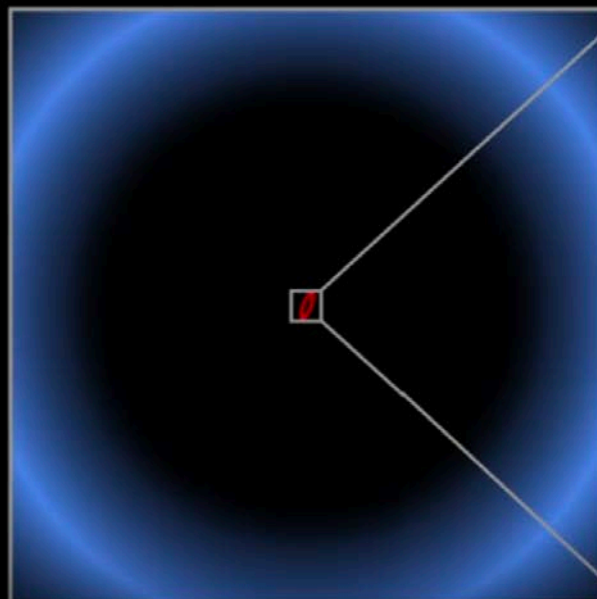
**Fascia degli
asteroidi**



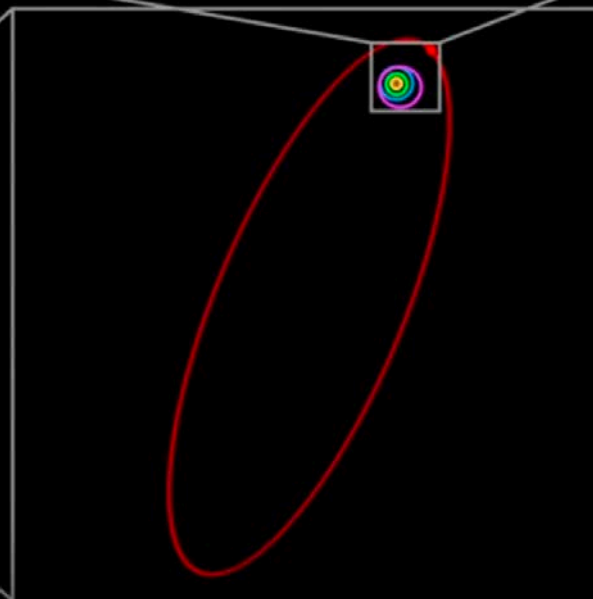
**Cintura di
Kuiper**



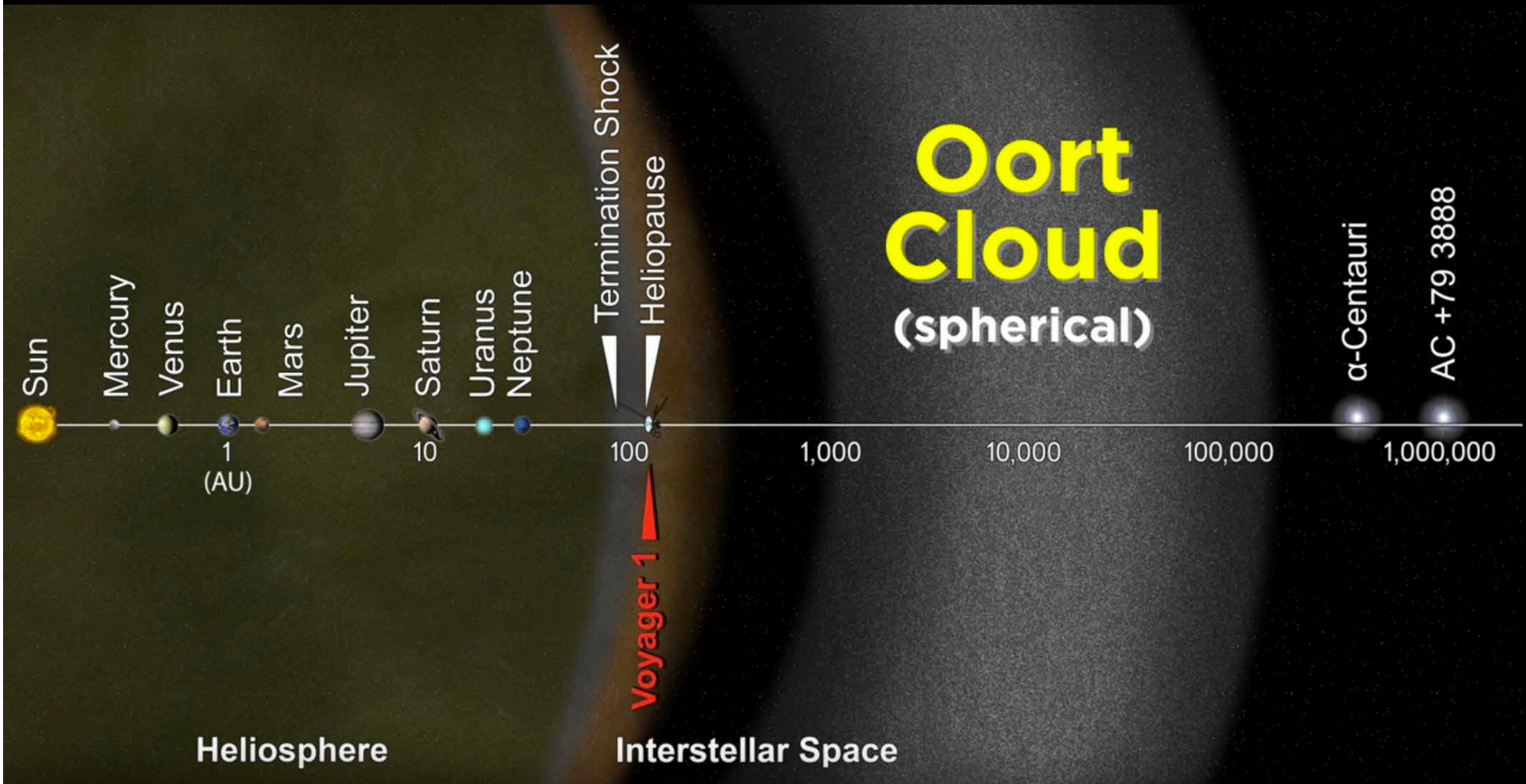
**Nube di
Oort**



Comete

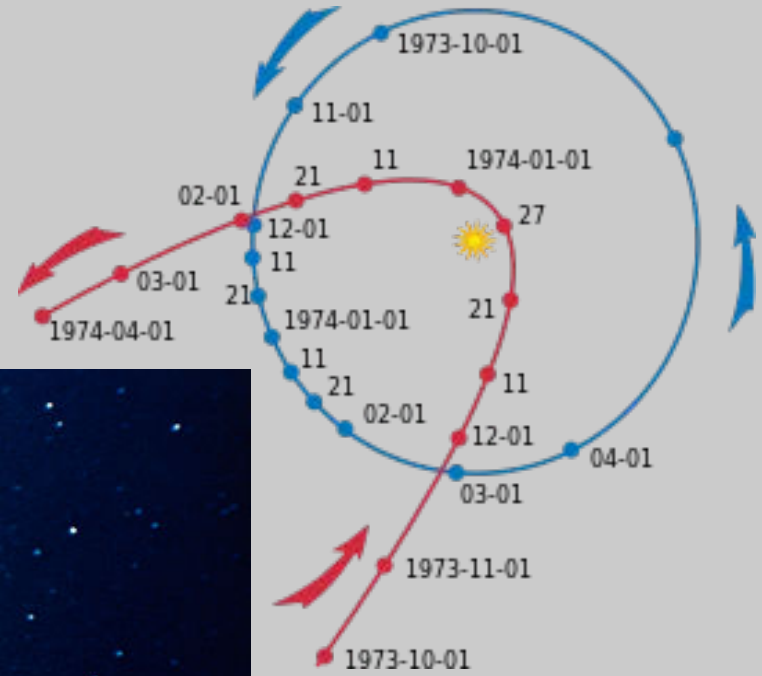


Panoramica del sistema solare



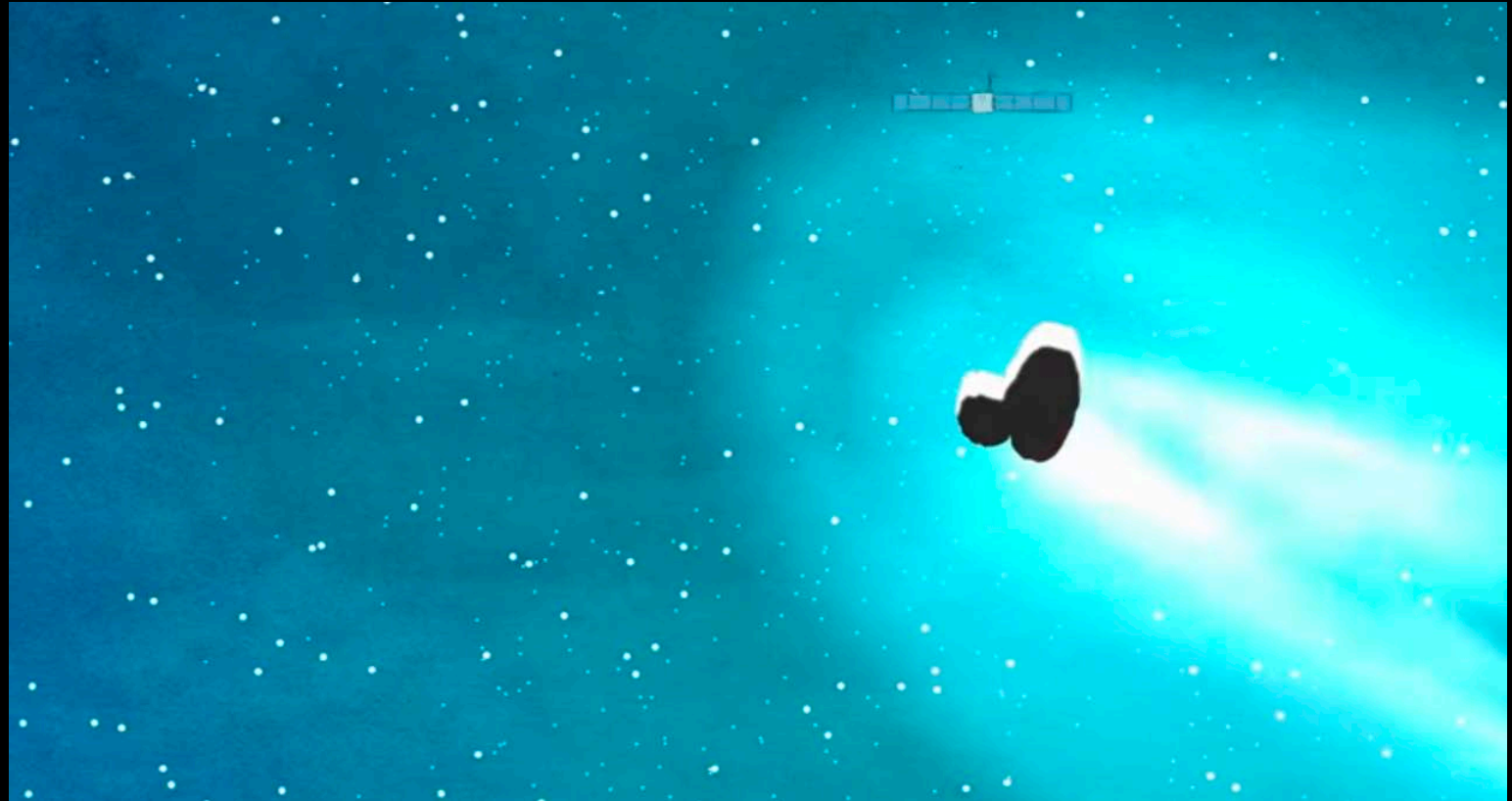
<https://www.youtube.com/watch?v=MD7Zt2cGXRc>

Cometa Kohoutek (C1973 E1)



Cometa 67P/Churyumov-Gerasimenko

Missione ESA: Rosetta/Philae



C'era una volta... Rosetta:

<https://www.youtube.com/watch?v=mOE1lt-t3JY>

<https://www.youtube.com/watch?v=mrXhXHyrRFM>

<https://www.youtube.com/watch?v=3aS1pgOU8Gs>

(Altri dettagli: <https://www.asi.it/esplorazione/sistema-solare/rosetta/>)

Anniversario missione Apollo 13
(13 aprile 1970 -13 aprile 2020)

La Luna

[Film:

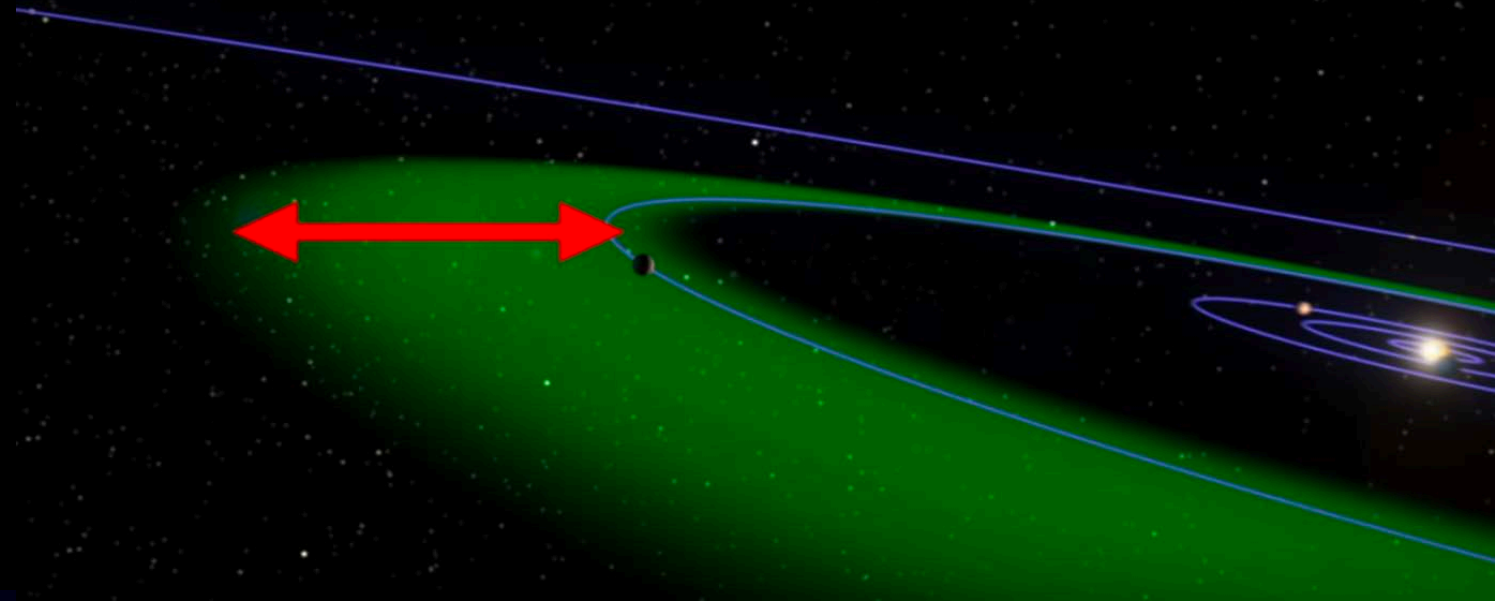
- Hidden figures (Il diritto di contare)
- Apollo 13]



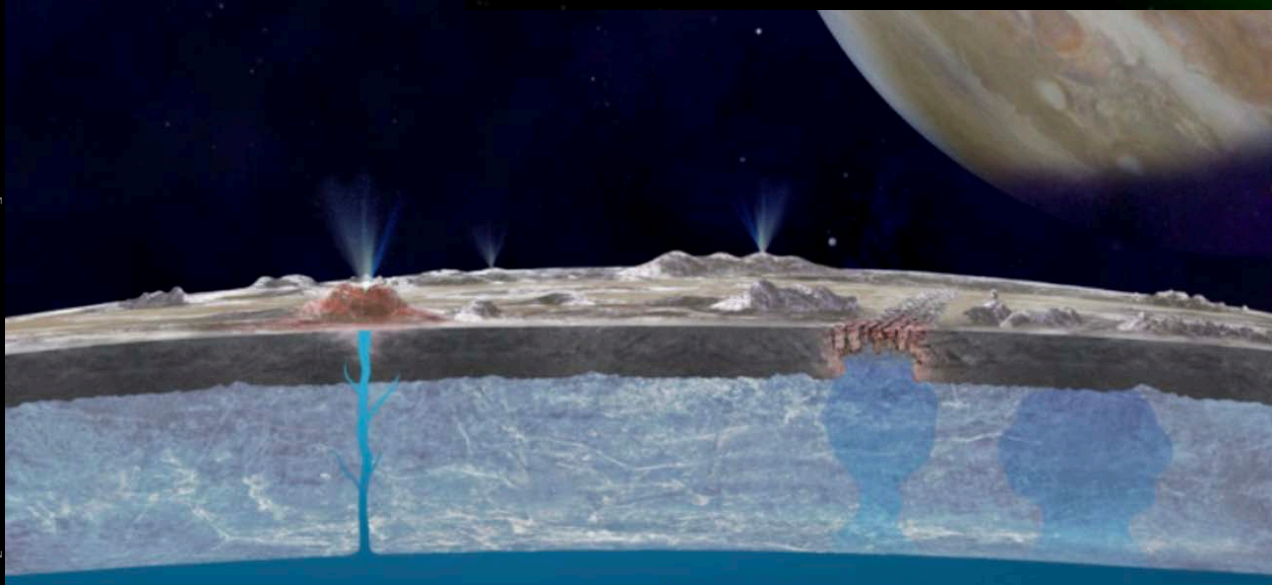
Astrobiologia

Condizioni per la vita:

- acqua liquida?
- ammoniaca?
- polveri?



[Credits: NASA/JPL-Caltech]



Encelado (Saturno) o
Europa (Giove)?

Astrobiologia

Marte?

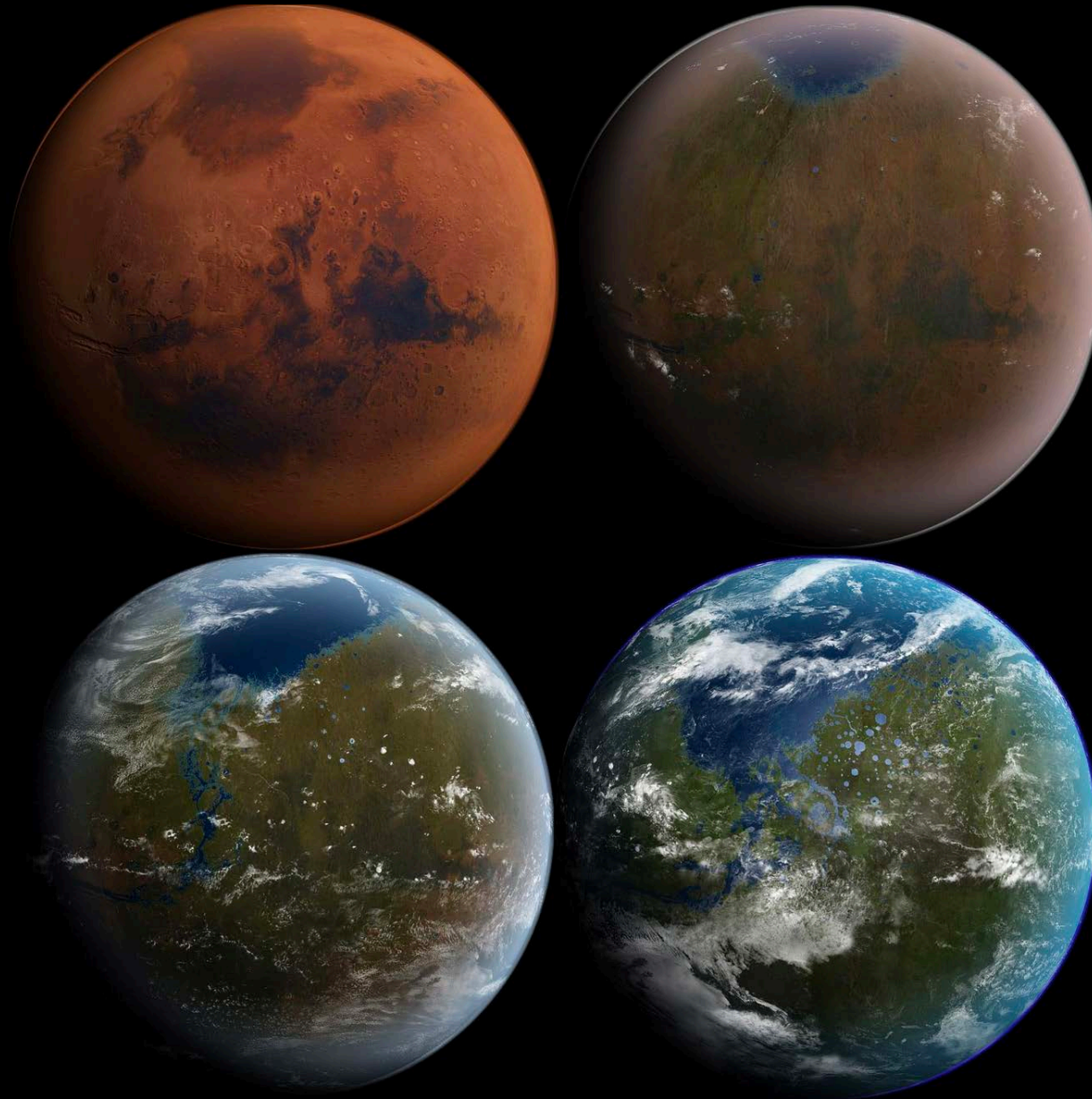
Credits: NASA/JPL-Caltech/MSSS



Film: *The Martian* (Sopravvissuto)

500 - 5000 anni

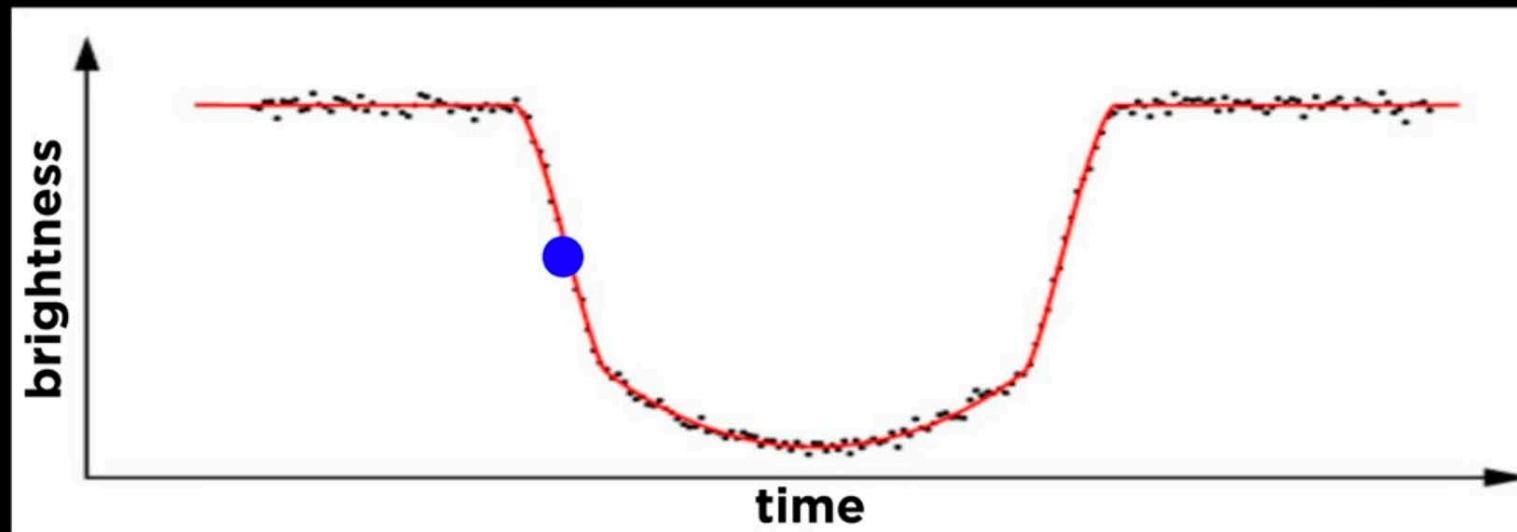
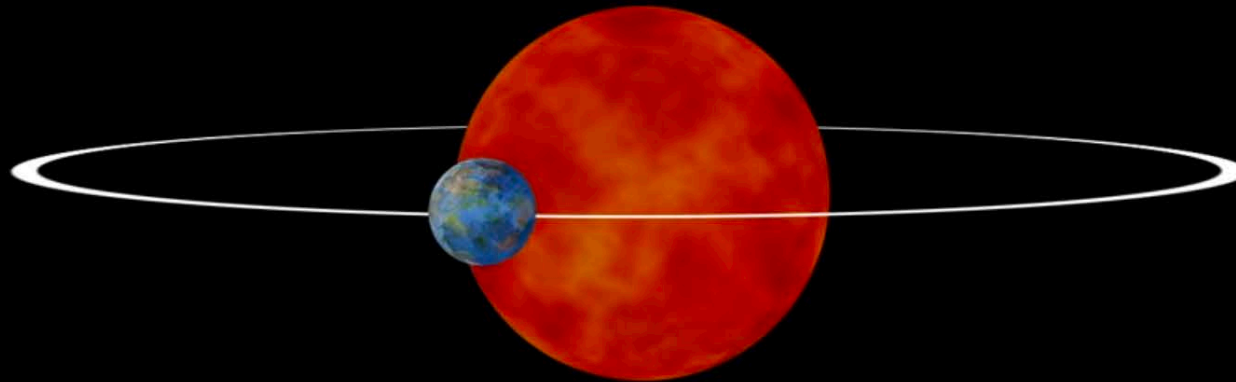
Terraformazione



Esopianeti

Il primo nel 1988

Oggi ~4000 in ~3000 sistemi stellari

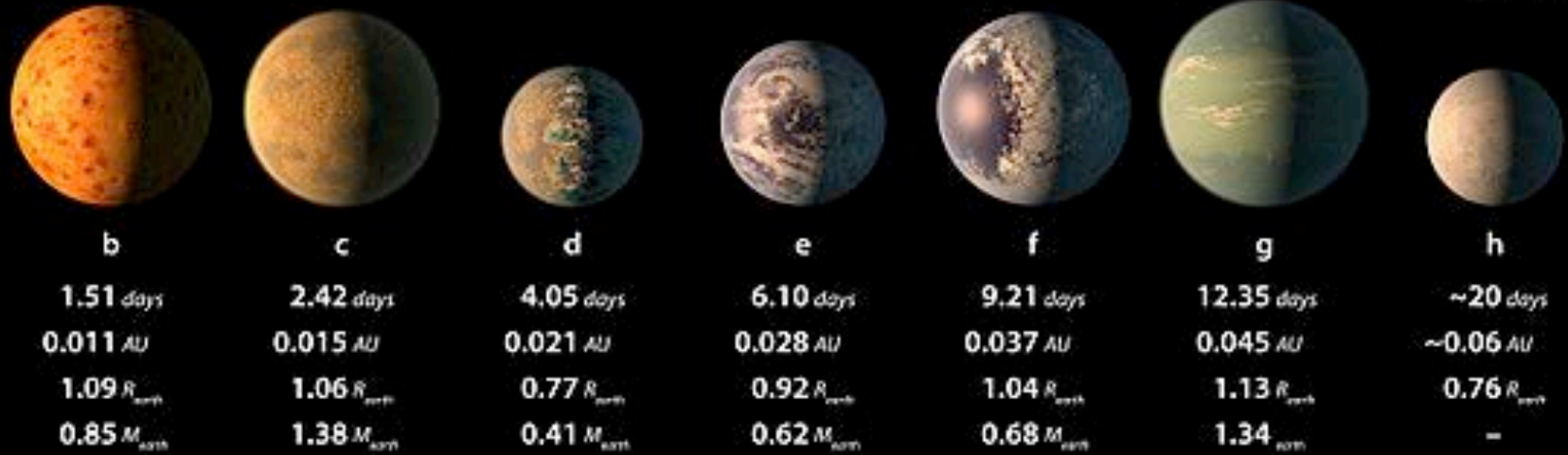


Esopianeti: Trappist-1

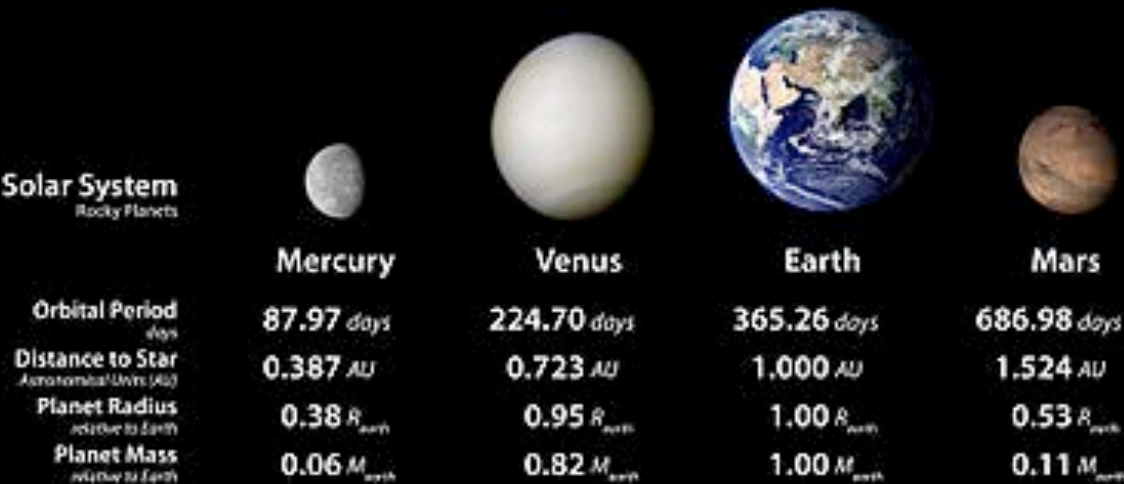
39.5 anni luce

Illustrations

TRAPPIST-1 System

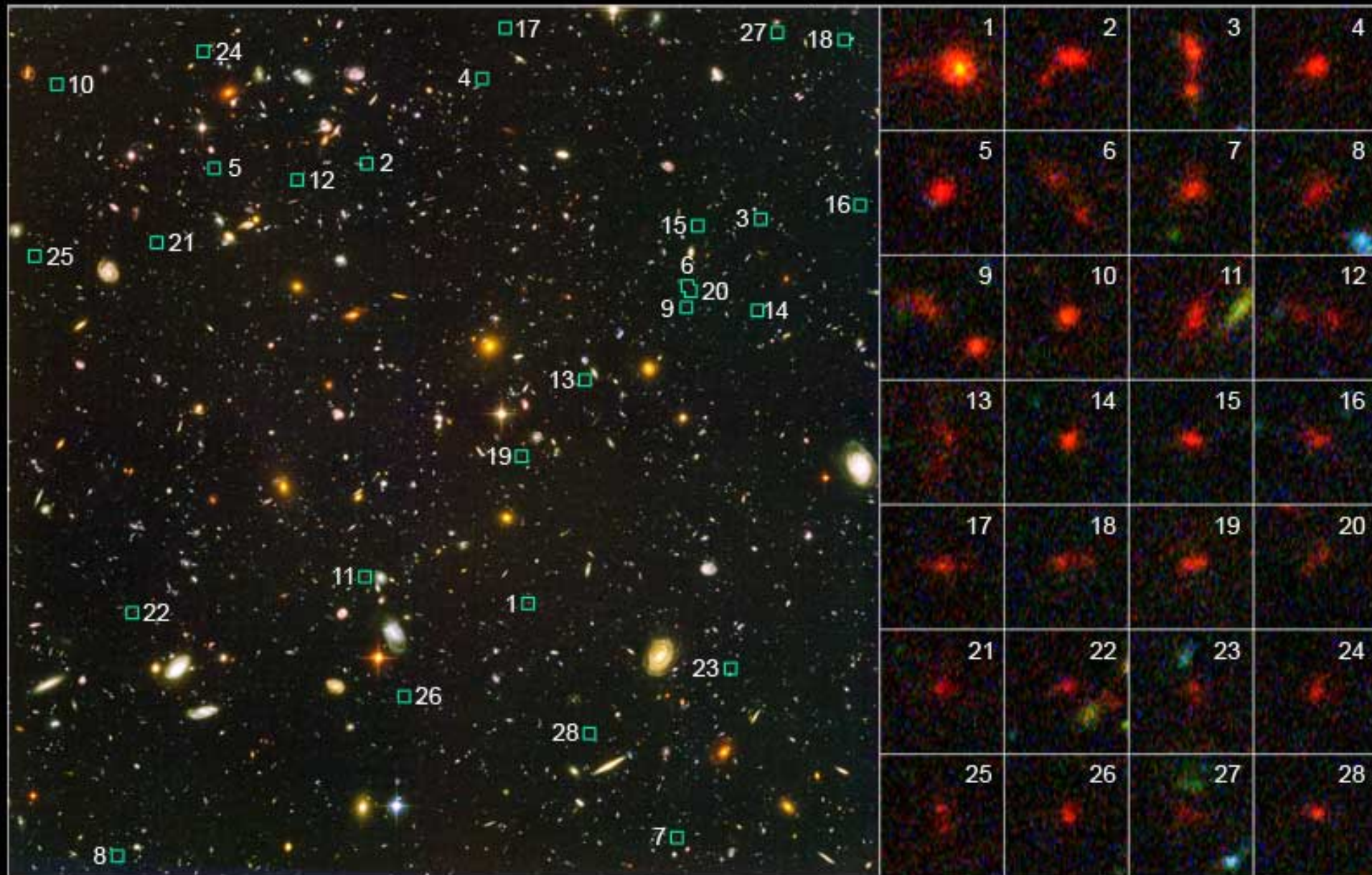


Solar System Rocky Planets



Le nuove Galassie riprese dall'occhio di Hubble Ultra Deep Field

HST ■ ACS/WFC

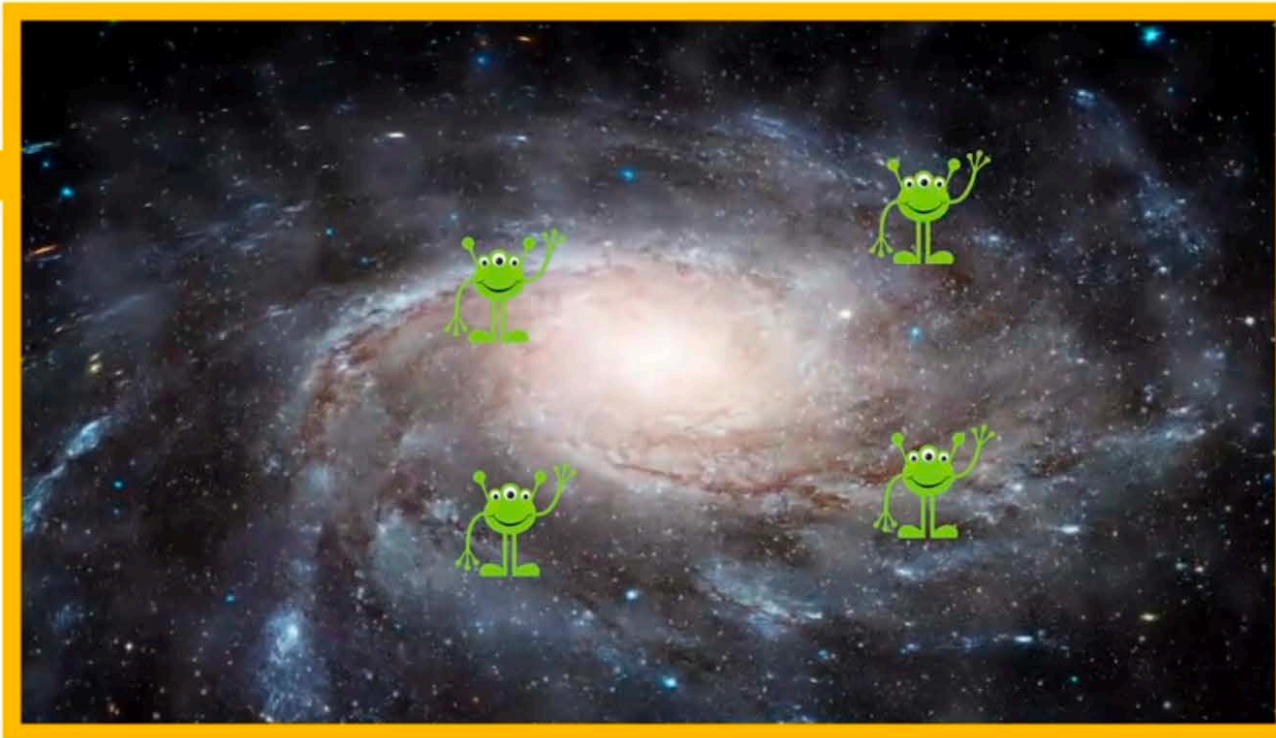


NASA, ESA, R. Bouwens and G. Illingworth (University of California, Santa Cruz)

STScI-PRC06-12

Equazione di Drake (1961)

$$\mathbf{N} = \mathbf{R}^* \times \mathbf{f}_p \times \mathbf{n}_e \times \mathbf{f}_l \times \mathbf{f}_i \times \mathbf{f}_c \times \mathbf{L}$$



+ paradosso di Fermi



SETI INSTITUTE

*(Search for
Extra-Terrestrial
Intelligence)*



- Barbara Sciascia (INFN) -

Film: Contact

Approfondimenti:

Forza di gravità nel vuoto [EN]: <https://www.youtube.com/watch?v=E43-CfukEgs>

Forza di gravità nel vuoto [EN]: <https://www.youtube.com/watch?v=s9Zb3xAgIoY>

Volare in assenza di gravità: https://www.youtube.com/watch?v=_bQAMjYmwhI

Libro Amedeo Balbi

- <https://www.keplero.org/2016/05/dove-sono-tutti-quant-un-viaggio-tra.html>

Astrobiology [EN]: https://www.youtube.com/watch?v=cl_YuKk9mzg

Ringraziamenti: alle professoresse Amalia Contessini e Fabiana Di Pasquale e agli alunni delle classi III [AS 2018/2019 e 2019/2020] della scuola media D. Bramante, IC S. Pio V, Roma, per i tanti spunti e suggerimenti per raccontare meglio la scienza difficile.

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