



LA PERCEZIONE DEL FINITO

Gianluca Rinaldi

24/01/2025

Associazione Astrofili del Rubicone (A.A.R.)



PARTE I

FINITO E INFINITO

FINITO E INFINITO



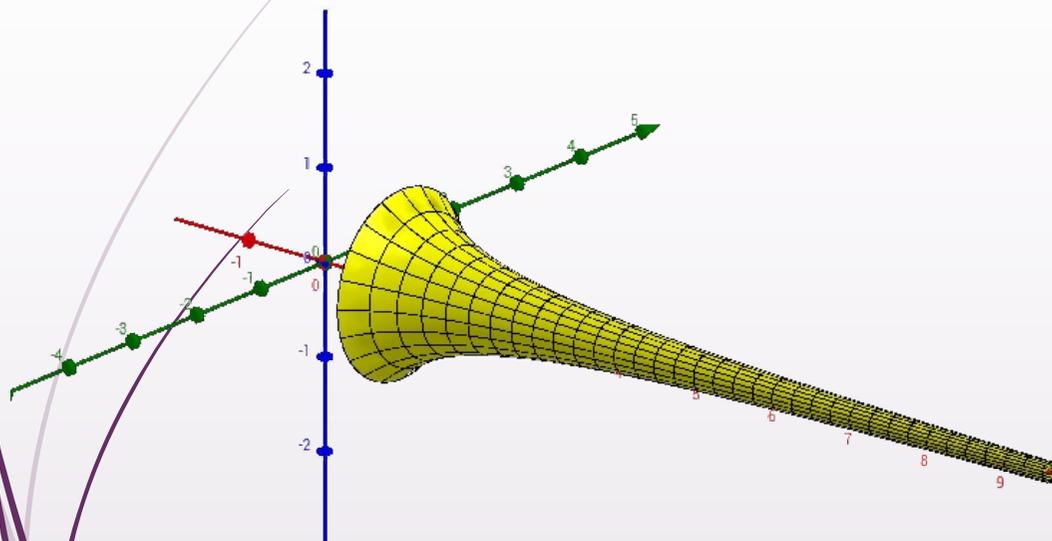
John Wallis (1616-1703)

$$M = 1000$$

$$M \rightarrow m \rightarrow \mathfrak{m} \rightarrow \infty$$

$$M = \text{CIC} \rightarrow \infty$$

FINITO E INFINITO



$$V = \pi \int_1^{\infty} \frac{1}{x^2} dx = \pi$$

$$A = 2\pi \int_1^{\infty} \frac{1}{x} \sqrt{1 + \frac{1}{x^4}} dx > 2\pi \int_1^{\infty} \frac{1}{x} dx = \infty$$



1
—
0



INFINITI

ω

∞

INFINITESIMI

ε

$\frac{1}{\infty}$



h

UNITÀ DI PLANCK

Lunghezza di Planck

$$l_P = \sqrt{\frac{\hbar G}{c^3}}$$

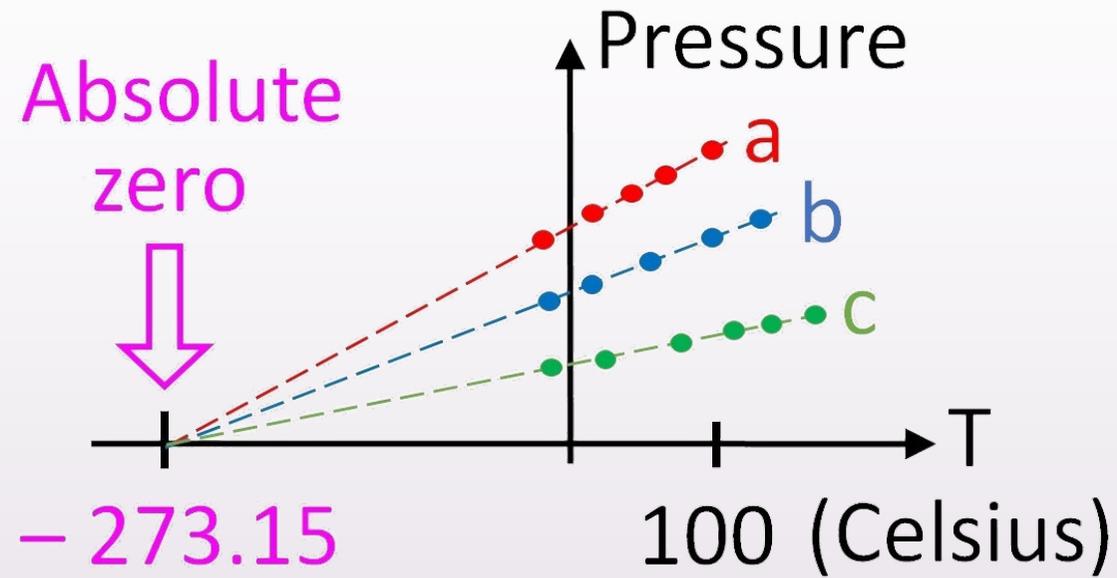
$$1.616255 \times 10^{-35} \text{ m}$$

Tempo di Planck

$$t_P = \sqrt{\frac{\hbar G}{c^5}}$$

$$5.391247 \times 10^{-44} \text{ s}$$

LO ZERO ASSOLUTO





TEMPERATURA DI PLANCK

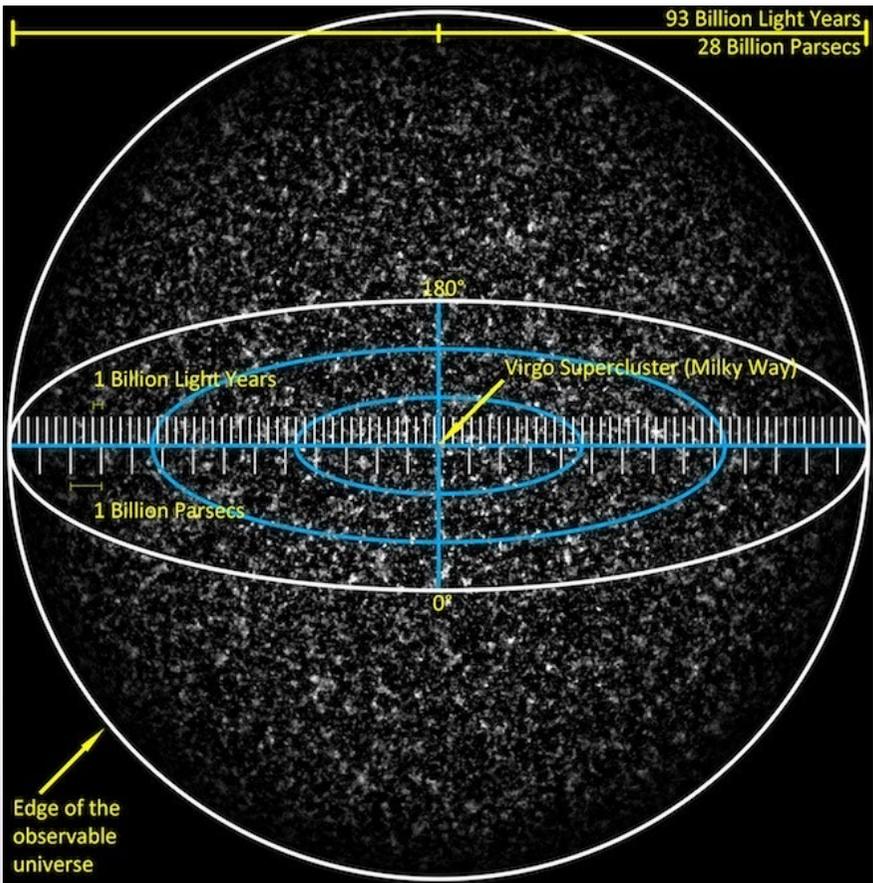
$$T_P = \sqrt{\frac{\hbar c^5}{G k^2}}$$

$$1.41679 \times 10^{32} \text{ K}$$



L'UNIVERSO È INFINITO?

UNIVERSO OSSERVABILE



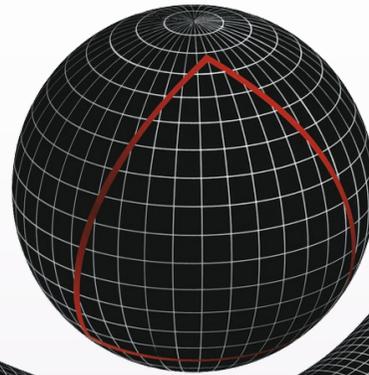
UNIVERSO OSSERVABILE



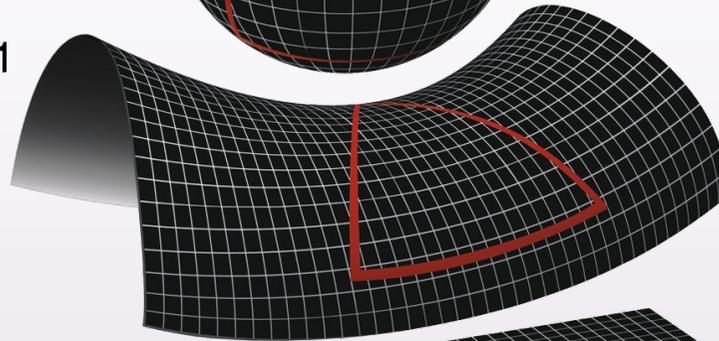
Il pallone da alta quota utilizzato per portare ad altezza suborbitale il telescopio atto a eseguire il progetto BOOMERanG

GEOMETRIA DELL'UNIVERSO

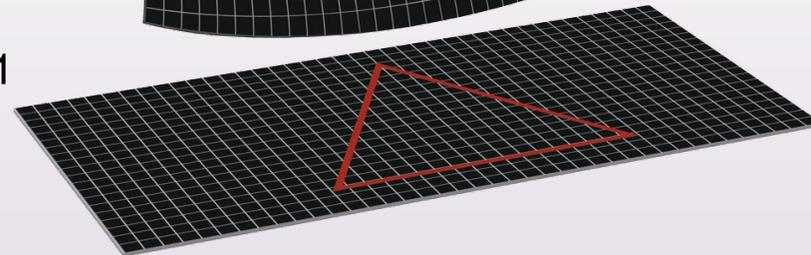
$\Omega_0 > 1$



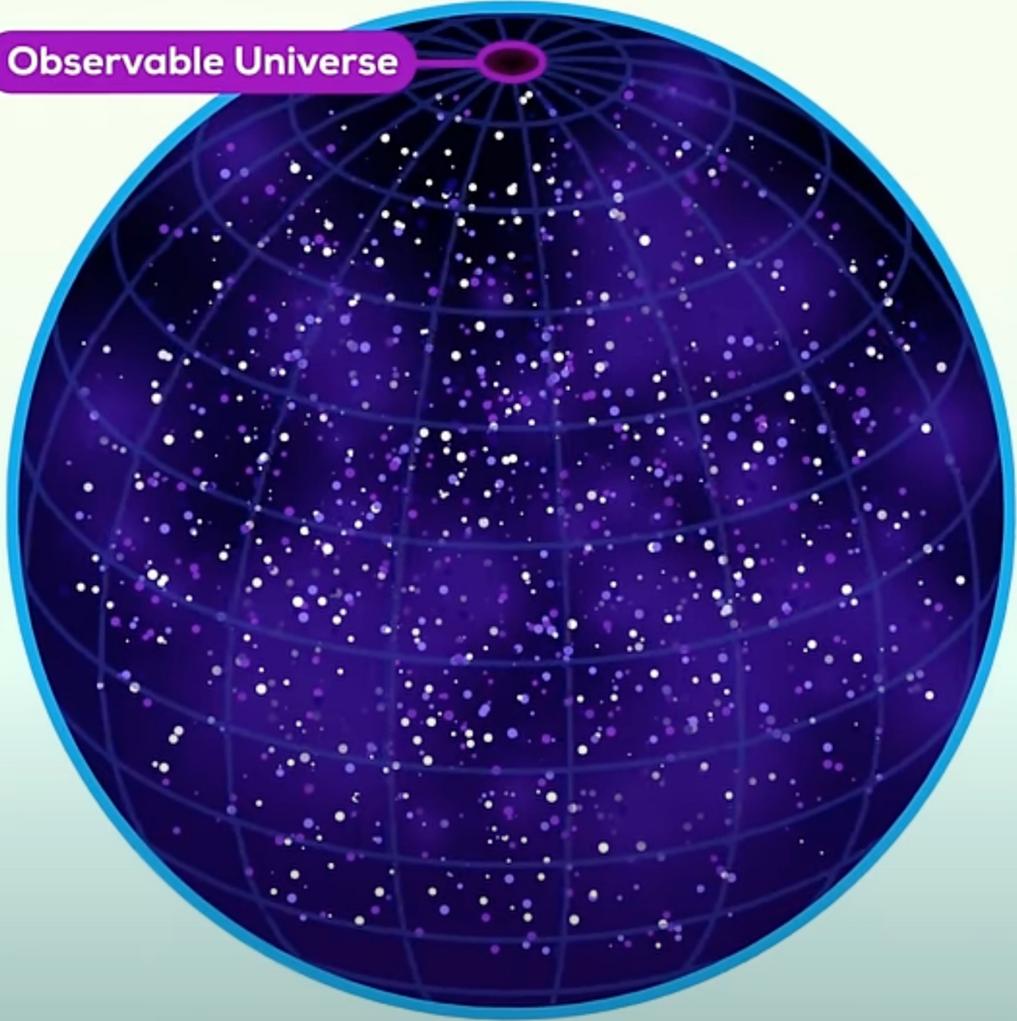
$\Omega_0 < 1$



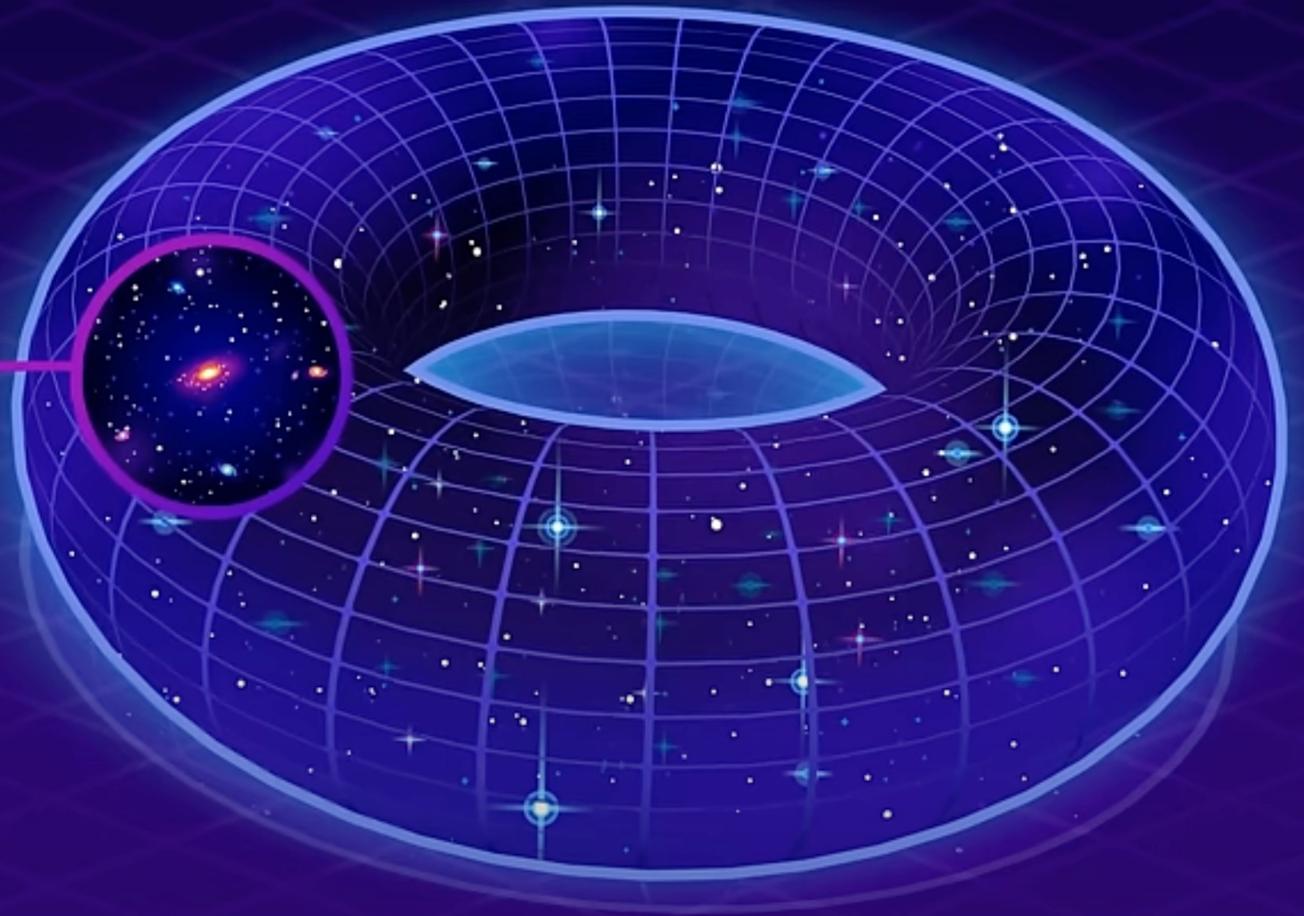
$\Omega_0 = 1$



Observable Universe



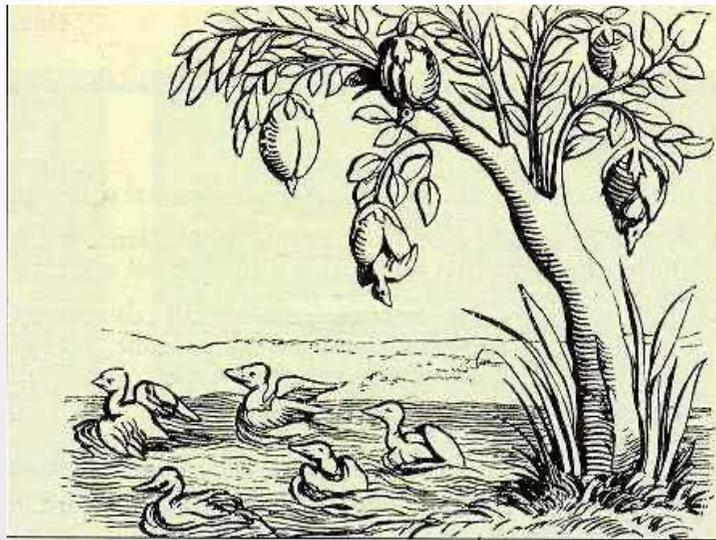
Observable Universe



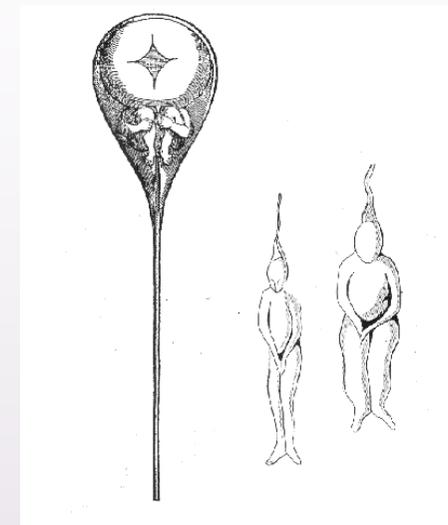


LA VITA COME LA VEDEVAMO IN PASSATO

Generazione spontanea



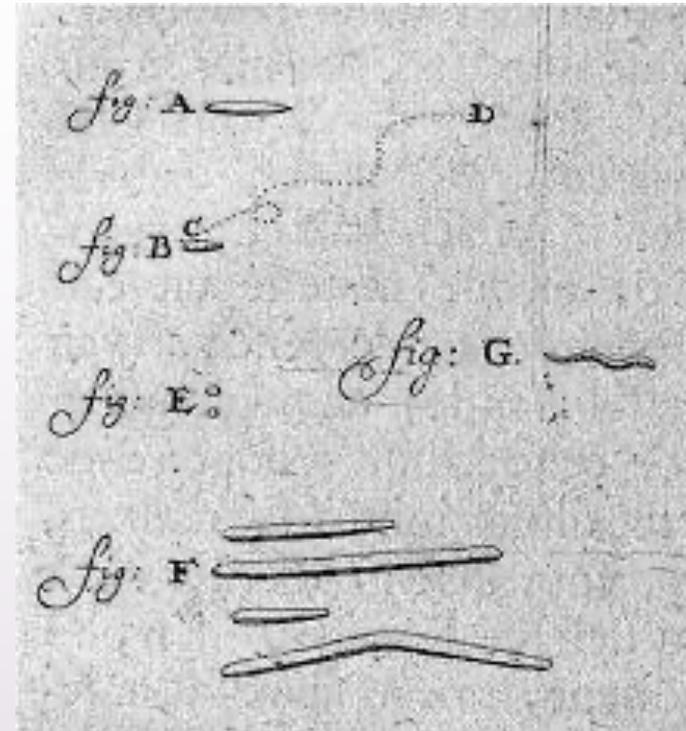
Preformismo



L'AVVENTO DELLA MICROSCOPIA



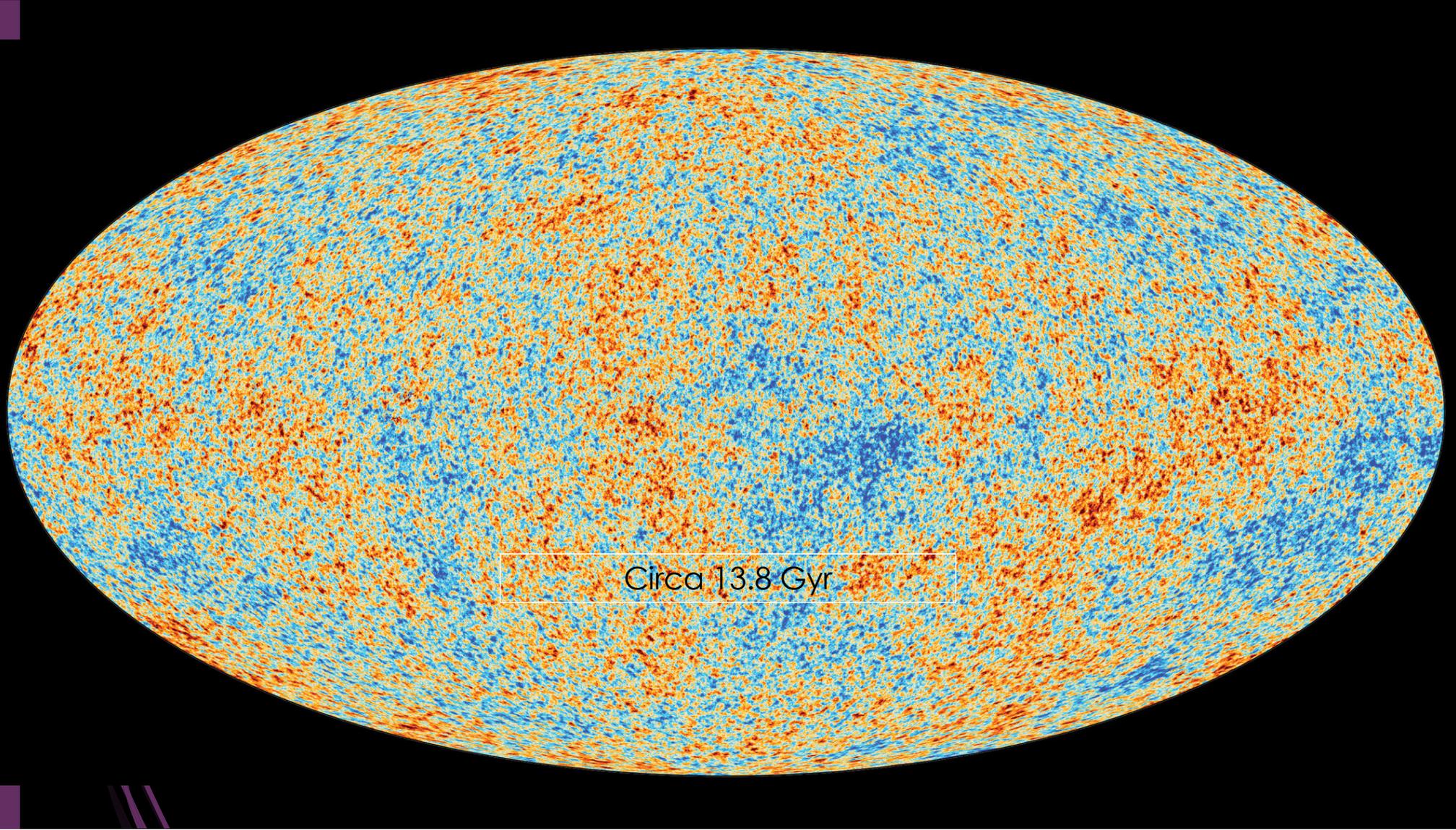
Antoni van Leeuwenhoek
(1632-17023)





BIOGENESI





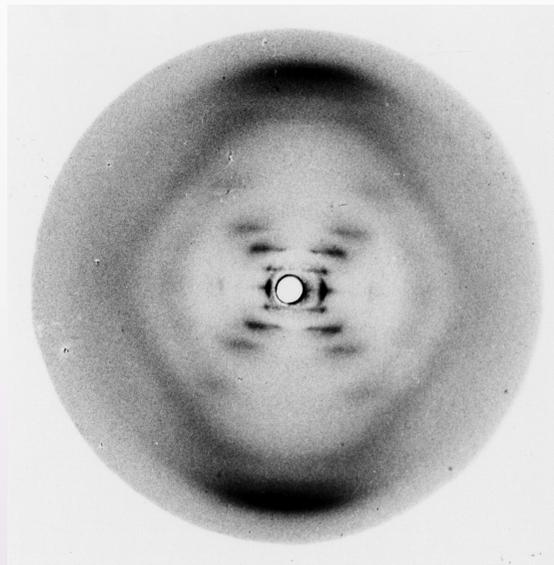
Circa 13.8 Gyr



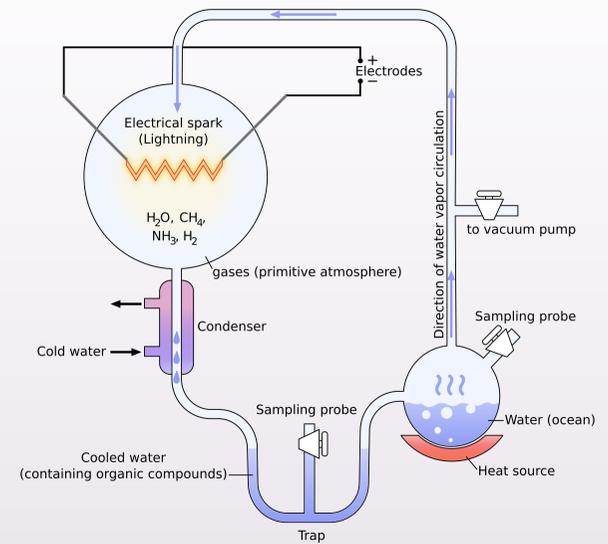
1953

1953

Struttura DNA



Esperimento di Miller-Urey



The background of the slide is a deep purple and blue cosmic scene, likely a visualization of the universe's expansion or a specific galaxy cluster. It features numerous small, distant galaxies and a prominent horizontal band of light. On the left side, there is a vertical purple bar and a purple arrow pointing to the right, which is partially overlapping the text.

PARTE II

RITORNO AL PASSATO

[Submitted on 28 Mar 2013]

Life Before Earth

Alexei A. Sharov, Richard Gordon

An extrapolation of the genetic complexity of organisms to earlier times suggests that life began before the Earth was formed. Life may have started from systems with single heritable elements that are functionally equivalent to a nucleotide. The genetic complexity, roughly measured by the number of non-redundant functional nucleotides, is expected to have grown exponentially due to several positive feedback factors: gene cooperation, duplication of genes with their subsequent specialization, and emergence of novel functional niches associated with existing genes. Linear regression of genetic complexity on a log scale extrapolated back to just one base pair suggests the time of the origin of life 9.7 billion years ago. This cosmic time scale for the evolution of life has important consequences: life took ca. 5 billion years to reach the complexity of bacteria; the environments in which life originated and evolved to the prokaryote stage may have been quite different from those envisaged on Earth; there was no intelligent life in our universe prior to the origin of Earth, thus Earth could not have been deliberately seeded with life by intelligent aliens; Earth was seeded by panspermia; experimental replication of the origin of life from scratch may have to emulate many cumulative rare events; and the Drake equation for guesstimating the number of civilizations in the universe is likely wrong, as intelligent life has just begun appearing in our universe. Evolution of advanced organisms has accelerated via development of additional information-processing systems: epigenetic memory, primitive mind, multicellular brain, language, books, computers, and Internet. As a result the doubling time of complexity has reached ca. 20 years. Finally, we discuss the issue of the predicted technological singularity and give a biosemiotics perspective on the increase of complexity.

Comments: 26 pages, 3 figures

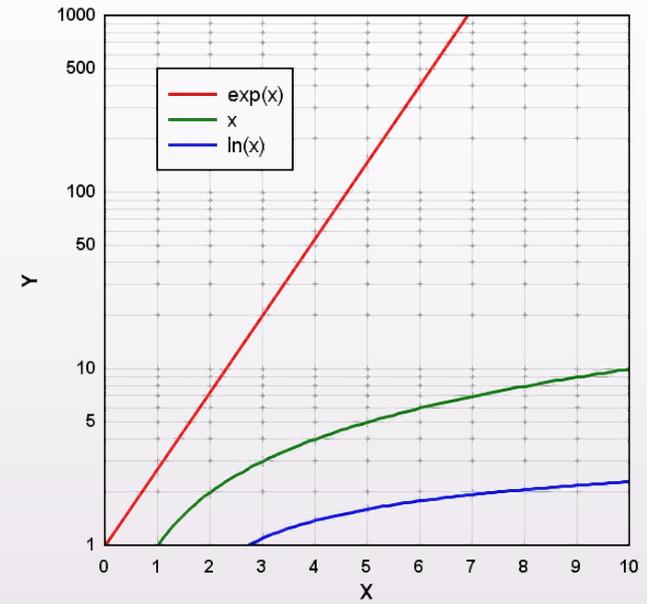
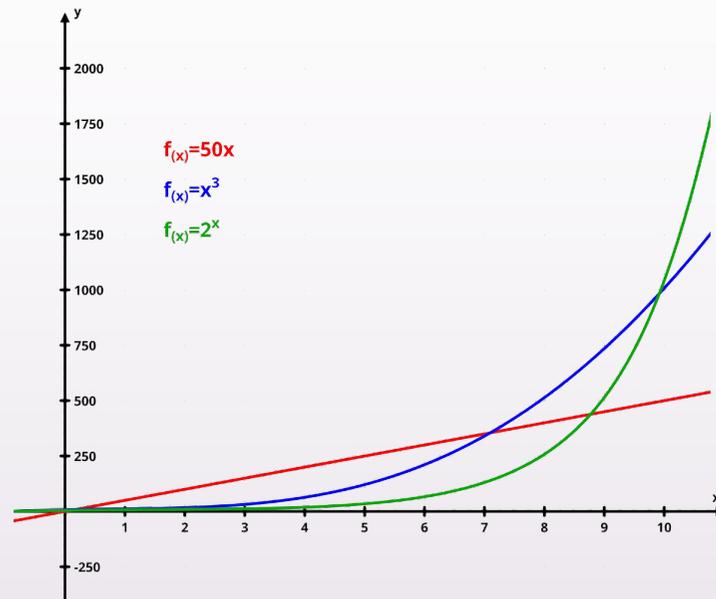
Subjects: **General Physics (physics.gen-ph)**

Cite as: [arXiv:1304.3381](https://arxiv.org/abs/1304.3381) [physics.gen-ph]

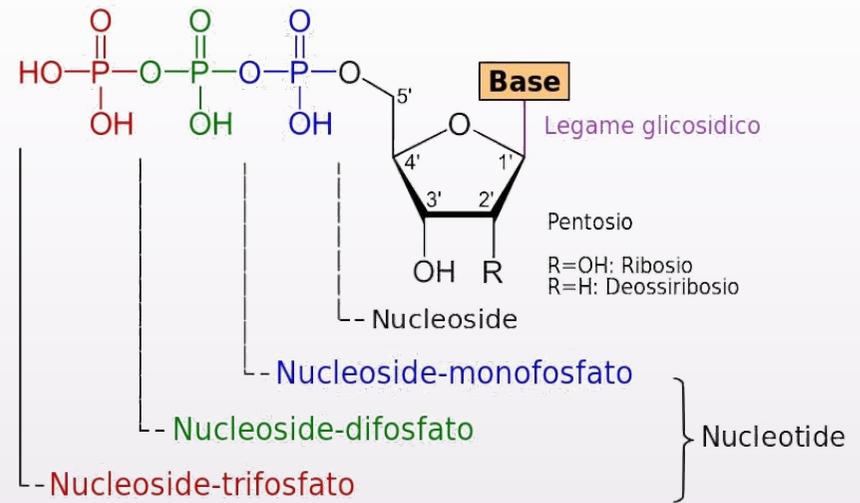
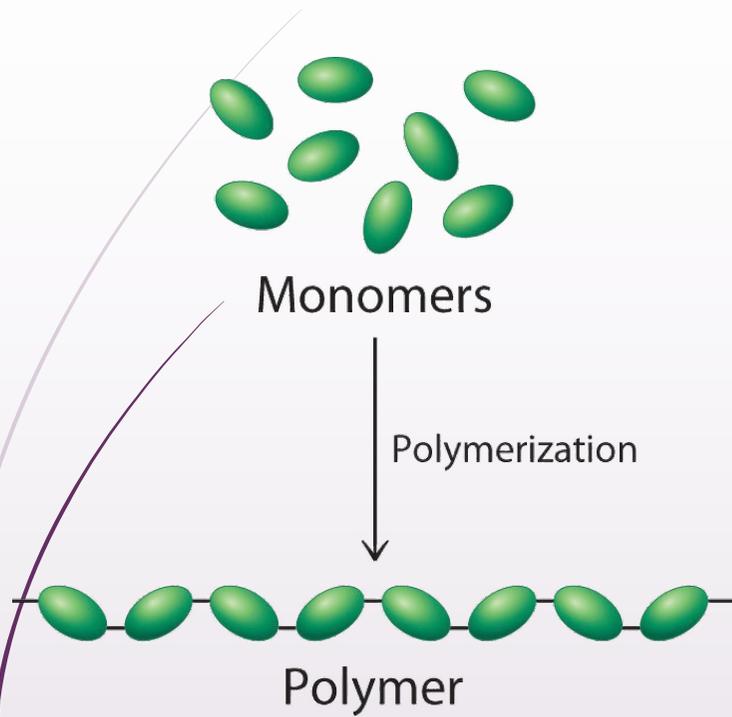
(or [arXiv:1304.3381v1](https://arxiv.org/abs/1304.3381v1) [physics.gen-ph] for this version)

<https://doi.org/10.48550/arXiv.1304.3381> 

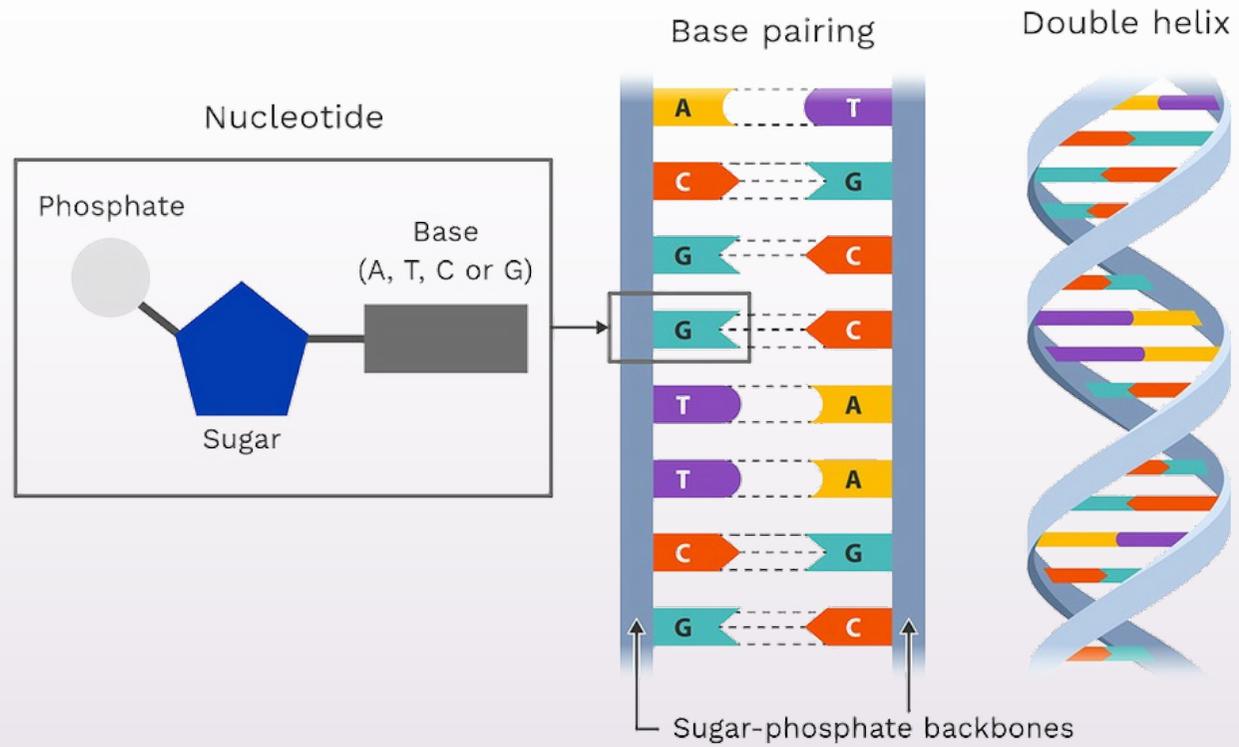
ESPONENZIALI E LOGARITMI



STRUTTURA DEL DNA

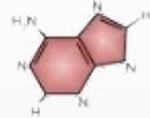


STRUTTURA DEL DNA

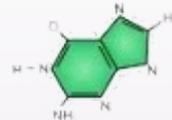


STRUTTURA DEL DNA

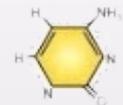
Adenine



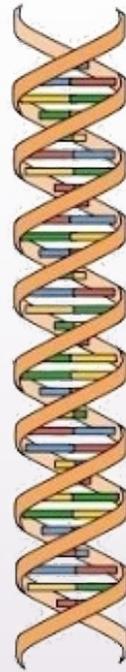
Guanine



Cytosine



Thymine



DNA

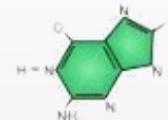


RNA

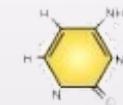
Adenine



Guanine



Cytosine



Uracil

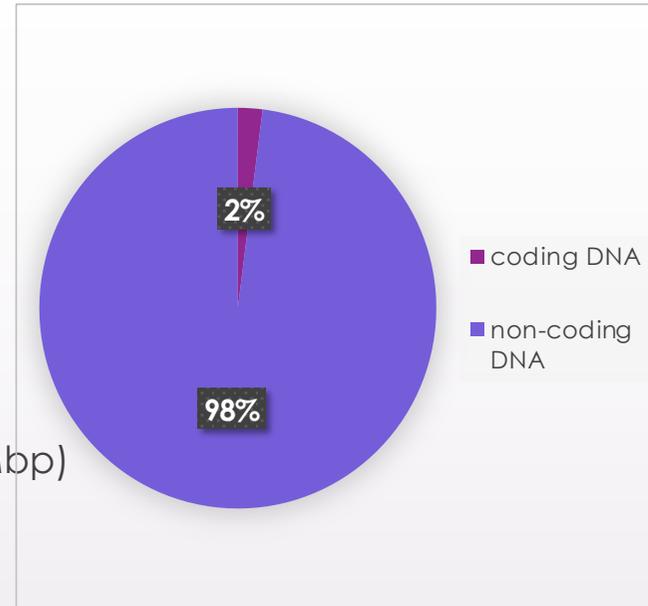


DOGMA CENTRALE DELLA BIOLOGIA



I NUMERI DEL DNA

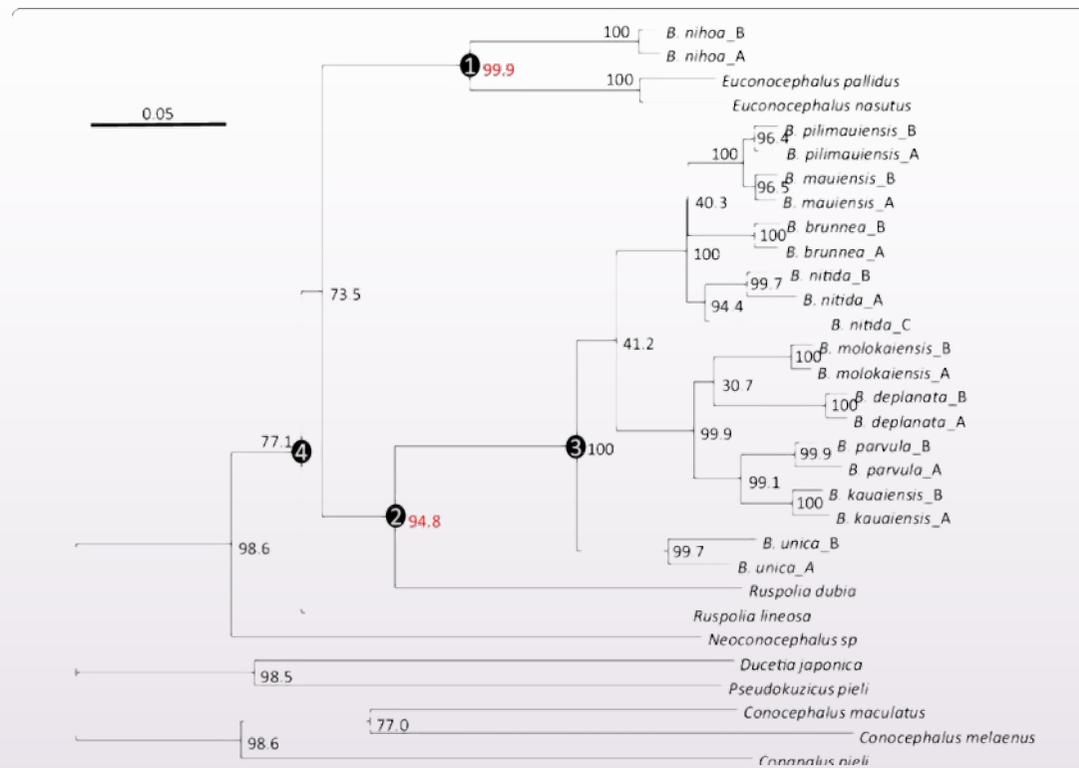
- ▶ 3.2 Gbp
- ▶ 20000 geni
- ▶ Media: 160 Kbp per gene
- ▶ Gene più piccolo: TDF (14 bp)
- ▶ Gene più grande: Distrofina (2.3 Mbp)



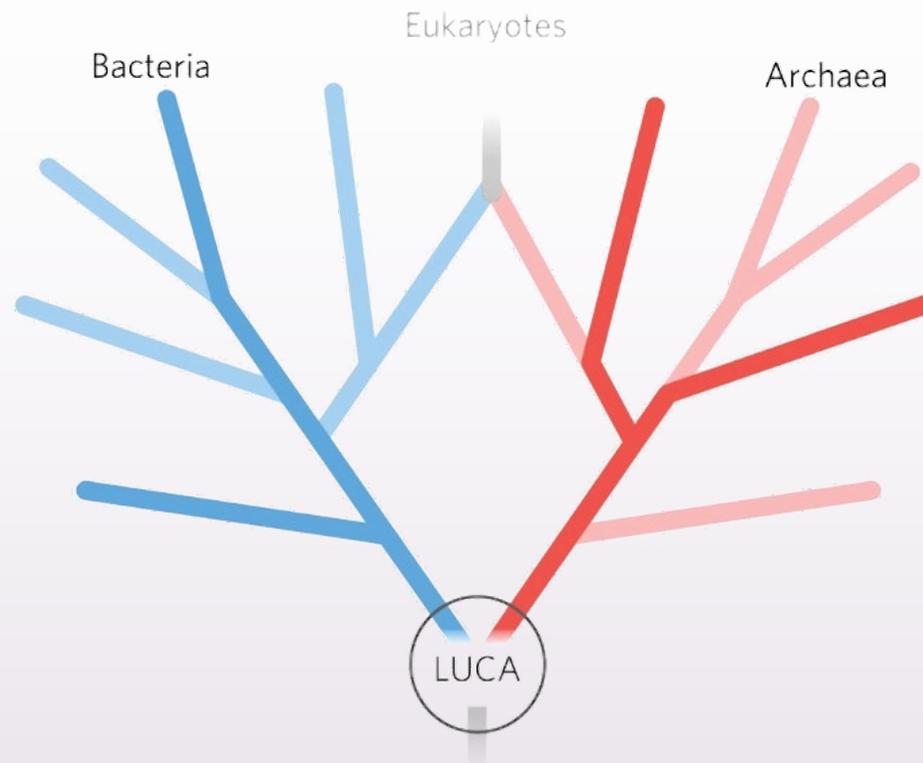
ALBERI FILOGENETICI

Q5E940_BOVIN	MPREDRATWKSNYFLKIIQLDDYPKCFIVGADNVGSKOMQOIRMSLRGK	AVVLMGKNTMMRKAIRGHLENN	PALE	76						
RLA0_HUMAN	MPREDRATWKSNYFLKIIQLDDYPKCFIVGADNVGSKOMQOIRMSLRGK	AVVLMGKNTMMRKAIRGHLENN	PALE	76						
RLA0_MOUSE	MPREDRATWKSNYFLKIIQLDDYPKCFIVGADNVGSKOMQOIRMSLRGK	AVVLMGKNTMMRKAIRGHLENN	PALE	76						
RLA0_RAT	MPREDRATWKSNYFLKIIQLDDYPKCFIVGADNVGSKOMQOIRMSLRGK	AVVLMGKNTMMRKAIRGHLENN	PALE	76						
RLA0_CHICK	MPREDRATWKSNYFMKIIQLDDYPKCFVVGADNVGSKOMQOIRMSLRGK	AVVLMGKNTMMRKAIRGHLENN	PALE	76						
RLA0_RANSY	MPREDRATWKSNYFLKIIQLDDYPKCFIVGADNVGSKOMQOIRMSLRGK	AVVLMGKNTMMRKAIRGHLENN	SALE	76						
Q7ZUG3_BRARE	MPREDRATWKSNYFLKIIQLDDYPKCFIVGADNVGSKOMQOIRMSLRGK	AVVLMGKNTMMRKAIRGHLENN	PALE	76						
RLA0_ICTPU	MPREDRATWKSNYFLKIIQLDDYPKCFIVGADNVGSKOMQOIRMSLRGK	AVVLMGKNTMMRKAIRGHLENN	PALE	76						
RLA0_DROME	MVRENKAAWKAQYFIKVVLEDFPKCFIVGADNVGSKOMQOIRMSLRGL	AVVLMGKNTMMRKAIRGHLENN	PQLE	76						
RLA0_DICDI	MSGAG-SKRKKLFIEKATKLFITTYDKMIVAEADFVGS	SOLOKIRKSRIRGI	GAVLMGKNTMIRKVVIRDLADSK	PELD						
Q54LP0_DICDI	MSGAG-SKRKNVFIEKATKLFITTYDKMIVAEADFVGS	SOLOKIRKSRIRGI	GAVLMGKNTMIRKVVIRDLADSK	PELD						
RLA0_PLAF8	MAKLSKQKKQMYIEKLSLIIQQYSKILIVHVDNVGSKOMASVRSKSLRGK	ATILMGKNTIRRTALKKNLQAV	PQIE	76						
RLA0_SULAC	MIGLAVITTKKIAKWKVDEVAELTEKLTHTKIIIANIEGFPADKLHEIRKKLRGK	ADIKVTKNNLFIALKNAG	YDTK	79						
RLA0_SULTO	MRIMAVITQERKIAKWKIEEVKLEKLRKYHTIIIANIEGFPADKLHDIRKKMRGM	AEIKVTKNTLFGIAAKNAG	LDVS	80						
RLA0_SULSO	MKRLALALKQKRVASWKIEFVKELTELKNSNTILIGNLEGFADKLHEIRKKLRGK	ATIKVTKNTLFGIAAKNAG	IDIE	80						
RLA0_AERPE	MSVVSIVGQMYKREKPIPEWKTLMLELEELFSKRRVFLADLTGPTFVVQRVRRKLLWKK	YPMVAKRRIILRAMKAAGIE	LDDN	86						
RLA0_PYRAE	MMLAIGKRRYVRTROYPARKVKIVSEATELLQKYPYVFLDLHGLSRILHEYRYRLRY	GVIKIIPFLFKIAFTKVYGG	IPAE	85						
RLA0_METAC	MAEERHTEHIPQWKKDEIENIKELIQSHKVFQMGVTEGILLATKMKKIRRDLDKV	AVLKVSRLTLEALNQLG	ETIP	78						
RLA0_METMA	MAEERHTEHIPQWKKDEIENIKELIQSHKVFQMGVTEGILLATKMKKIRRDLDKV	AVLKVSRLTLEALNQLG	ESTIP	78						
RLA0_ARCFU	MAAVRGS	PPEYKVRAVEEIKRMISKPVVAIVSFRNVPAGOMKIRREFRGK	AEIKVVKNTLLERALDALG	GDYL						
RLA0_MEIKA	MAVKAKGQPPSGYE	PKVAEWKRREVKELKELMDEYENVGLVDLEGIAPOLQEIIRAKLRERD	TIIRMSRLTLMRIAALAEKLDER	PELE						
RLA0_METH	MAHVAEWKKKEVQELHDLIKQYEVVGIANLADIPAROLQKMRQLRDS	ALIRMSKTLISLAEKAGREL	ENVD	74						
RLA0_METTL	MITAESEHKIAPWKIEEVNKLKELLNKQIIVALVDMMEVPAROLOEIRDKIR	GTMLKMSRLTLEIRAIKEVAEETGNPEFA	82							
RLA0_MEIYA	MIDAKSEHKIAPWKIEEVNKLKELLNKQIIVALVDMMEVPAROLOEIRDKIR	DQMTLKMSRLTLEIRAIKEVAEETGNPEFA	82							
RLA0_MEIJA	MEIKVKAHVAPWKIEEVKTLKGLIKSKPVVAIVDMMDVAPOLQEIIRDKIR	DKVKLRMSRLTLEIRAIKEVAEELNPKLA	81							
RLA0_PYRAB	MAHVAEWKKKEVEELANLIKSYPPVALVDVSSMPAYPLSQMRR	IRENGGLRVSRLTLEIRAIKKAQELGKPELE	77							
RLA0_PYRHO	MAHVAEWKKKEVEELAKLIKSYPPVALVDVSSMPAYPLSQMRR	IRENGGLRVSRLTLEIRAIKKAQELGKPELE	77							
RLA0_PYRFU	MAHVAEWKKKEVEELANLIKSYPPVALVDVSSMPAYPLSQMRR	IRENNGLRVSRLTLEIRAIKKAQELGKPELE	77							
RLA0_PYRKO	MAHVAEWKKKEVEELANLIKSYPPVALVDVAGVPAYPLSKMRDKLR	GKALLRVSRLTLEIRAIKKAQELGQPELE	76							
RLA0_HALMA	MSAESERKTEIPEWKKQEVDAIVMIESYESVGVVNIAGIPSRLOLDMRRDLHGT	AELRVSRLTLEIRALDDVD	DGLE	79						
RLA0_HALVO	MSESEVRQTEVIPQWKKREVDLVDVFIESYESVGVVGVAGIPSRLOLDMRRDLHGS	AAVRMSRLTLEIRALDEVN	DGFE	79						
RLA0_HALSA	MSAEEQRTTEEVPEWKRQEVAVLDDLETYDSVGVVNVTCIPSKOLDMRRDLHGQ	AALRMSRLTLEIRALEEAG	DGLD	79						
RLA0_THEAC	MKEVVSQKKELVNEITORIKASRSVAIVDTAGIRTRQIQDIRGKNRGK	INLKVIKTLFLKALENLGD	EKLS	72						
RLA0_THEVO	MRKINPKKKEIVSELAQDITTSKAVAIVDIKGVRTROMQDIRAKNRDK	VKIKVVKTLFLKALDSIND	EKLT	72						
RLA0_PICTO	MTEPAQWKIDFVKNELEINSRKVAIVS	IKGLRNNFQKIRNSIRDK	ARIKVSARLLRLAIENTGK	NNIV						
ruler	1	10	20	30	40	50	60	70	80	90

ALBERI FILOGENETICI



ALBERI FILOGENETICI



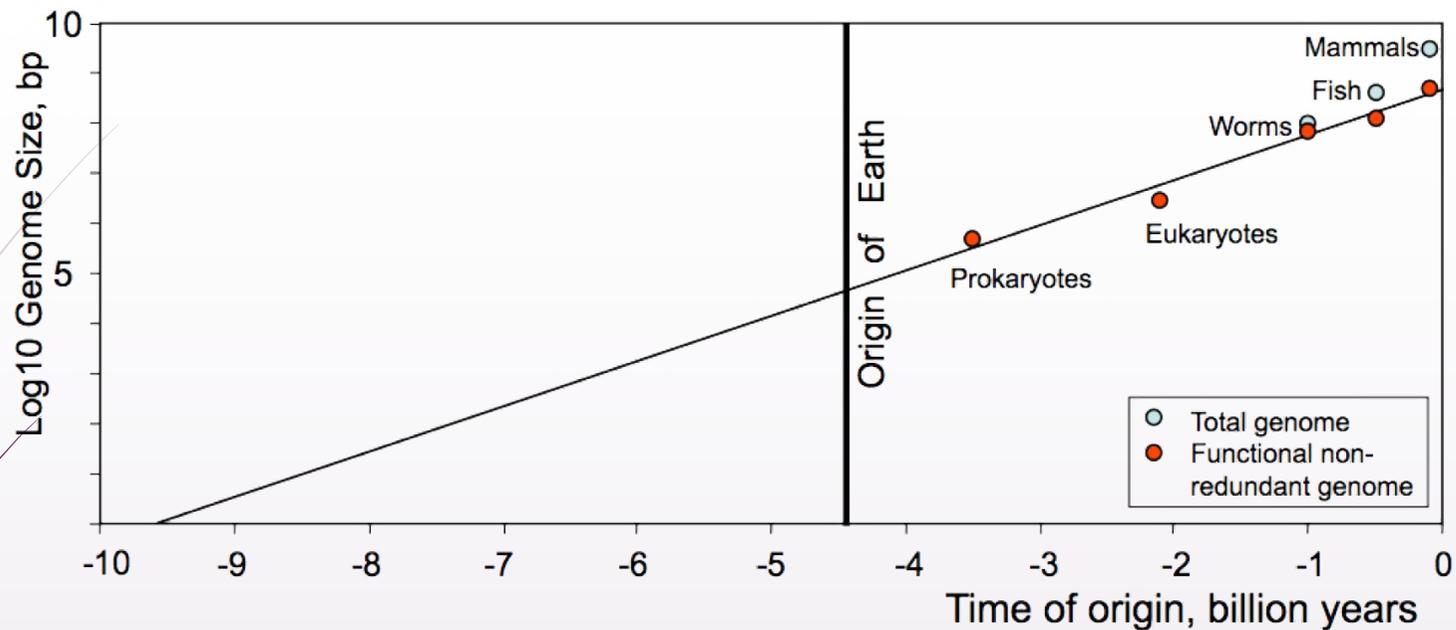


Figure 1. On this semilog plot, the complexity of organisms, as measured by the length of functional non-redundant DNA per genome counted by nucleotide base pairs (bp), increases linearly with time (Sharov, 2012). Time is counted backwards in billions of years before the present (time 0). Modified from Figure 1 in (Sharov, 2006).

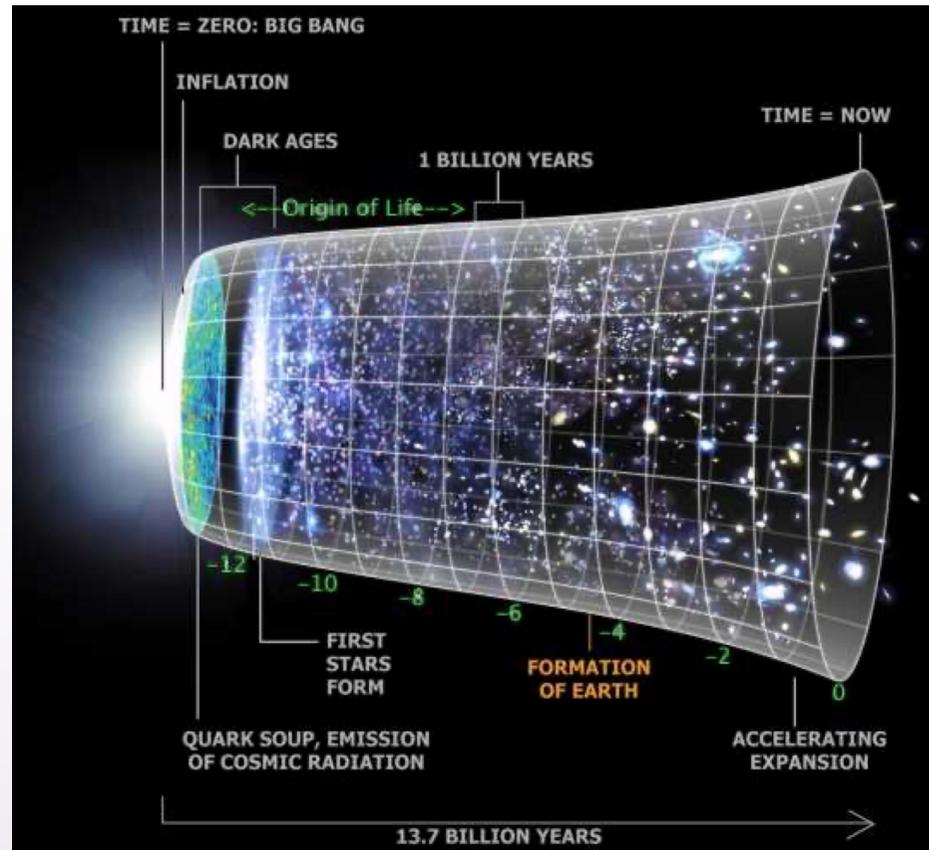
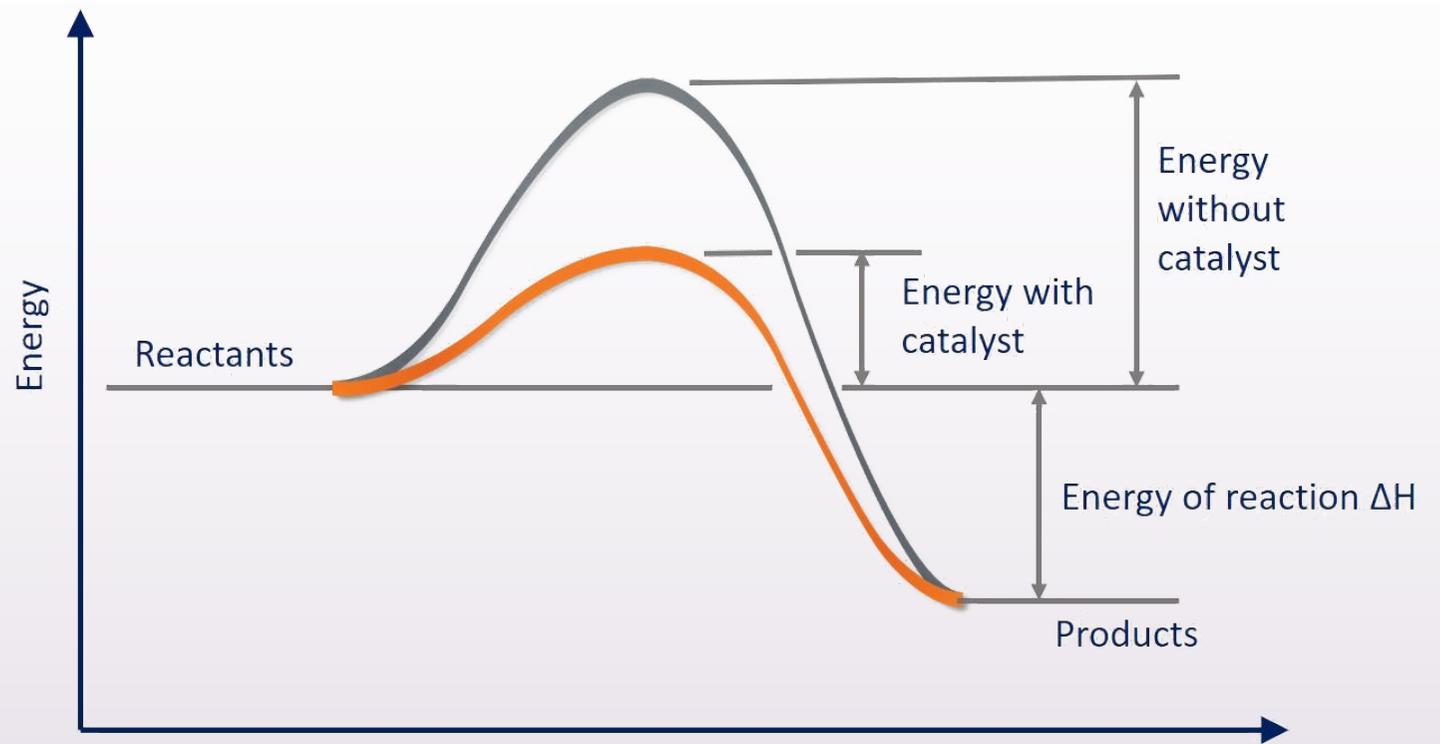


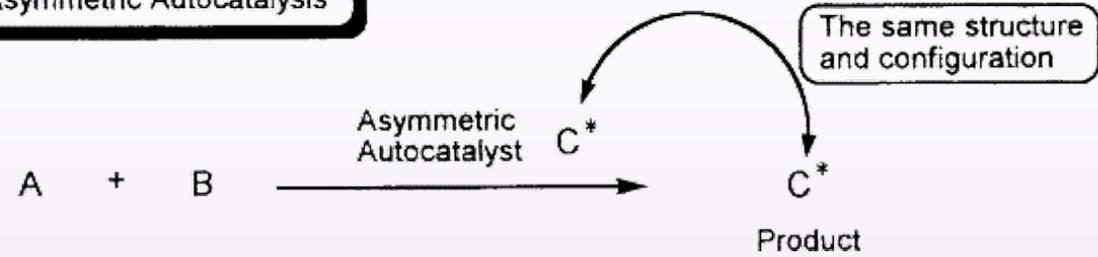
Figure 2. A schematic view of the development of the universe since the Big Bang, courtesy of the Hubble Space Telescope Science Institute, on which we have superimposed our estimate for the origin of life, 9.7 ± 2.5 billion years ago. Note that the “Dark Ages” may have ended at -13.55 billion years (Zheng, *et al.*, 2012) (with the Big Bang at -13.75 billion years (Jarosik, *et al.*, 2011)), rather than at -11.5 billion years, as depicted.

CATALISI E AUTOCATALISI



CATALISI E AUTOCATALISI

Asymmetric Autocatalysis



NUOVA TIMELINE





IMPLICAZIONI

- ▶ Genetica comune
- ▶ Timescale vita complessa
- ▶ Erronea ricostruzione ambientale per studi OoL



[International Journal
of Astrobiology](#)

Article contents

[Abstract](#)

[References](#)

The habitable epoch of the early Universe

Published online by Cambridge University Press: **09 September 2014**

[Abraham Loeb](#)

[Show author details](#) ▼

Article

[Metrics](#)

[Get access](#)

[Share](#)

[Cite](#)

[Rights & Permissions](#)

Abstract

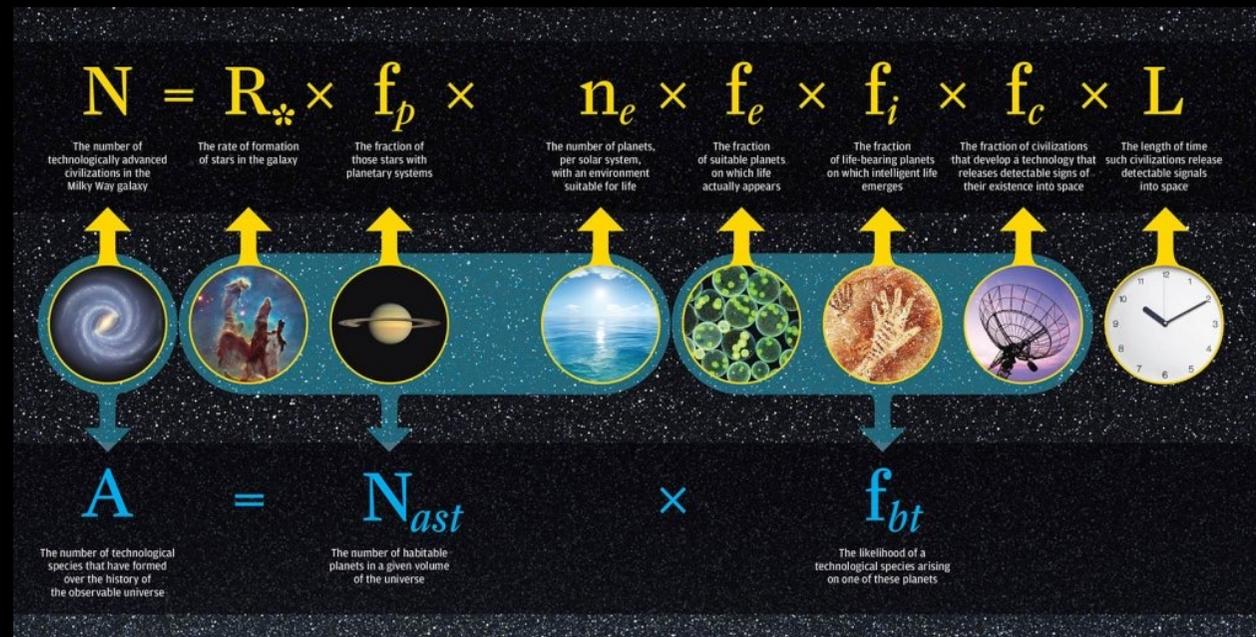
In the redshift range $100 \leq (1+z) \leq 137$, the cosmic microwave background (CMB) had a temperature of 273–373 K (0–100°C), allowing early rocky planets (if any existed) to have liquid water chemistry on their surface and be habitable, irrespective of their distance from a star. In the standard Λ CDM cosmology, the first star-forming halos within our Hubble volume started collapsing at these redshifts, allowing the chemistry of life to possibly begin when the Universe was merely 10–17 million years old. The possibility of life starting when the average matter density was a million times bigger than it is today is not in agreement with the anthropic explanation for the low value of the cosmological constant.

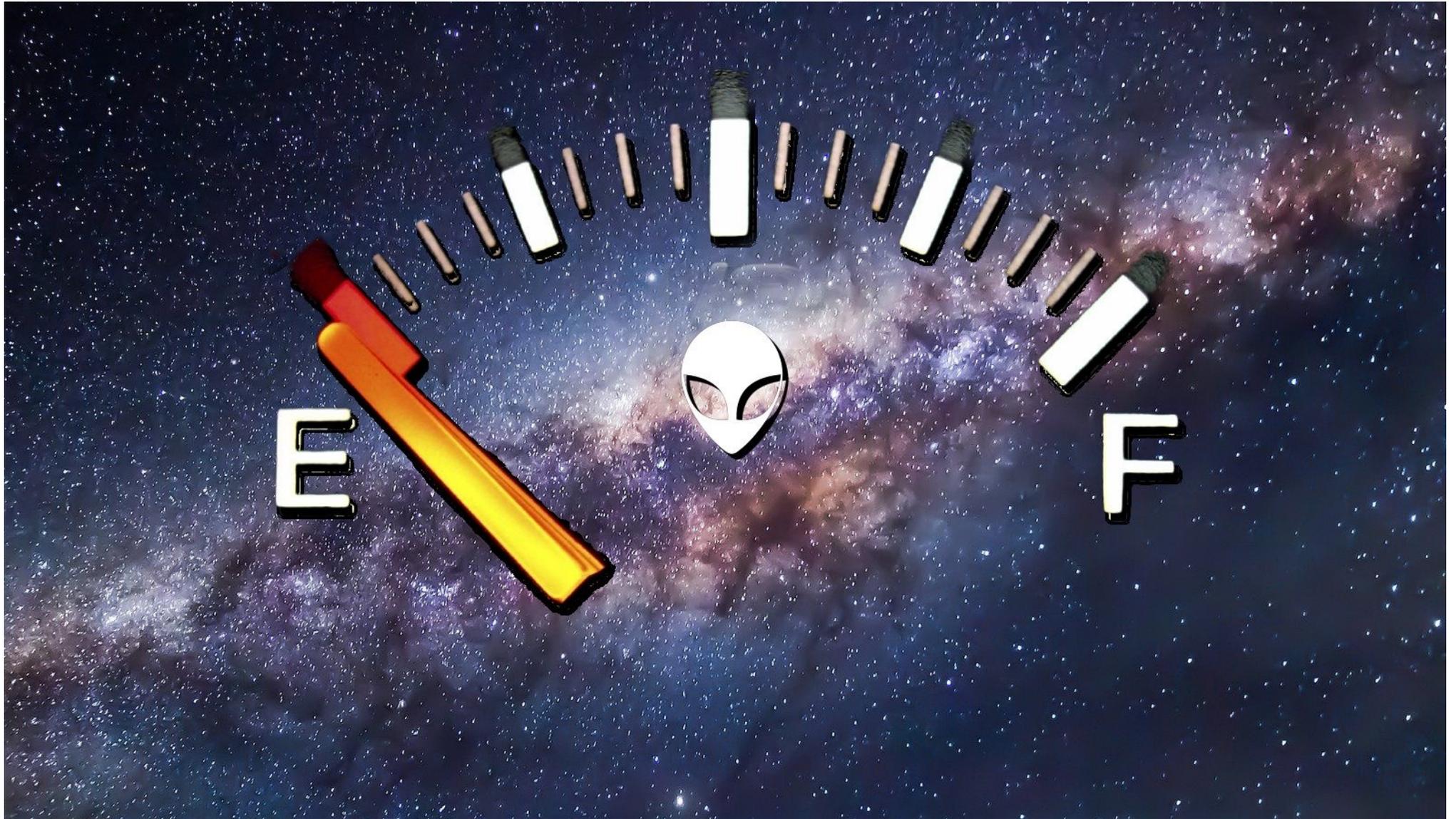


PARTE III

PROSPETTIVA

L'EQUAZIONE DI DRAKE





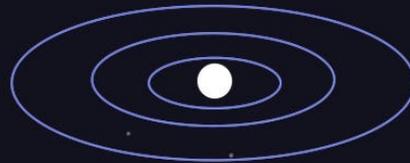
LA SCALA DI KARDAŠĚV



Type I

PLANETARY

$\sim 10^{17}$ W



Type II

STELLAR

$\sim 10^{26}$ W

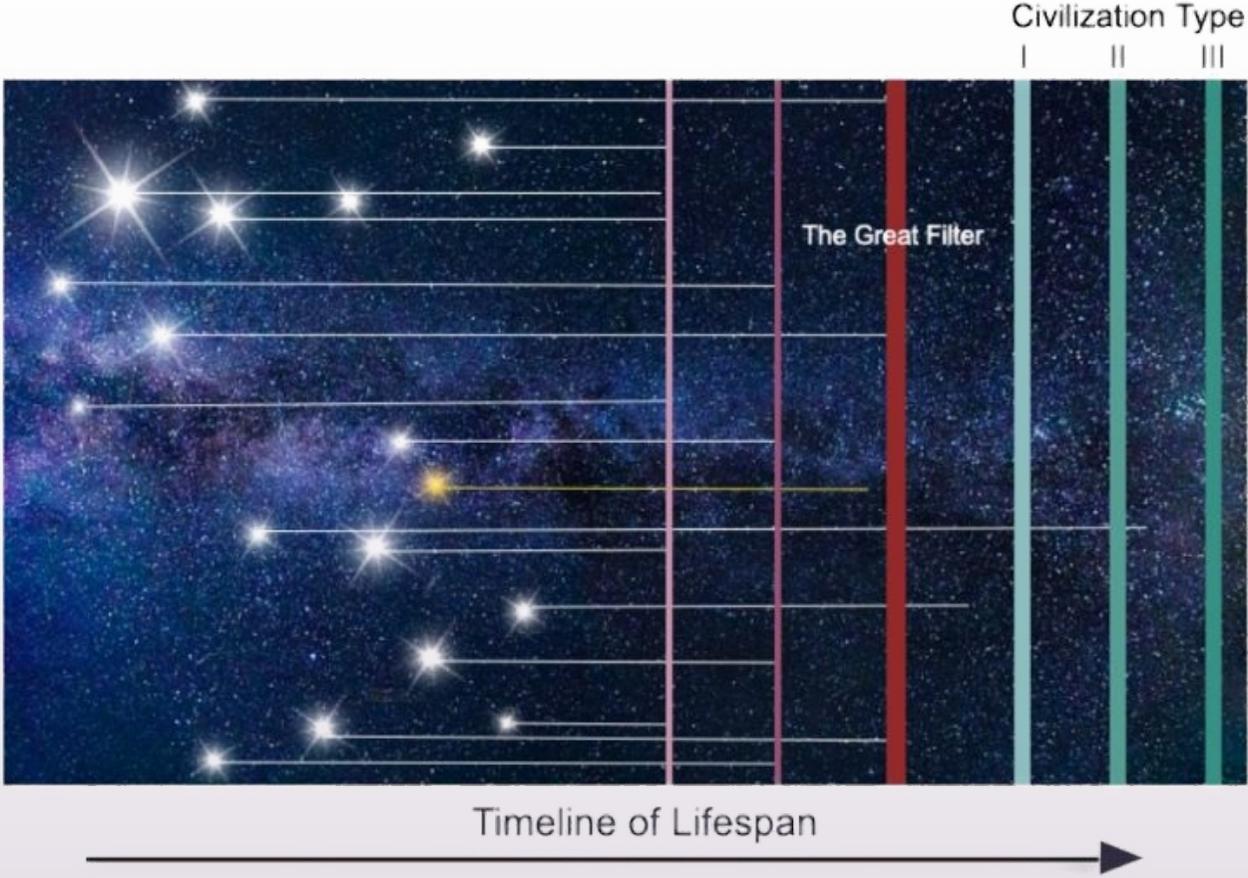


Type III

GALACTIC

$\sim 10^{37}$ W

IL GRANDE FILTRO

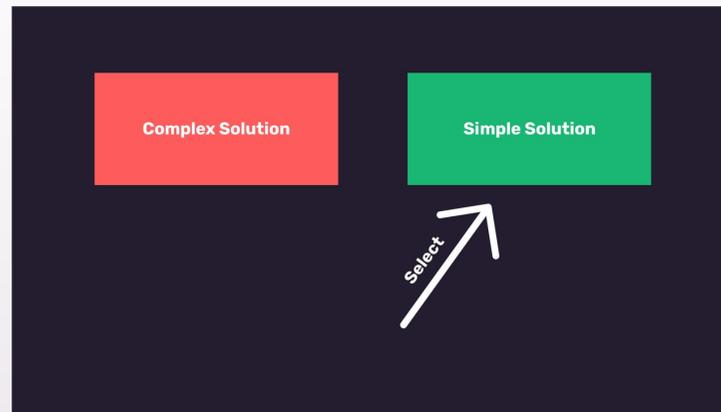




GRAZIE PER LA VOSTRA ATTENZIONE

EXTRA SLIDE (RASOI)

Rasoio di Occam



Spada laser fiammeggiante di
Newton

