Савремене верзије космологије

Ненад Швракић

As seen on public television

The Elegant Universe

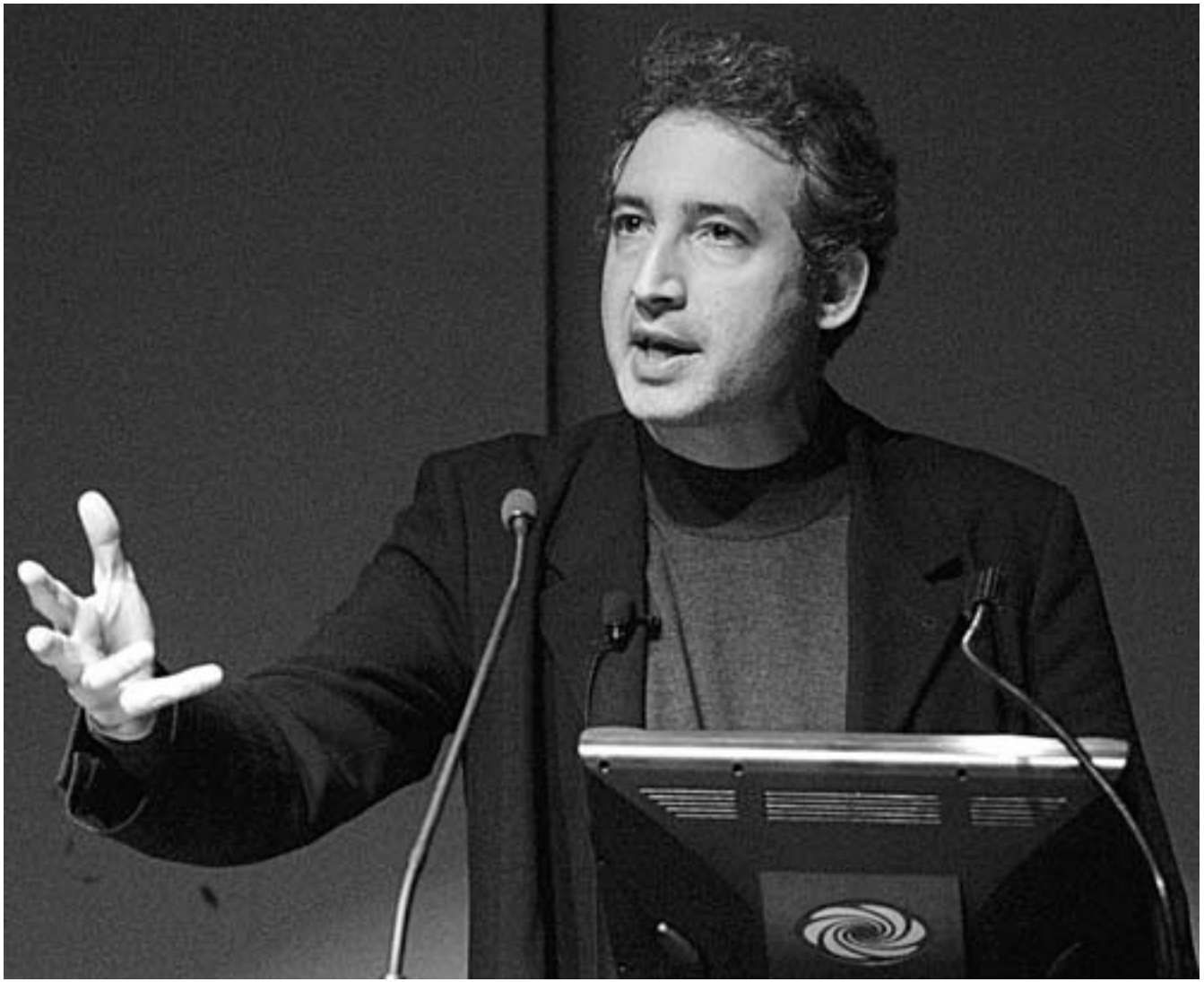
Superstrings, Hidden Dimensions,
and the Quest for the Ultimate Theory

NOVA

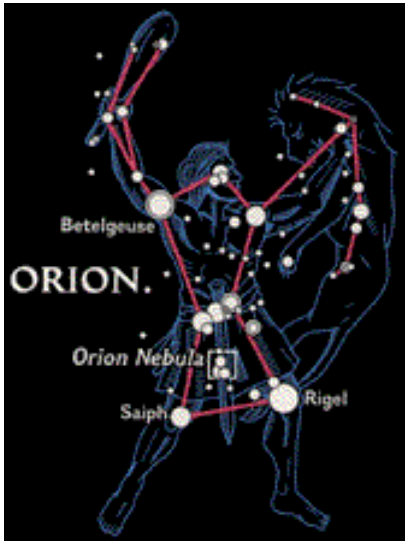
DVD VIDEO

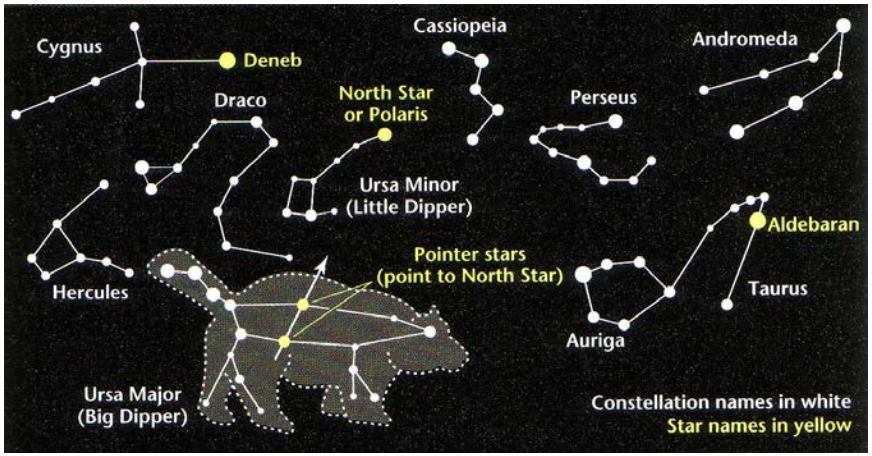
WGBH BOSTON VIDEO

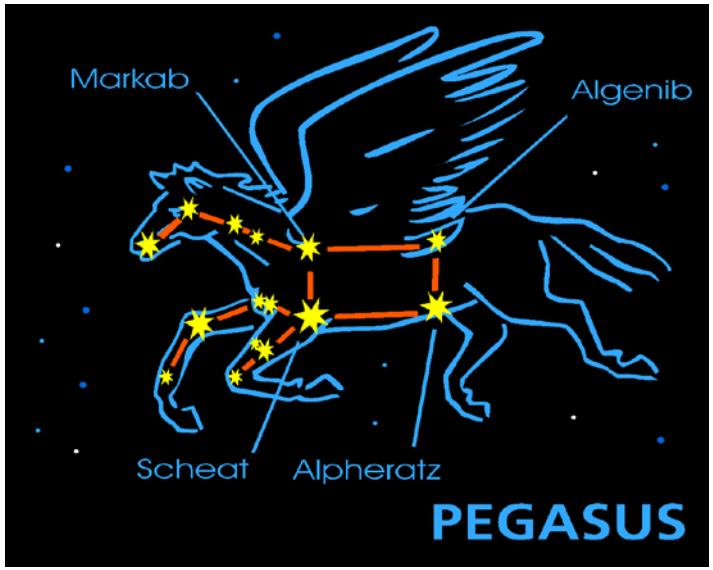
Brian Greene



Теоријски прилази и објашњења







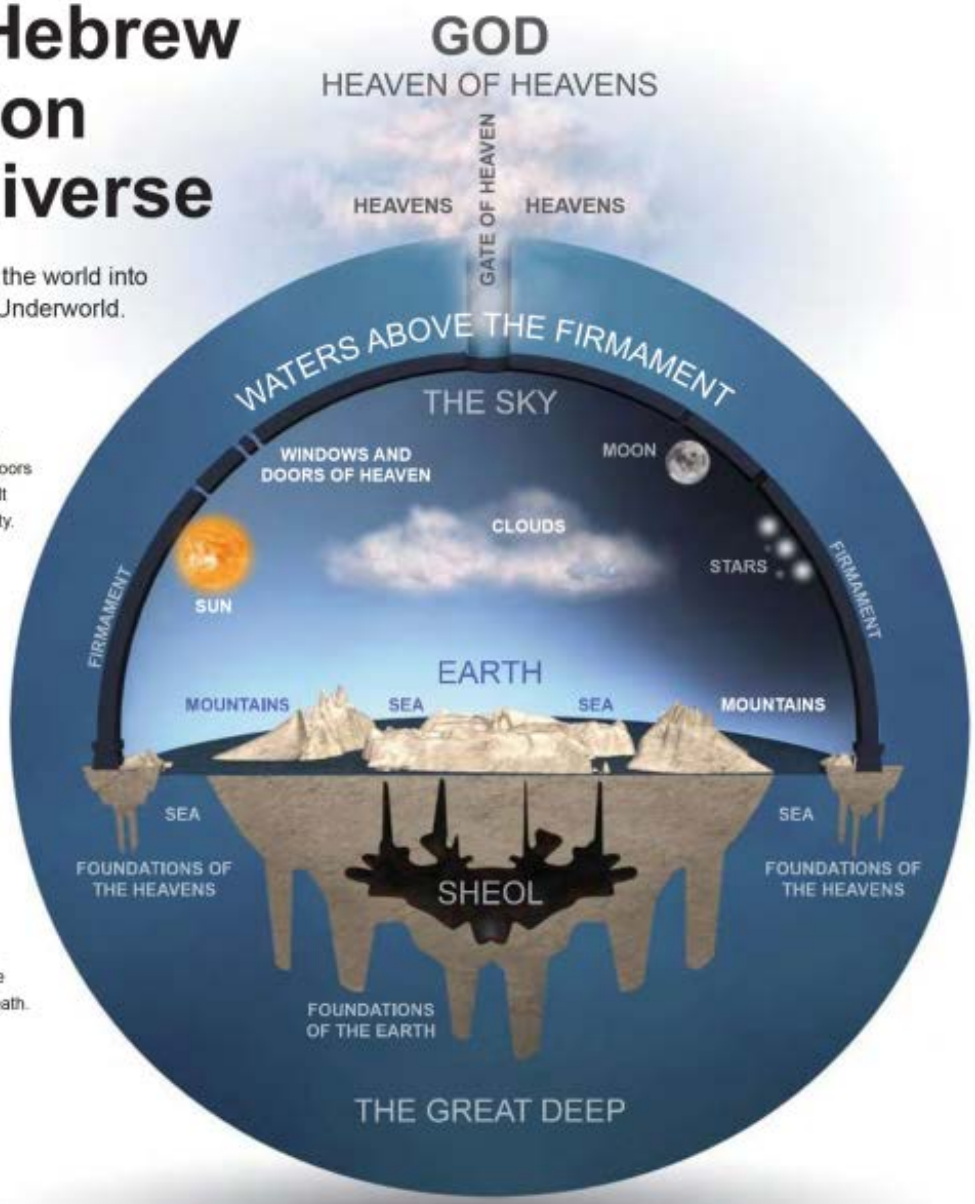
Ancient Hebrew Conception of the Universe

The ancient Israelites divided the world into Heaven, Earth, Sea, and the Underworld.

They viewed the sky as a vault resting on foundations—perhaps mountains—with doors and windows that let in the rain. God dwelt above the sky, hidden in cloud and majesty.

The world was viewed as a disk floating on the waters, secured or moored by pillars. The earth was the only known domain—the realm beyond it was considered unknowable.

The Underworld (Sheol) was a watery or dusty prison from which no one returned. Regarded as a physical place beneath the earth, it could be reached only through death.

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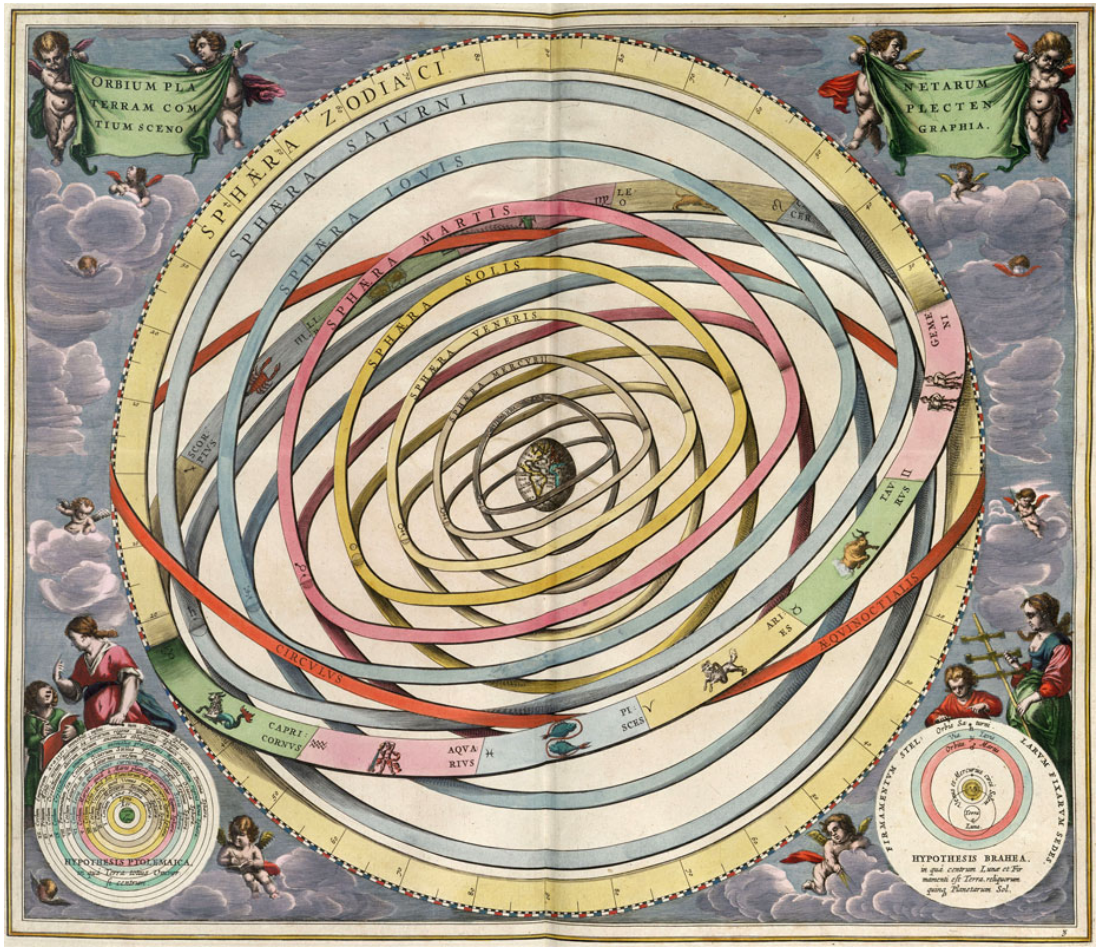

ORBIVM PLA
TERRAM COM
TIVM SCENO
NETARVM
PLECTEN
GRAPHIA.
SPHÆRA ZODIACI
SPHÆRA SATVRNI
SPHÆRA IOVIS
SPHÆRA MARTIS
SPHÆRA SOLIS
SPHÆRA VENERIS
SPHÆRA MERCVRII
TERRA
LUNA
CIRCVLVS
EQUINOCTIALIS
CAPRI
CORNVS
AQVA
RIVS
PI
SCES
ARI
ES
TAV
RVS
GEMI
NI
CAN
CER
LEO
VIRGO
LIBRA
SCORPIVS
SAGITTARIVS
HYPOTHESIS PTOLEMAICA
HYPOTHESIS BRAHEA.
in qua centrum Lunæ et Firmamenti est Terra, reliquarum
quinq; Planetarum Sol.
FIRMAMENTVM STEL.
SATVRNVS IOVIS MARTIS

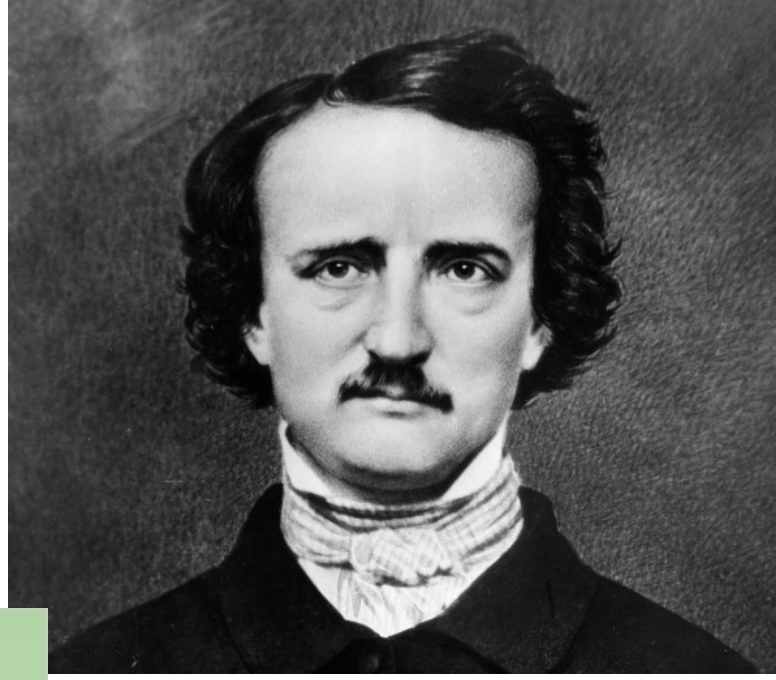
EUREKA:

A PROSE POEM.

BY

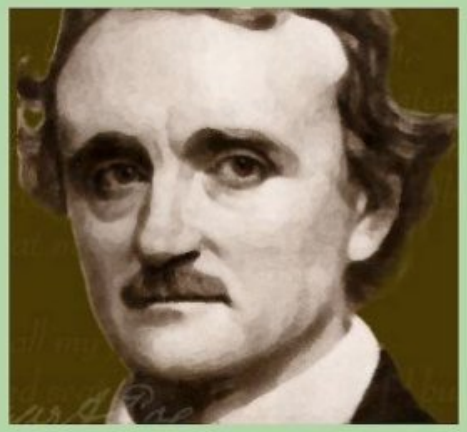
EDGAR A. POE.

NEW-YORK:
GEO. P. PUTNAM,
OF LATE FIRM OF "WILEY & PUTNAM,"
155 BROADWAY.
MDCCCXLVIII.



"A beautiful achievement of an unusually independent mind." — Albert Einstein

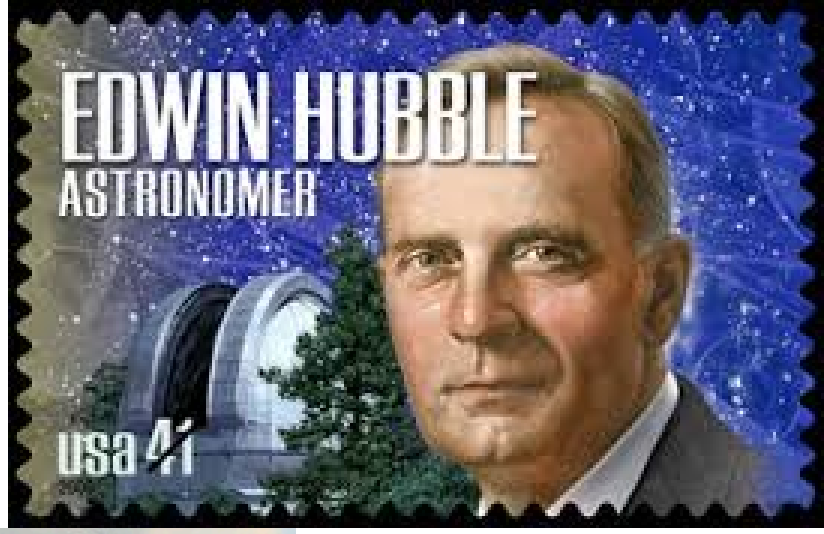
EUREKA

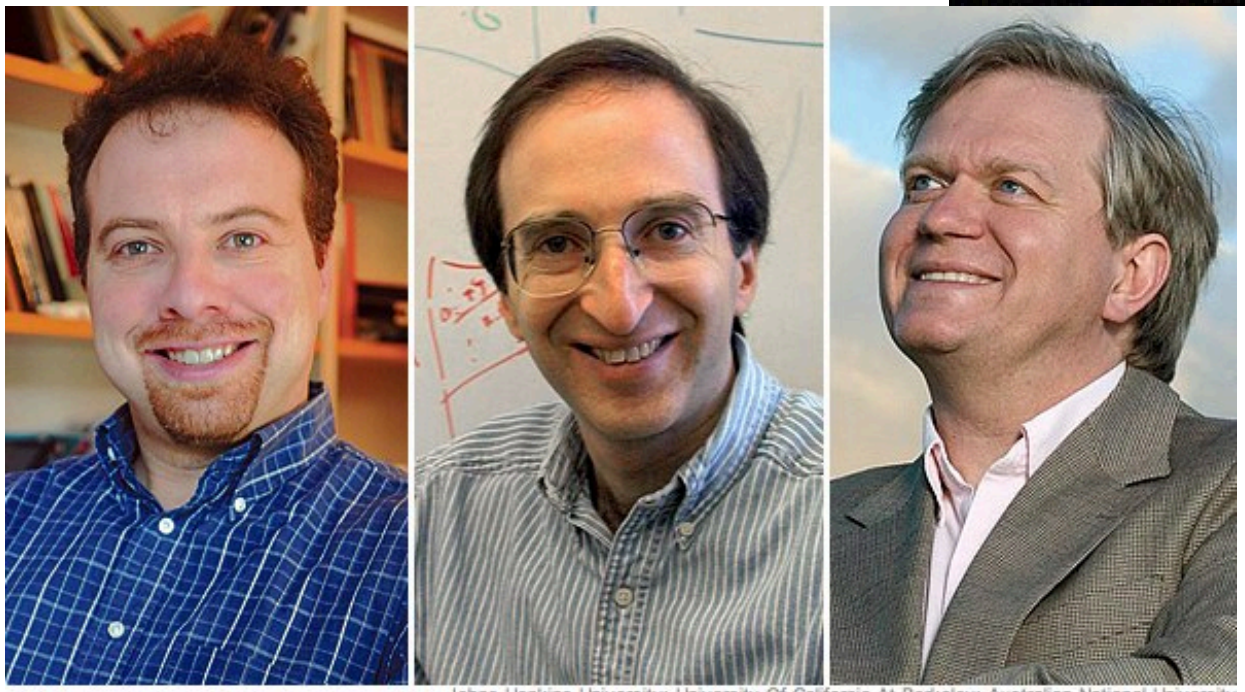


A Cosmological Inquiry

by Edgar Allan Poe

Космос се шири – Е. Хабл 1929



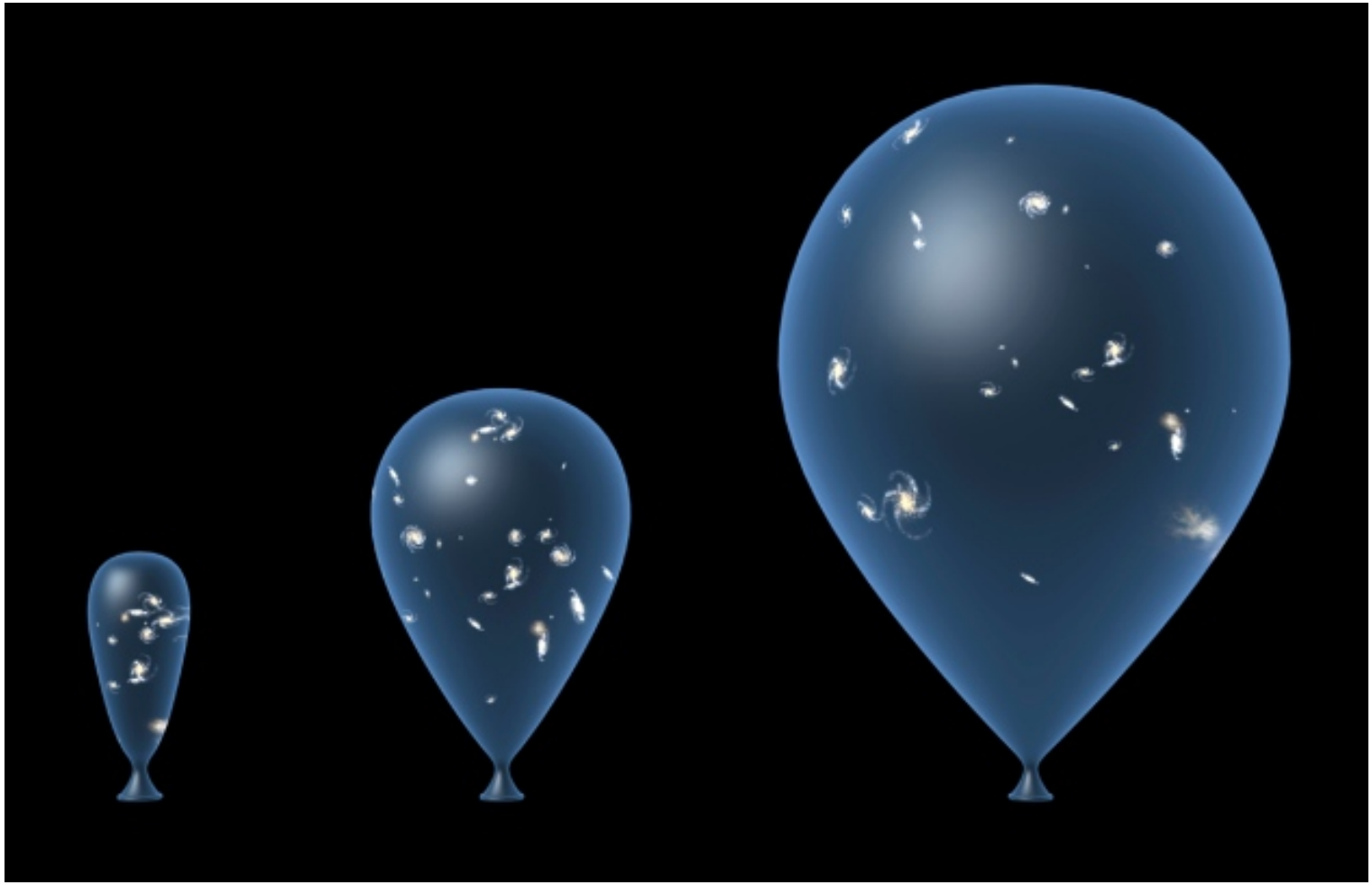


Johns Hopkins University; University Of California At Berkeley; Australian National University

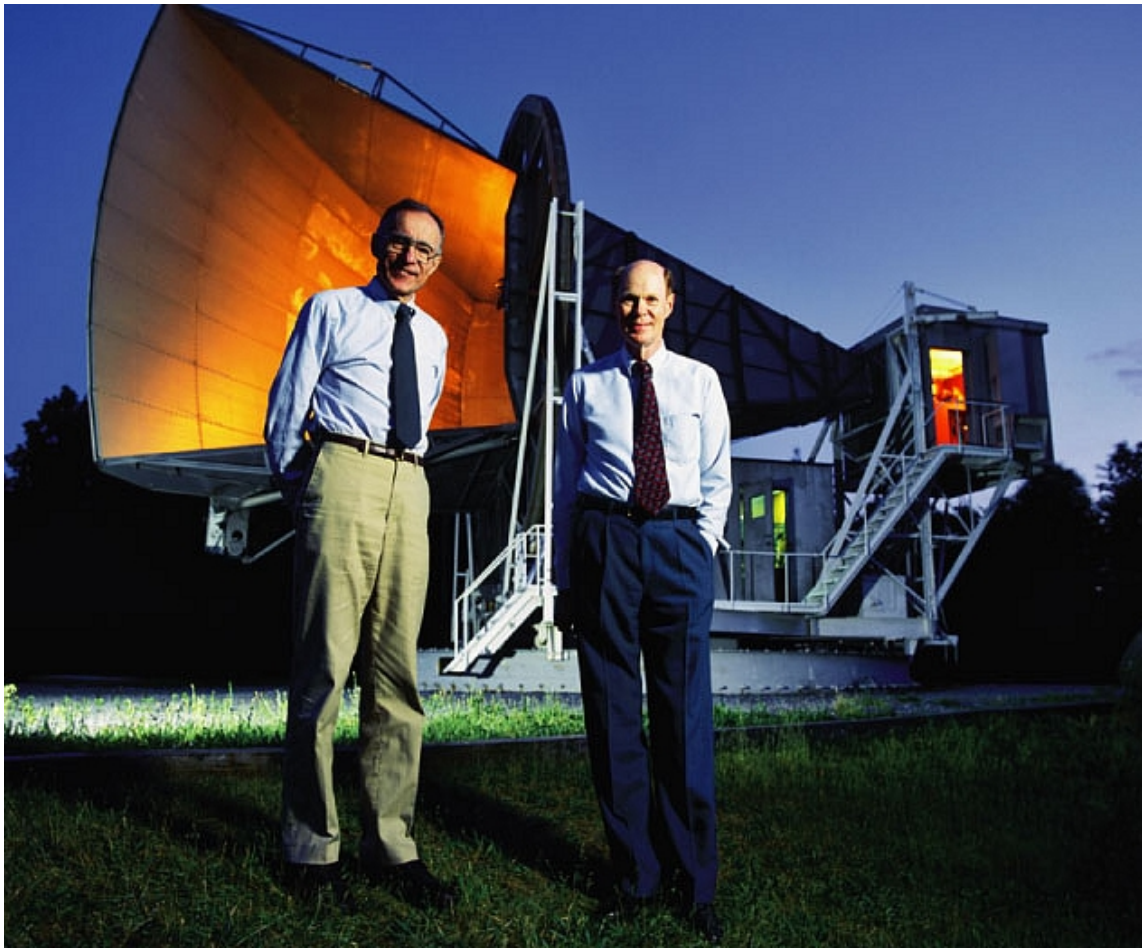
From left, Adam Riess, Saul Perlmutter and Brian Schmidt shared the Nobel Prize in physics awarded Tuesday.

Космос се убрзано шири – Рис, Перлмутер, Шмит - 2011

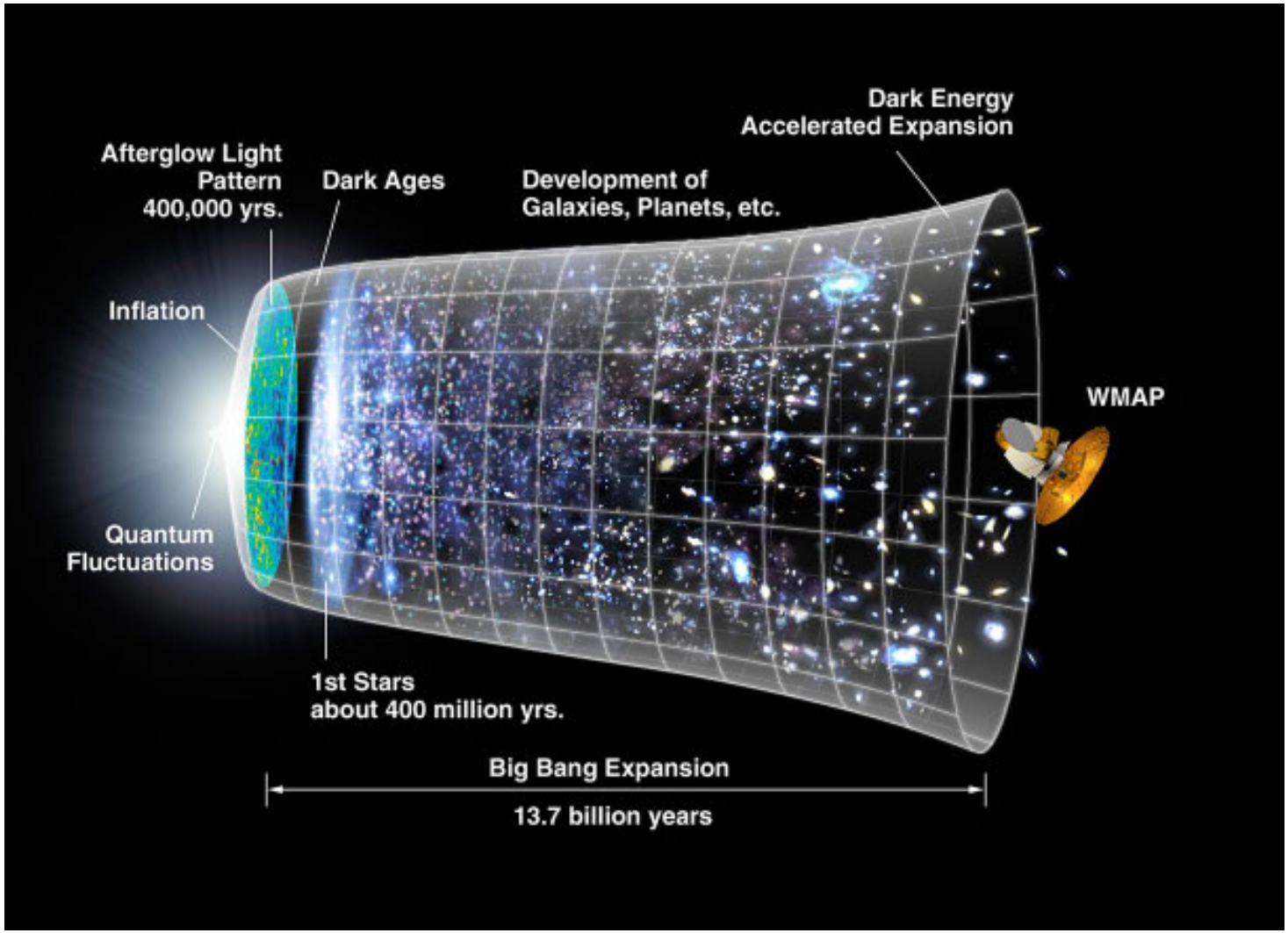
Свемир се шири – Велики Прасак



Позадинско зрачење - 1977



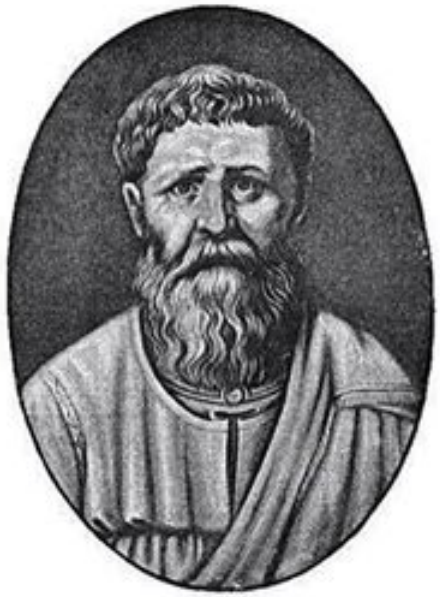
Вилсон и Пензиас



Шта је било пре Великог Праска?

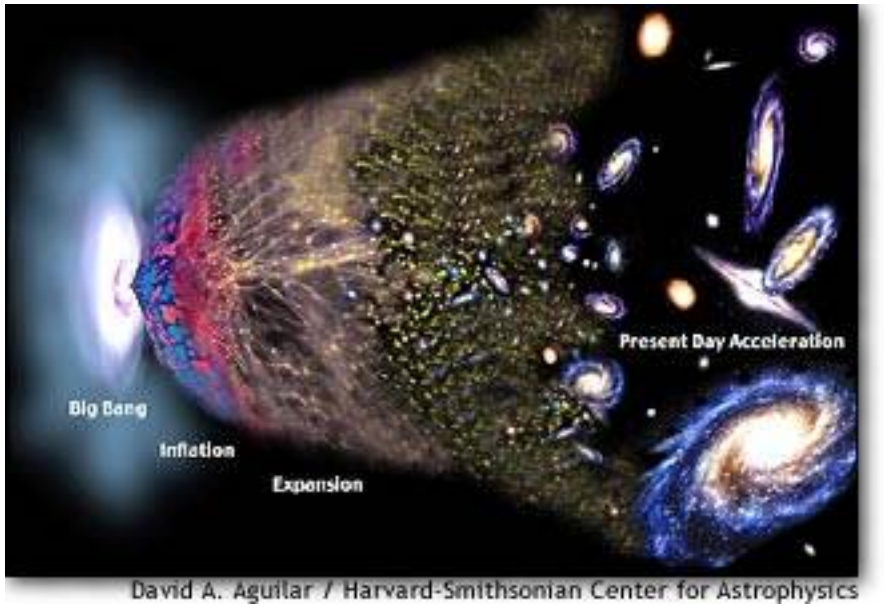
Шта је Бог радио пре него што је створио Свет?

Правио је Пакао за оне који постављају таква питања –Св.Аугустин

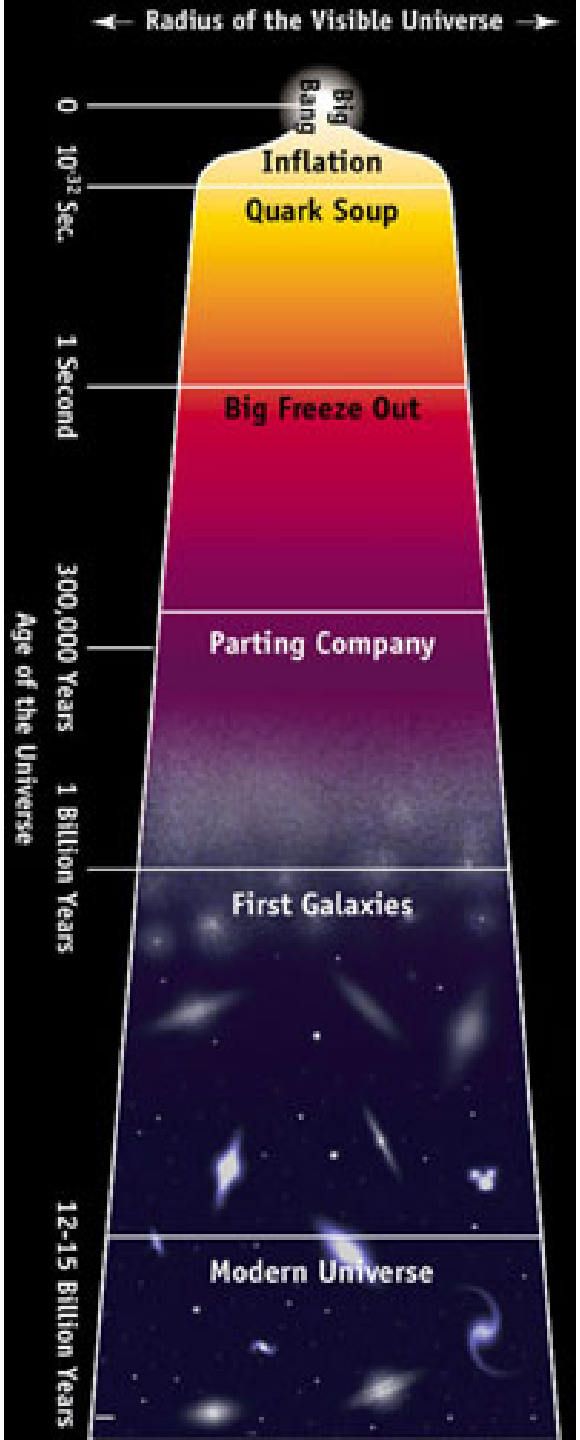


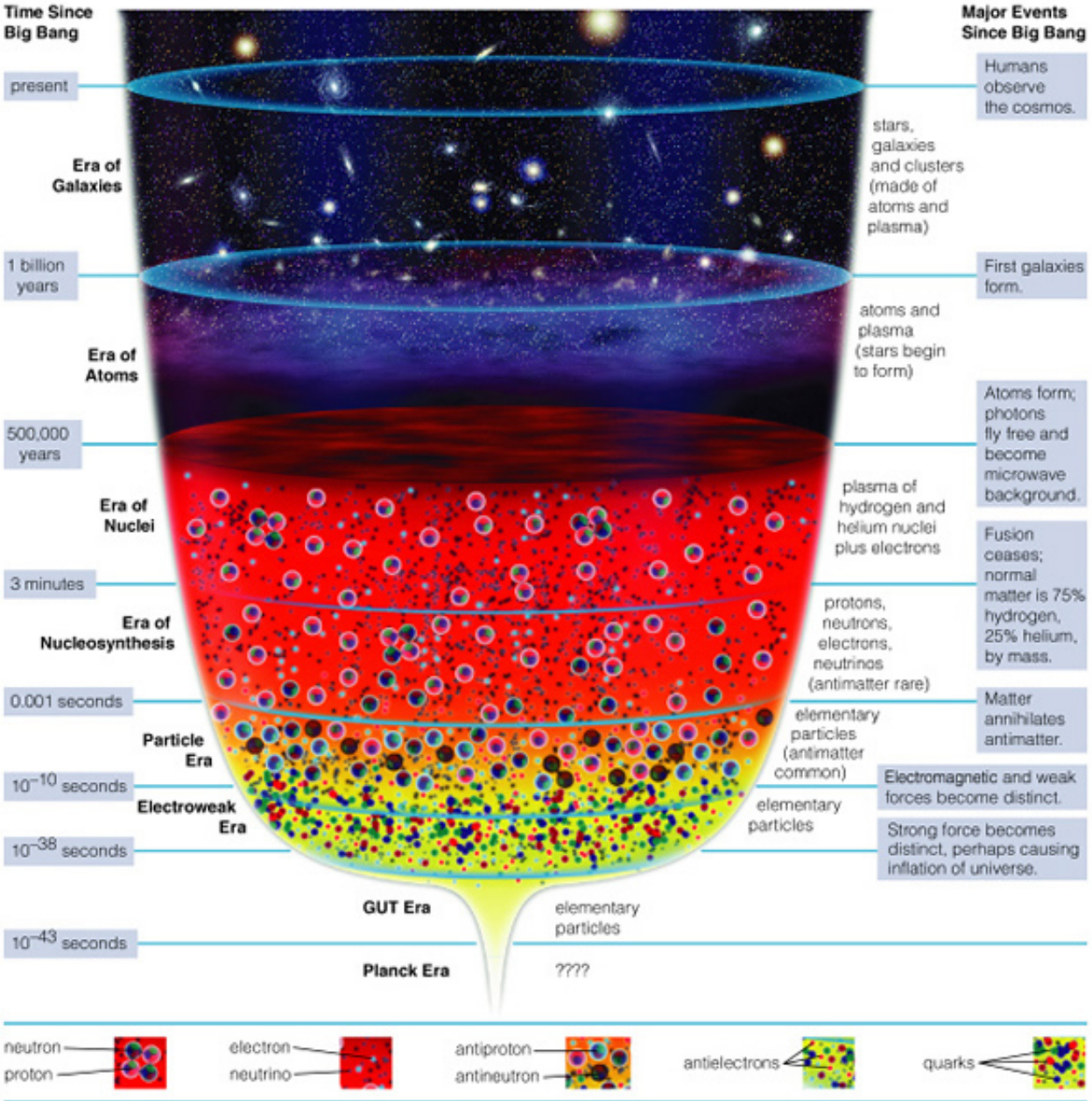
"Women should not be enlightened or educated in any way. They should, in fact, be segregated as they are the cause of hideous and involuntary erections in holy men."

St. Augustine



David A. Aguilar / Harvard-Smithsonian Center for Astrophysics



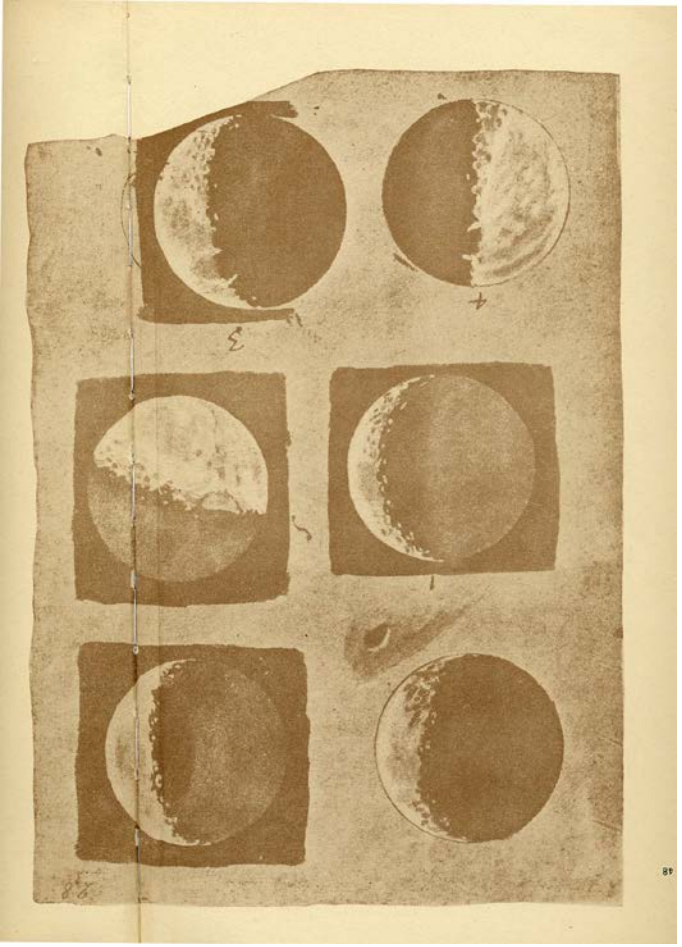

Time Since Big Bang
Major Events Since Big Bang
present
Humans observe the cosmos.
Era of Galaxies
stars, galaxies and clusters (made of atoms and plasma)
1 billion years
First galaxies form.
Era of Atoms
atoms and plasma (stars begin to form)
500,000 years
Atoms form; photons fly free and become microwave background.
Era of Nuclei
plasma of hydrogen and helium nuclei plus electrons
3 minutes
Fusion ceases; normal matter is 75% hydrogen, 25% helium, by mass.
Era of Nucleosynthesis
protons, neutrons, electrons, neutrinos (antimatter rare)
0.001 seconds
Matter annihilates antimatter.
Particle Era
elementary particles (antimatter common)
10^{-10} seconds
Electromagnetic and weak forces become distinct.
Electroweak Era
elementary particles
10^{-38} seconds
Strong force becomes distinct, perhaps causing inflation of universe.
GUT Era
elementary particles
10^{-43} seconds
Planck Era
????
neutron
proton
electron
neutrino
antiproton
antineutron
antielectrons
quarks

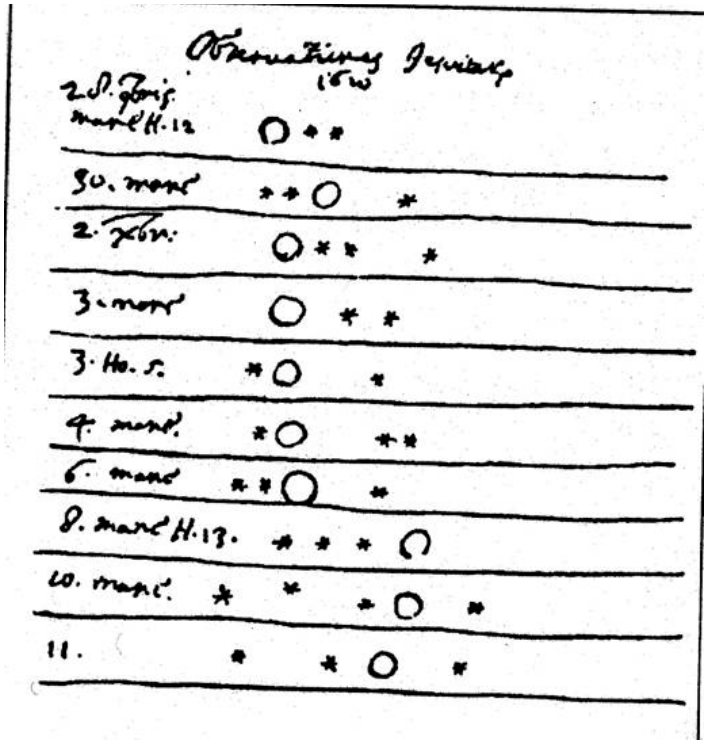
Развој астрономских метода и инструмената

Експериментални подаци

1611

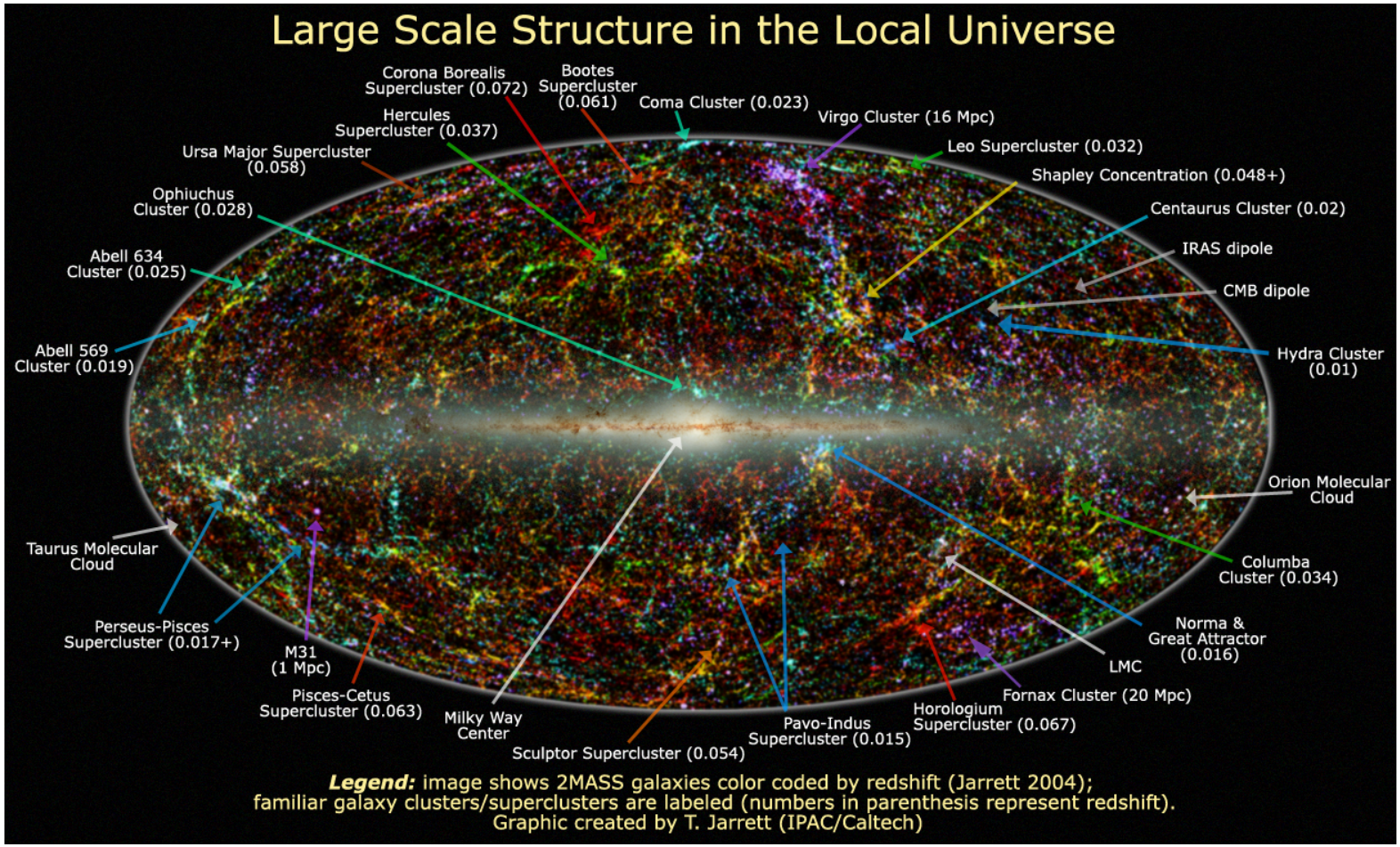
Accademia dei lincei
14. April, 1611, Federico Cesi



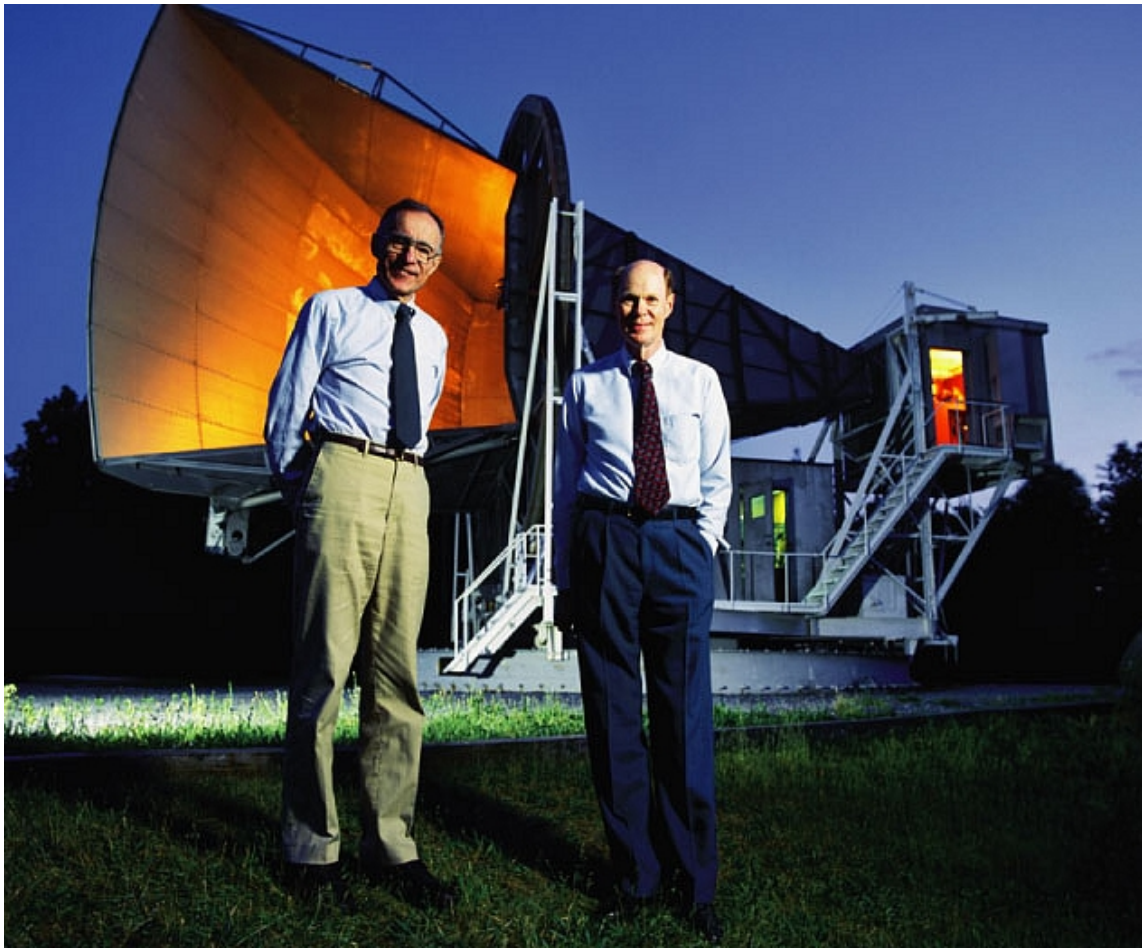


Звезде Медичи

Хабл телескоп

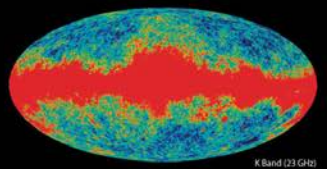

Large Scale Structure in the Local Universe
Corona Borealis Supercluster (0.072)
Bootes Supercluster (0.061)
Coma Cluster (0.023)
Virgo Cluster (16 Mpc)
Hercules Supercluster (0.037)
Ursa Major Supercluster (0.058)
Leo Supercluster (0.032)
Shapley Concentration (0.048+)
Ophiuchus Cluster (0.028)
Centaurus Cluster (0.02)
Abell 634 Cluster (0.025)
IRAS dipole
CMB dipole
Abell 569 Cluster (0.019)
Hydra Cluster (0.01)
Orion Molecular Cloud
Taurus Molecular Cloud
Columba Cluster (0.034)
Perseus-Pisces Supercluster (0.017+)
Norma & Great Attractor (0.016)
M31 (1 Mpc)
LMC
Pisces-Cetus Supercluster (0.063)
Fornax Cluster (20 Mpc)
Milky Way Center
Horologium Supercluster (0.067)
Pavo-Indus Supercluster (0.015)
Sculptor Supercluster (0.054)
Legend: image shows 2MASS galaxies color coded by redshift (Jarrett 2004);
familiar galaxy clusters/superclusters are labeled (numbers in parenthesis represent redshift).
Graphic created by T. Jarrett (IPAC/Caltech)

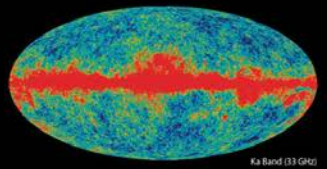
Позадинско зрачење - 1977

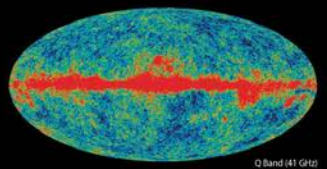


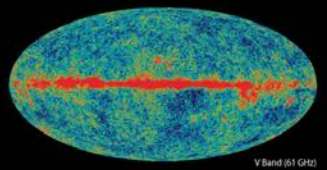
Вилсон и Пензиас

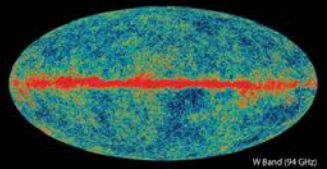
Wilkinson Microwave Anisotropy Probe (WMAP)


K Band (23 GHz)

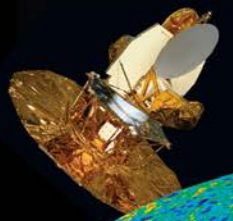

Ka Band (33 GHz)

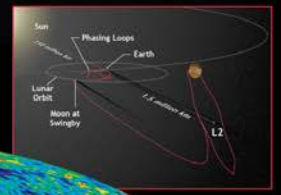

Q Band (41 GHz)

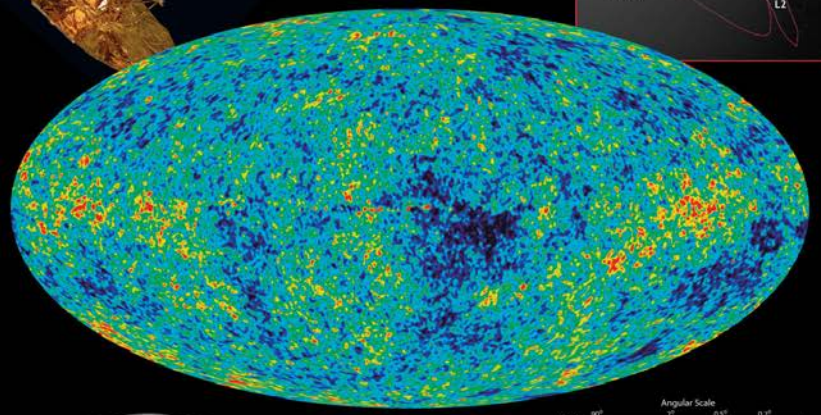

V Band (61 GHz)

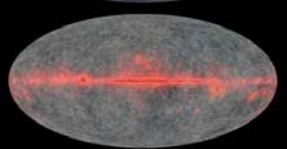

W Band (94 GHz)

WMAP Full-sky Maps

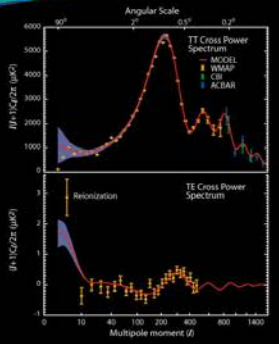


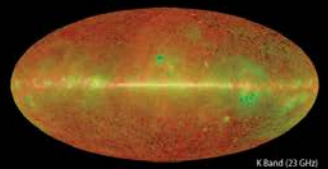


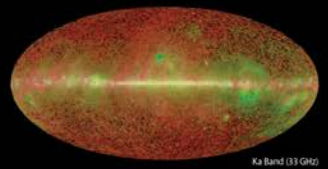


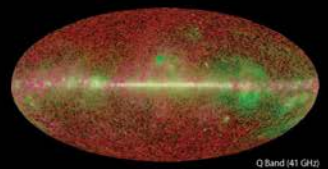


WMAP Foregrounds vs. Cosmic Microwave Background
Red=Q band Green=V band Blue=W band




K Band (23 GHz)


Ka Band (33 GHz)


Q Band (41 GHz)


V Band (61 GHz)


W Band (94 GHz)

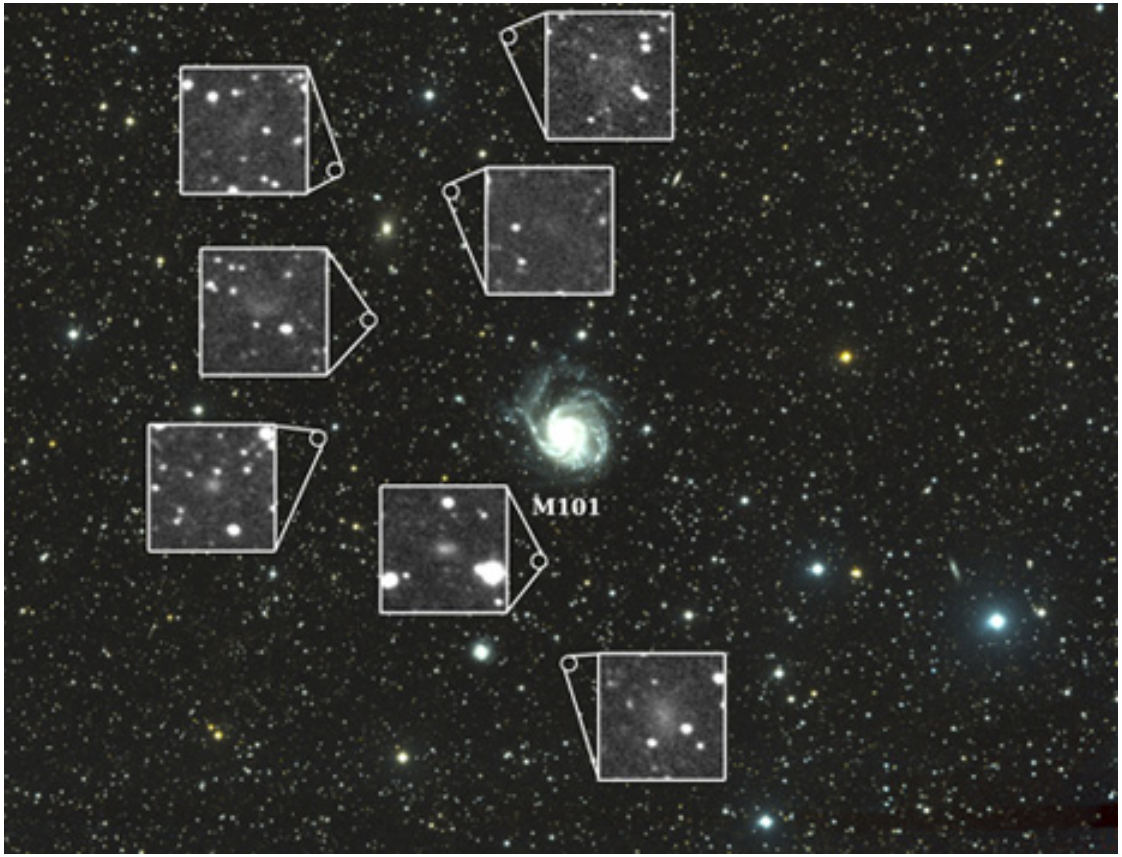
WMAP Foregrounds
Red=Synchrotron Green=Free-Free Blue=Thermal Dust

Goddard Space Flight Center • Princeton University • University of Chicago • UCLA • University of British Columbia • Brown University
http://map.gsfc.nasa.gov • http://lambda.gsfc.nasa.gov

NW-2002-5-032-GSFC

Вилин коњиц

2015

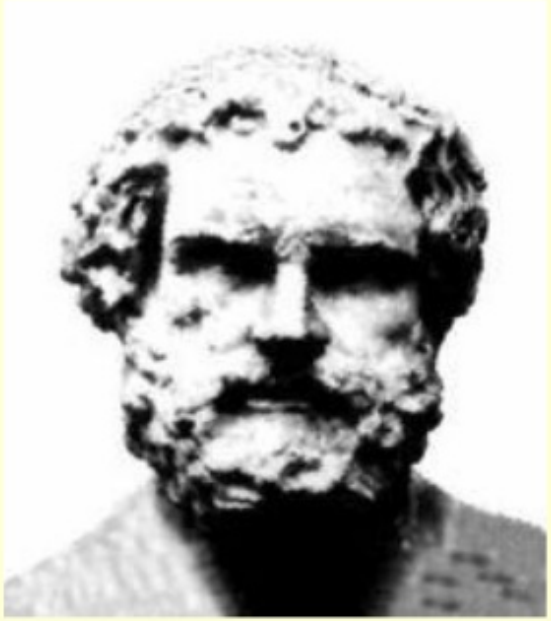

M101

Шта је материја?

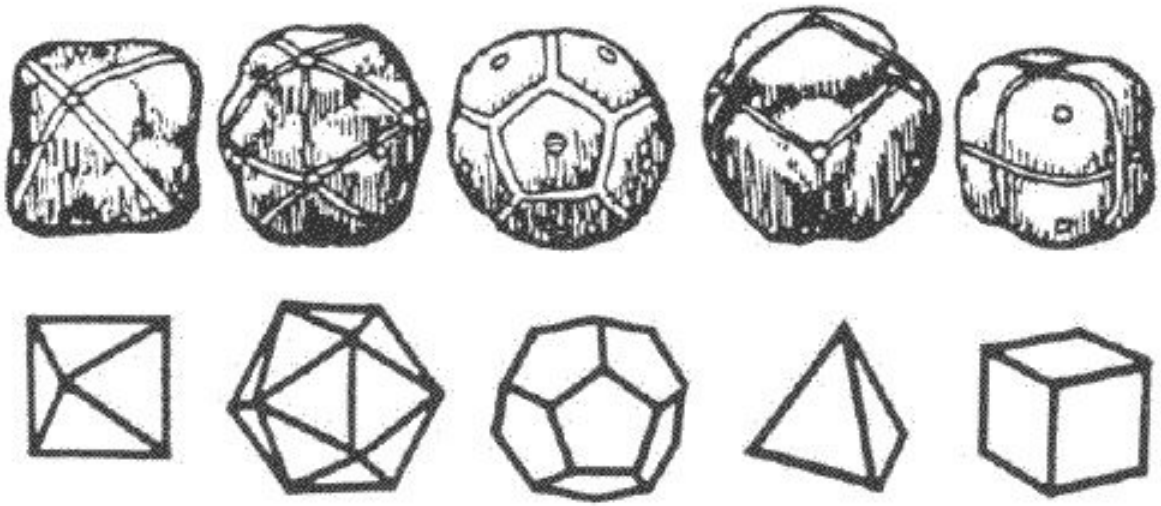
Природа материје

Democritus
460 – 370 B.C.

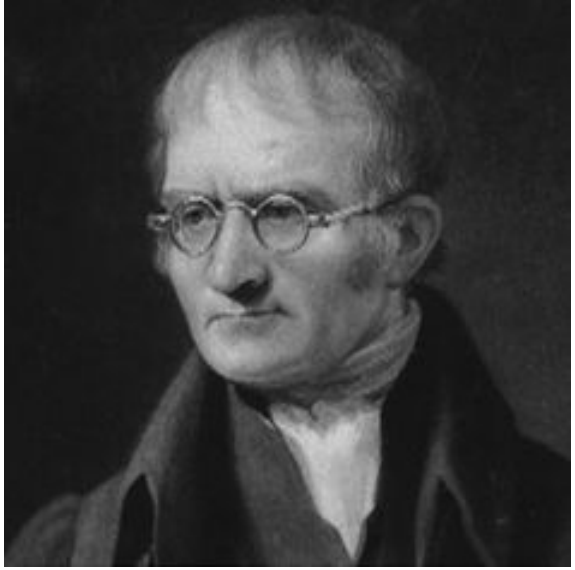
- There are various basic elements from which all matter is made
- Everything is composed of small atoms moving in a void
- Some atoms are round, pointy, oily, have hooks, etc. to account for their properties
- Ideas rejected by leading philosophers because void = no existence



Идеја атомизма (Фејнман)

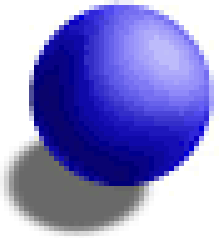


Stone balls at the Ashmolean Museum, Oxford, dated at least 1000 years before Plato, showing all the Platonic solids



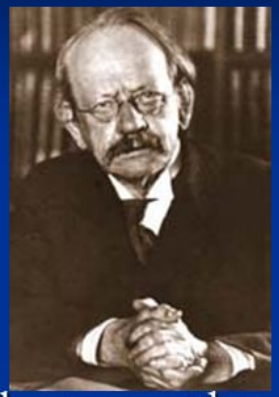
John Dalton Atomic Model

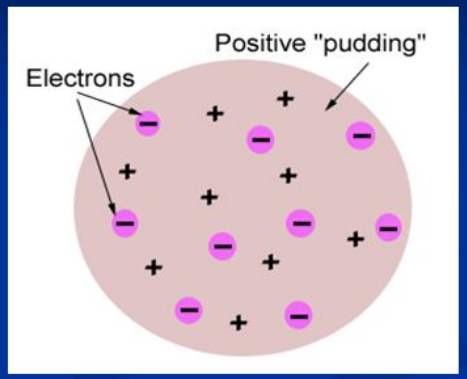
- Elements are made of extremely small particles called atoms
- Atoms of a given element are identical in size, mass, and other properties.
- Atoms cannot be subdivided, created, or destroyed
- Atoms of different elements combine in simple whole number ratios to form chemical compounds
- In chemical reactions, atoms are combined, separated, or rearranged.



Thomson's Atomic Model

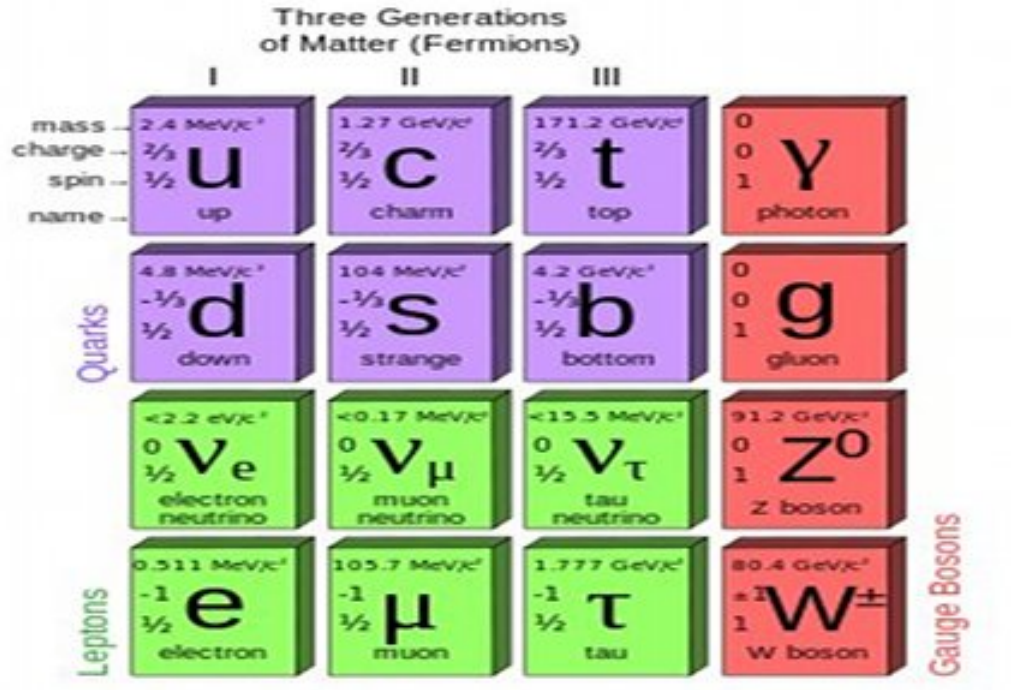
- Thomson's Atomic Model



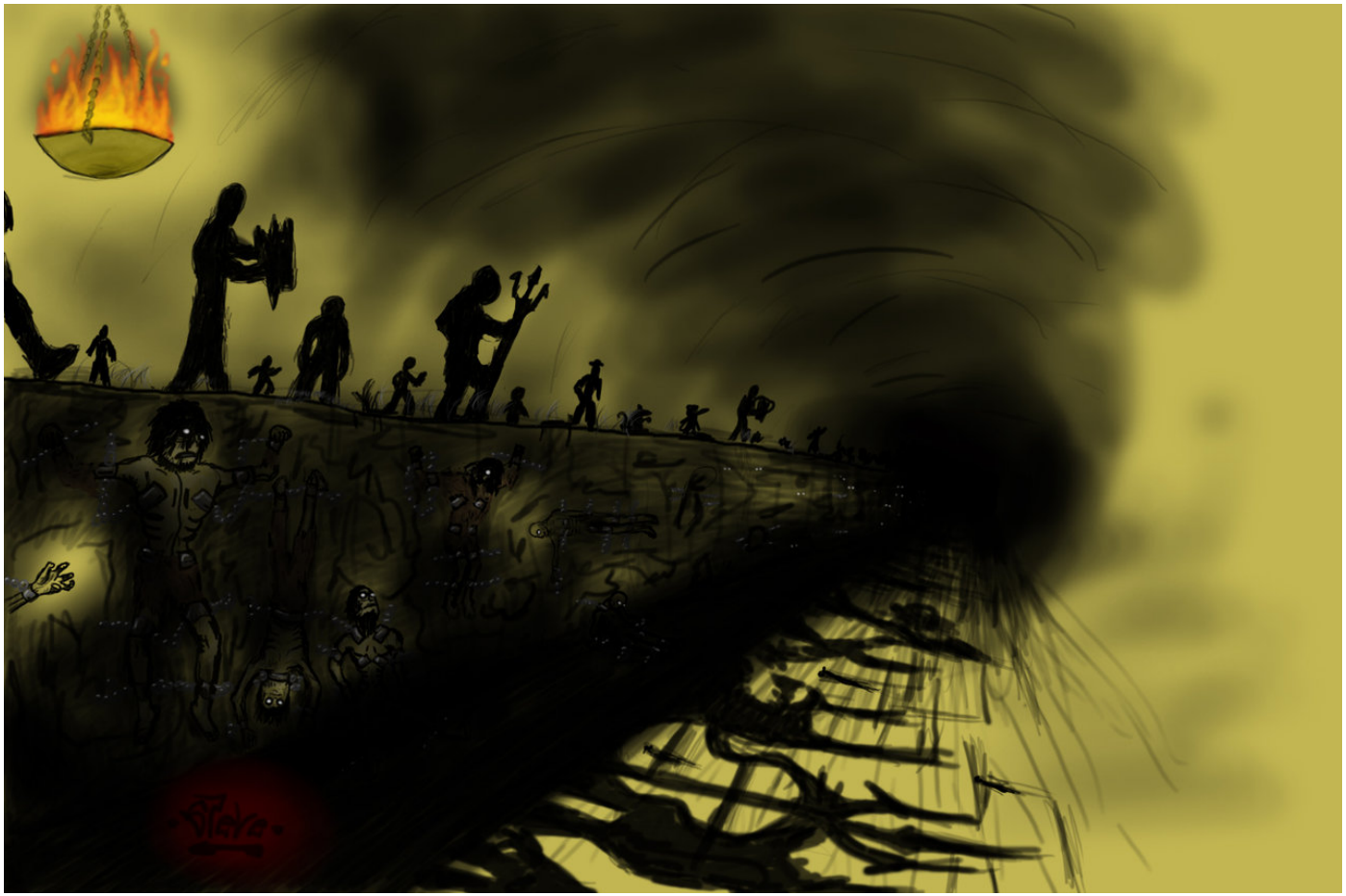


- Thomson though electrons were like plums embedded in a positively charged "pudding", so his model was called the "plum pudding" model

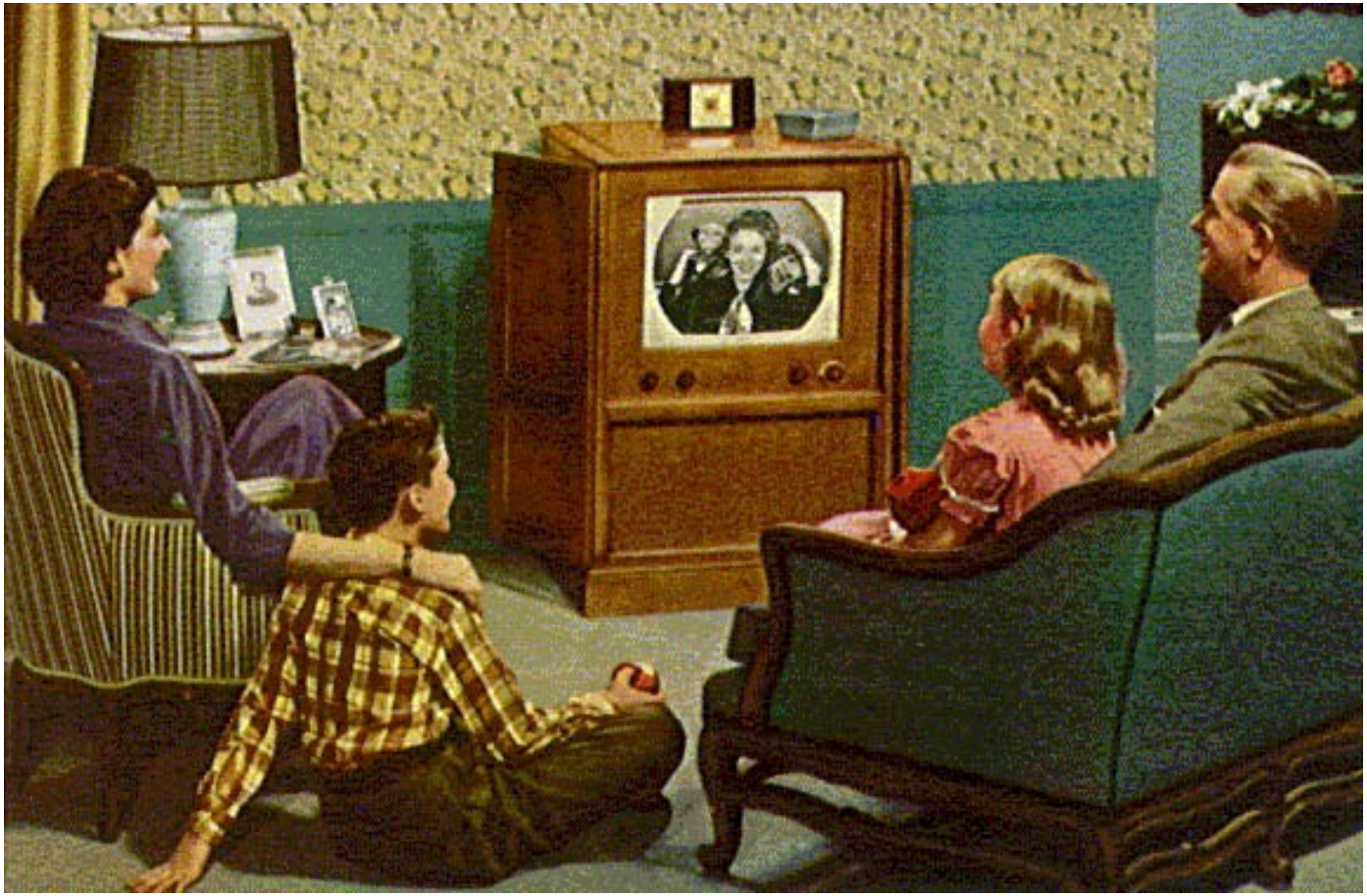
Стандардни Модел



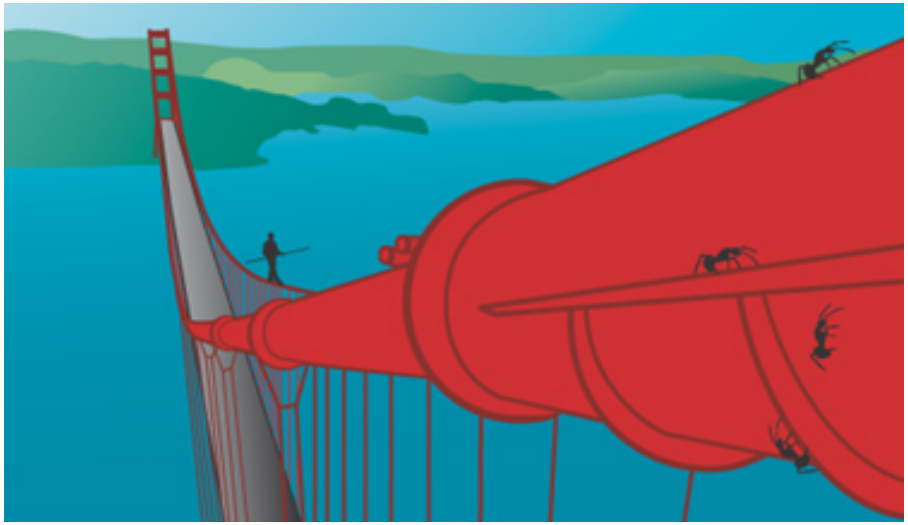
Теорија струна

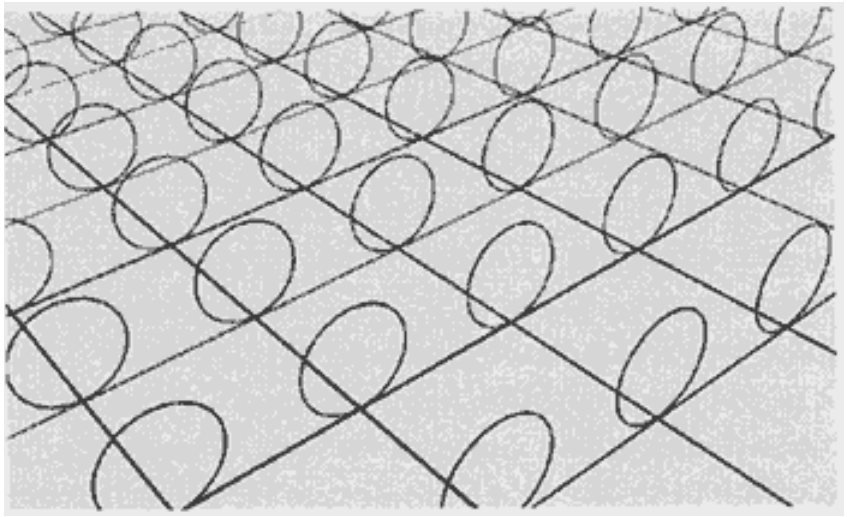



The fire
shadows cast
on wall
Prisoners
Roadway where
puppeteers perform

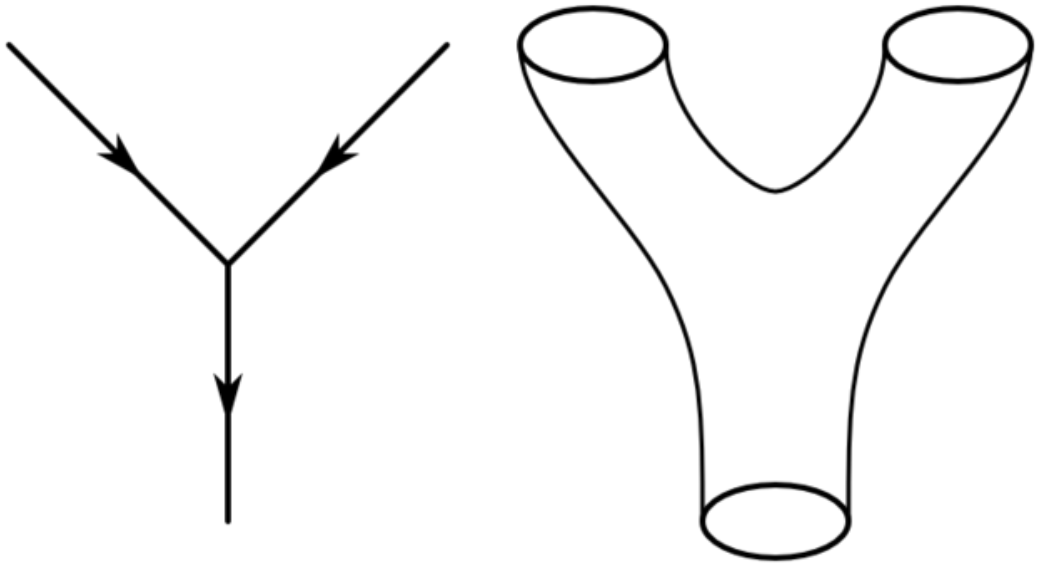


Kaluza-Klajn teorija

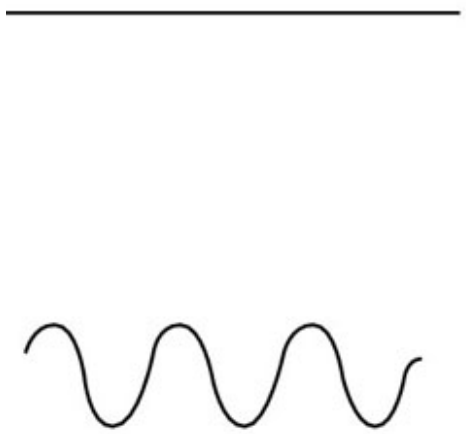




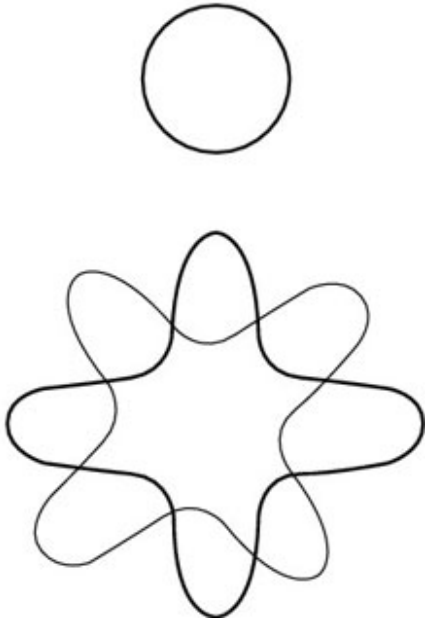
Strune umesto čestica

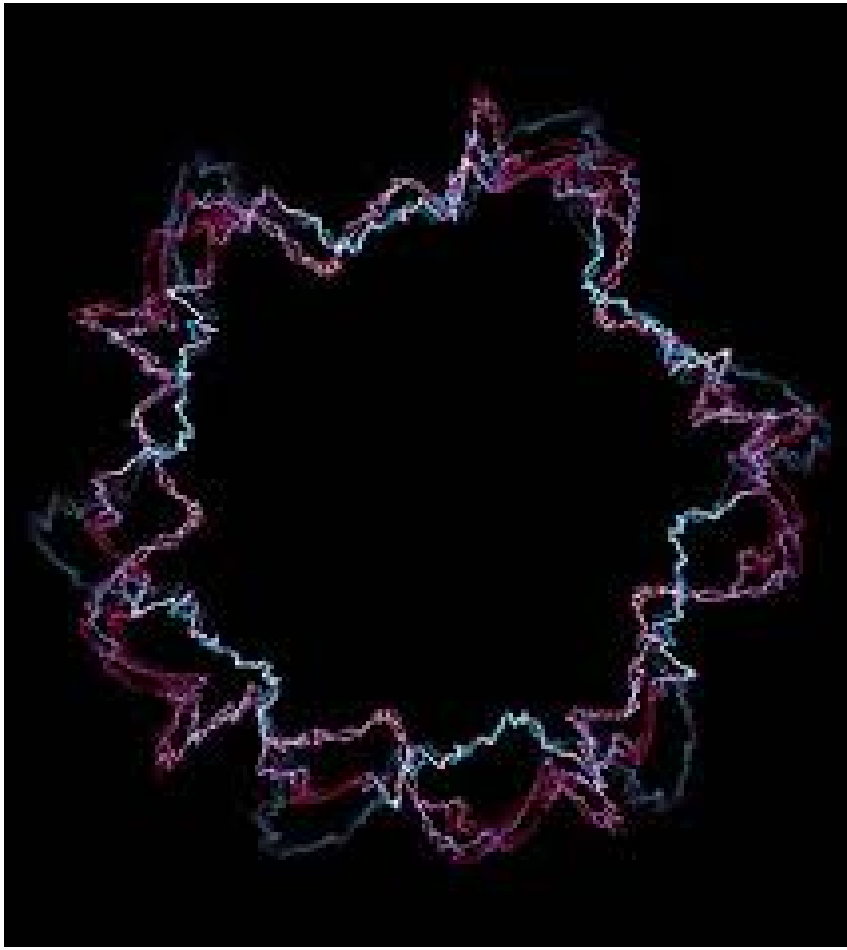


Open strings

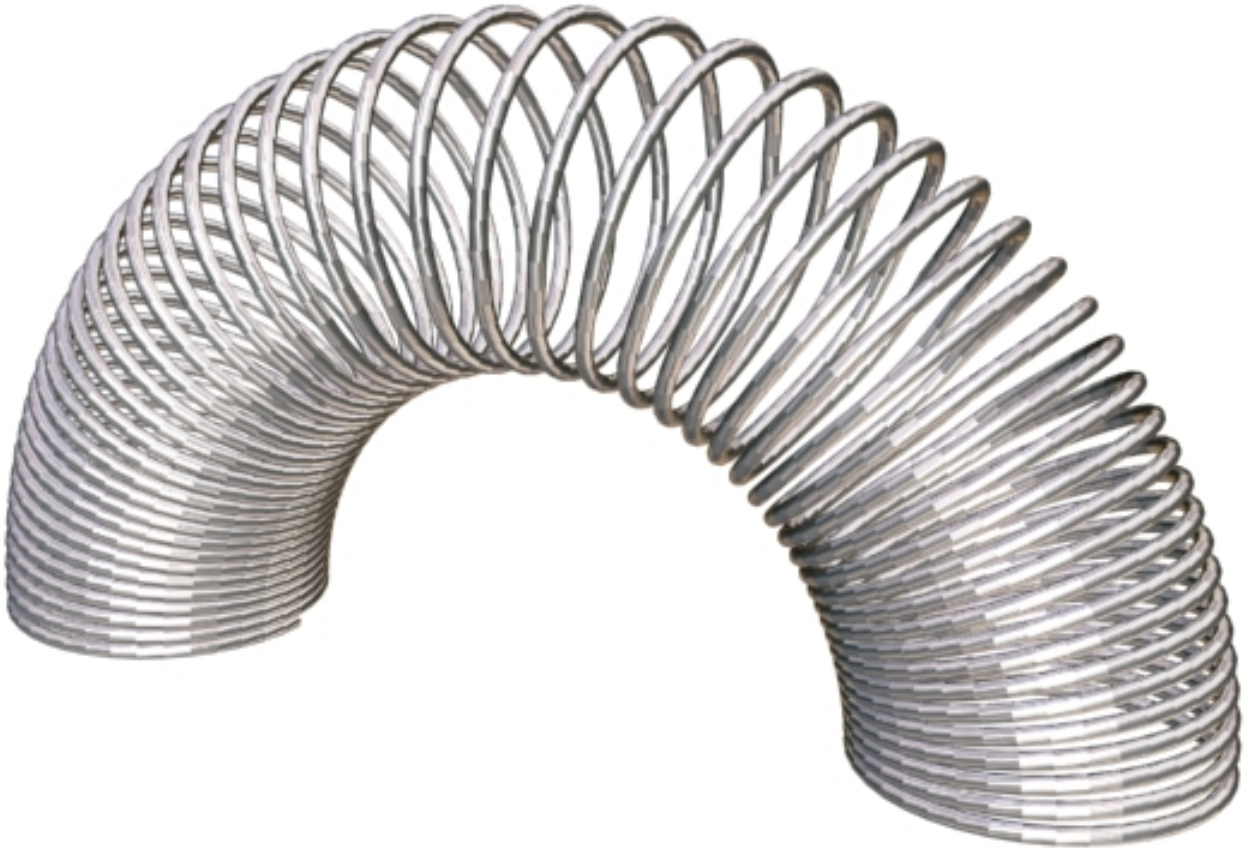


Closed strings

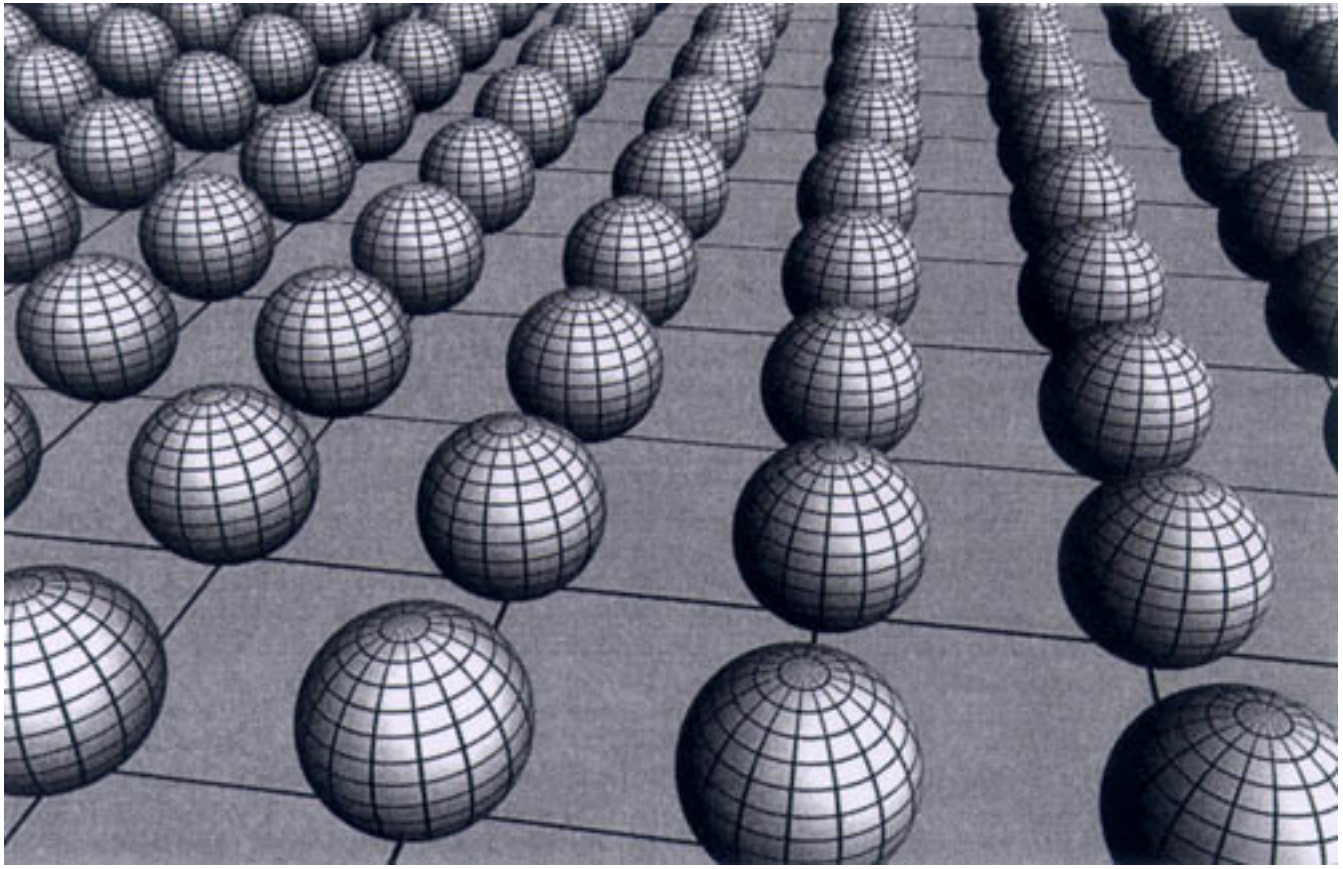




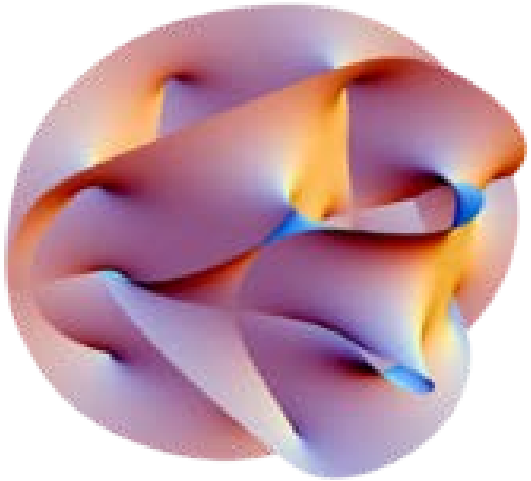
1+1 dimenzioni prostor

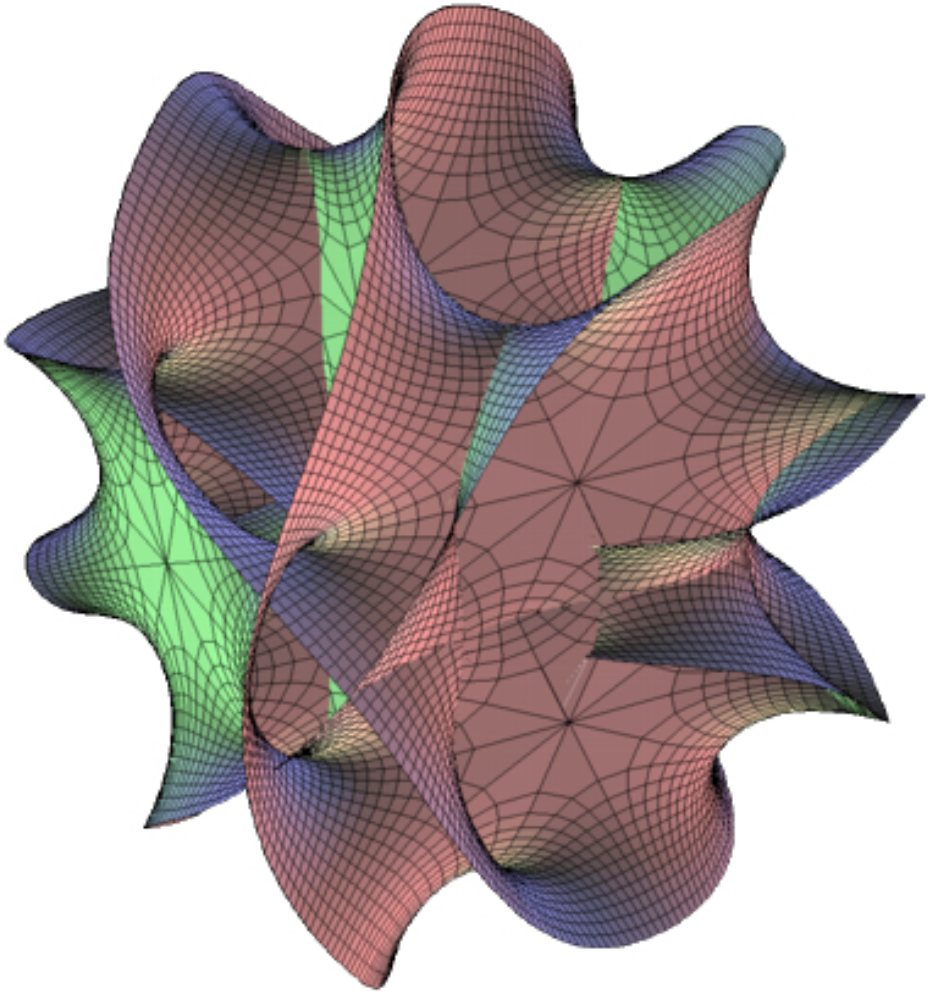


2+2 dimenzioni prostor

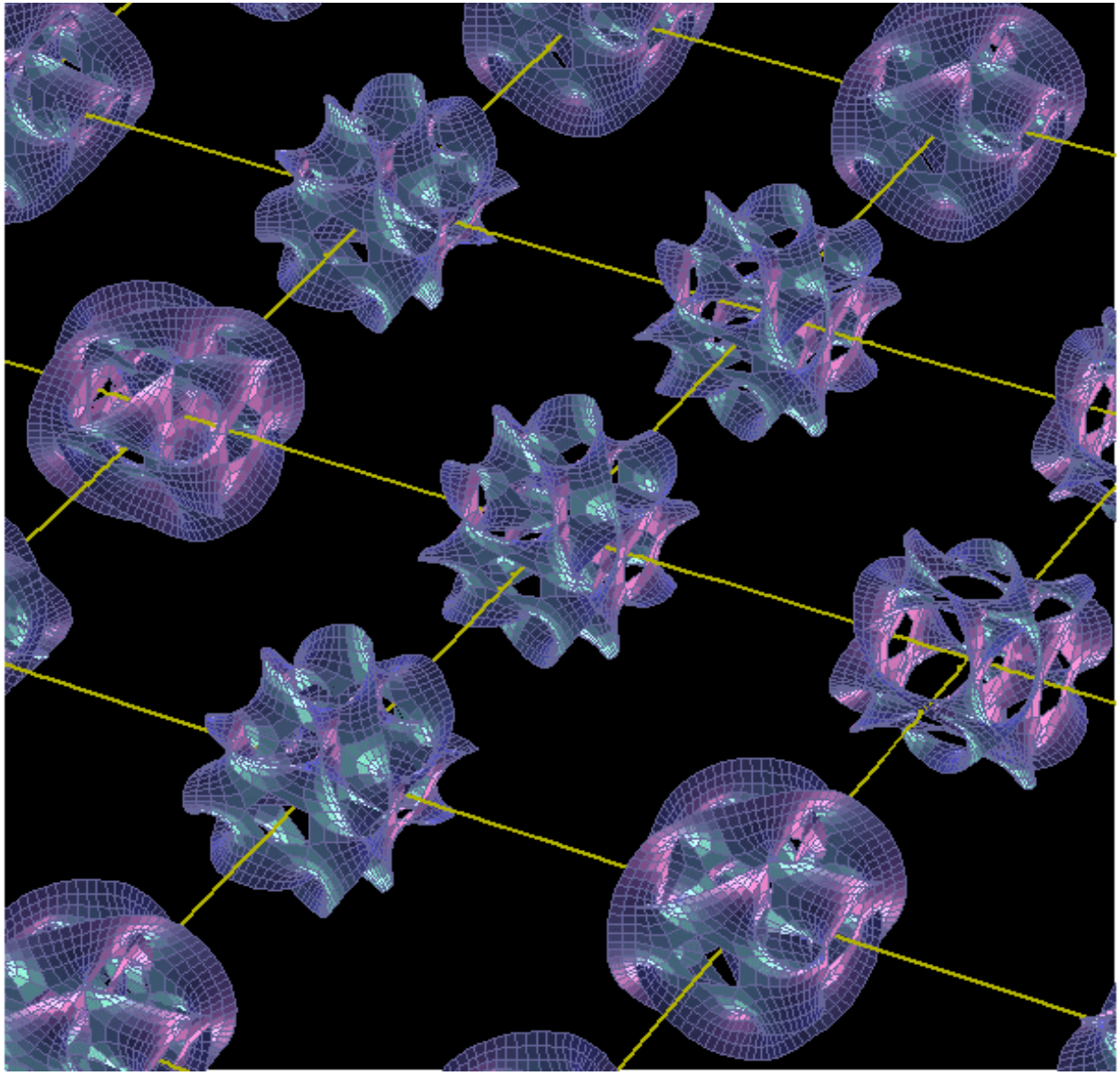


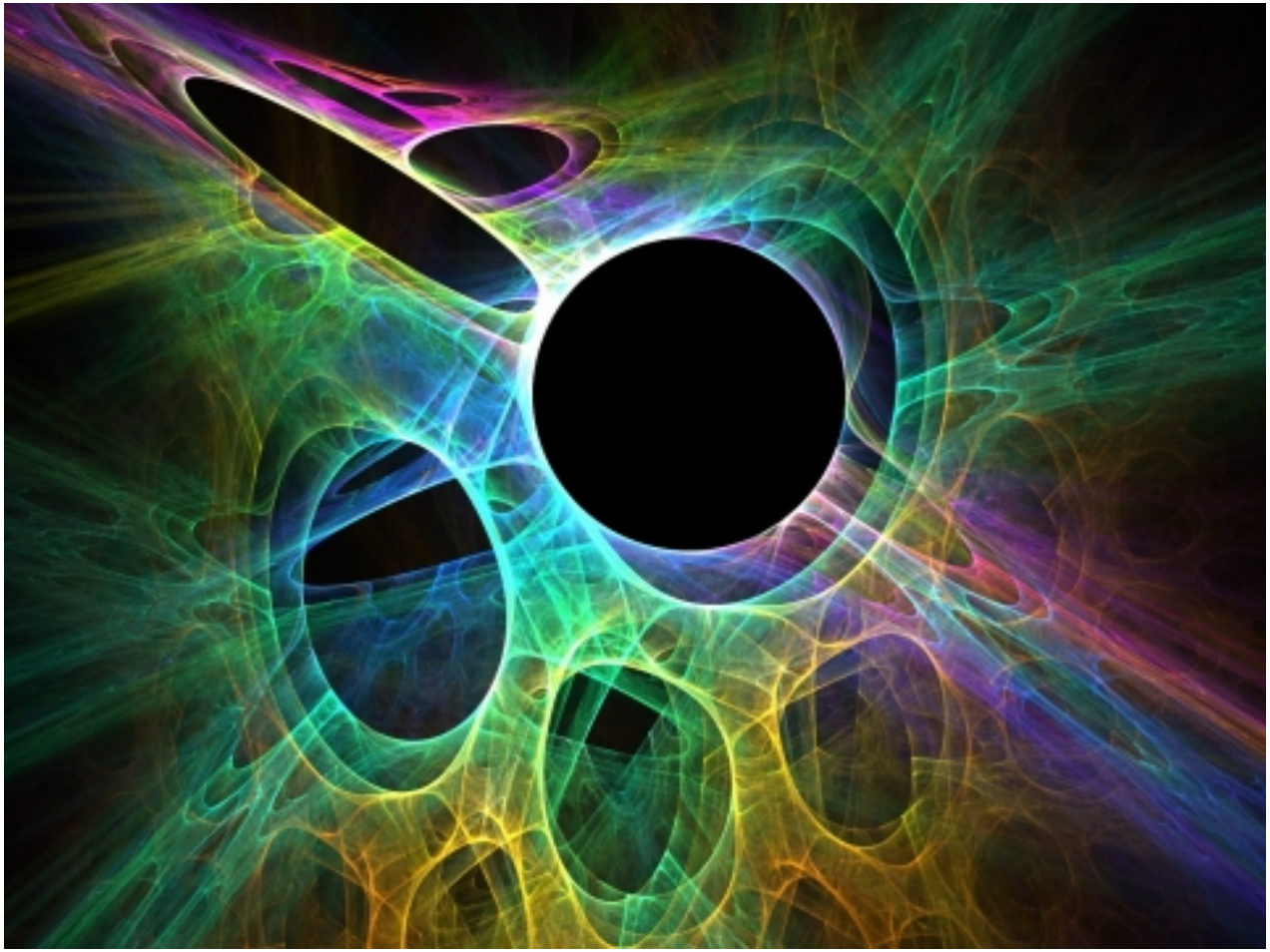
Calabi – Yau mnogostrukost





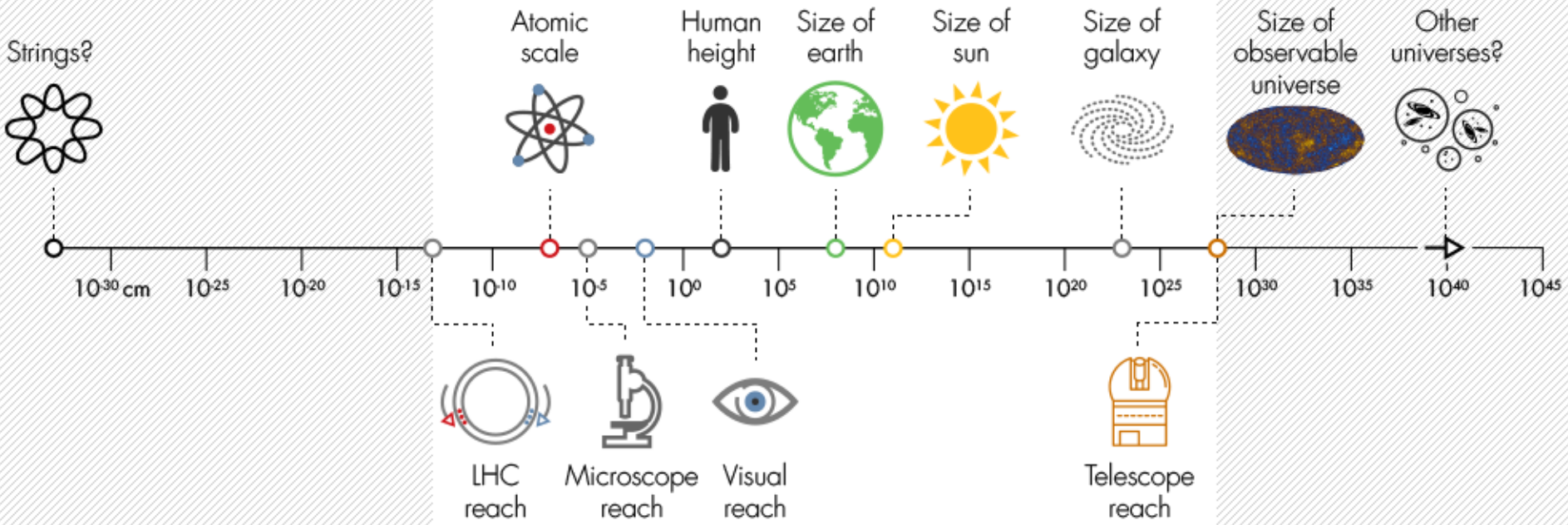
Naš svet





The Ends of Evidence

Humans can probe the universe over a vast range of scales (white area), but many modern physics theories involve scales outside of this range (grey).

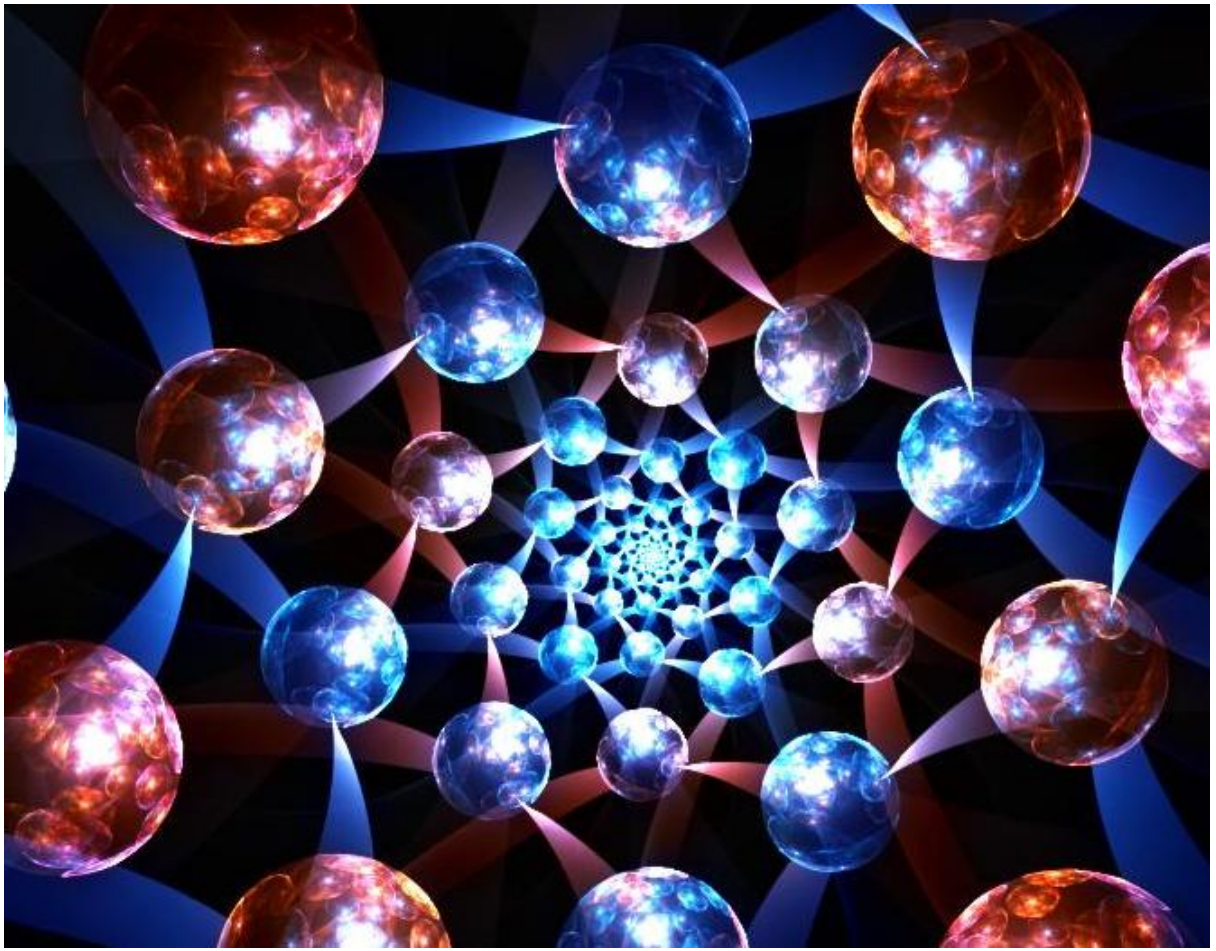


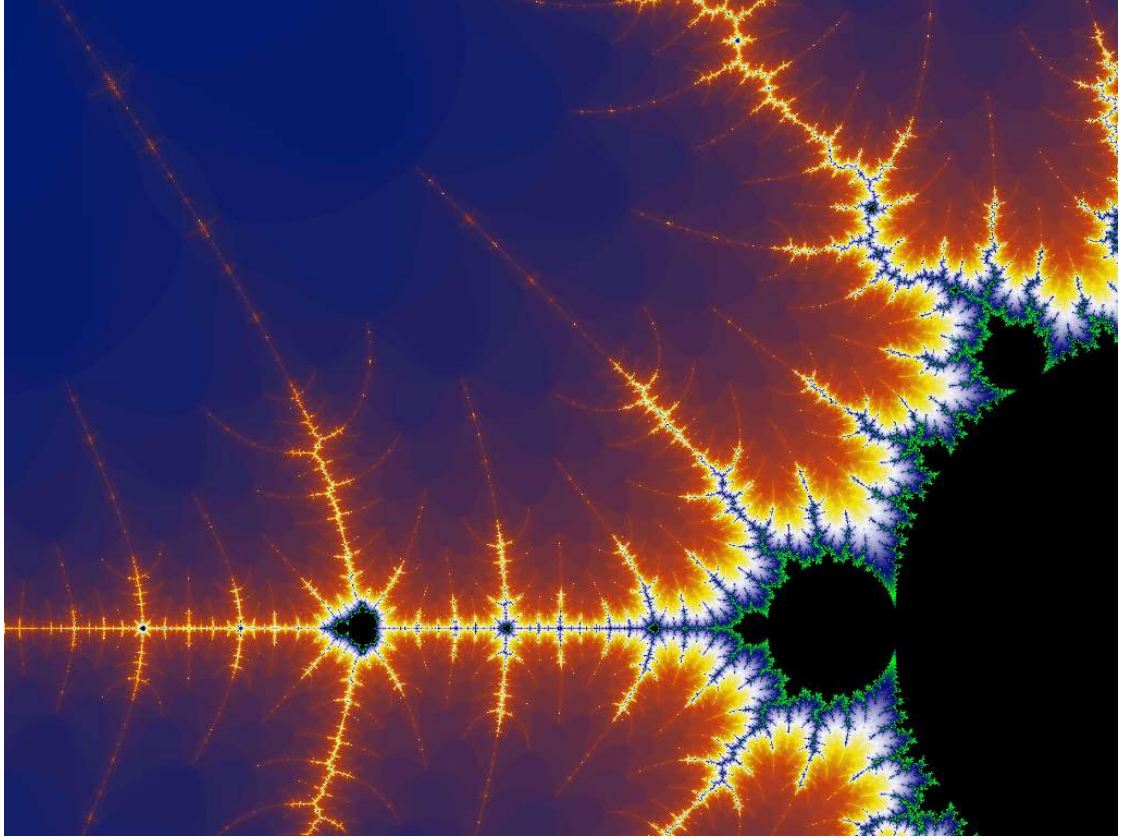
Екстравагантне теорије космоса

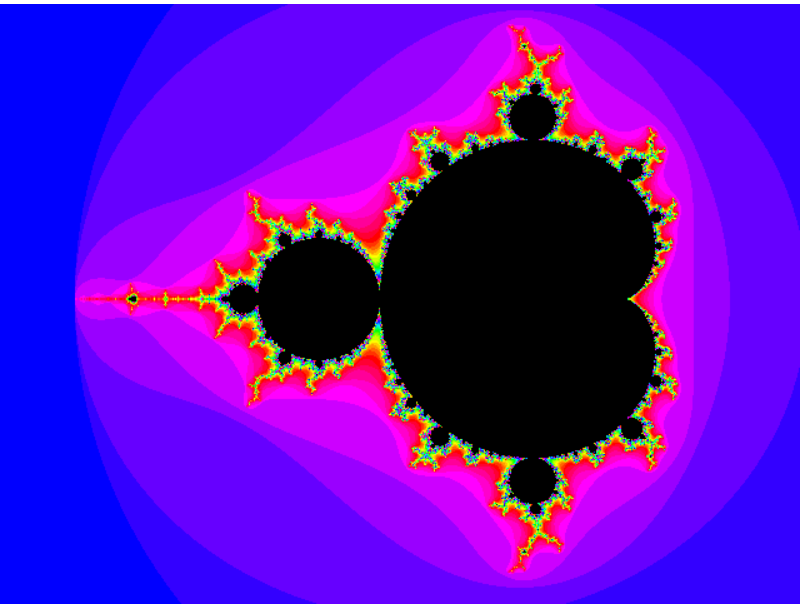
Терацентрични космос
Хелиоцентрични космос
Егоцентрични космос

Временска подударност (повезаност)

Холографски космос

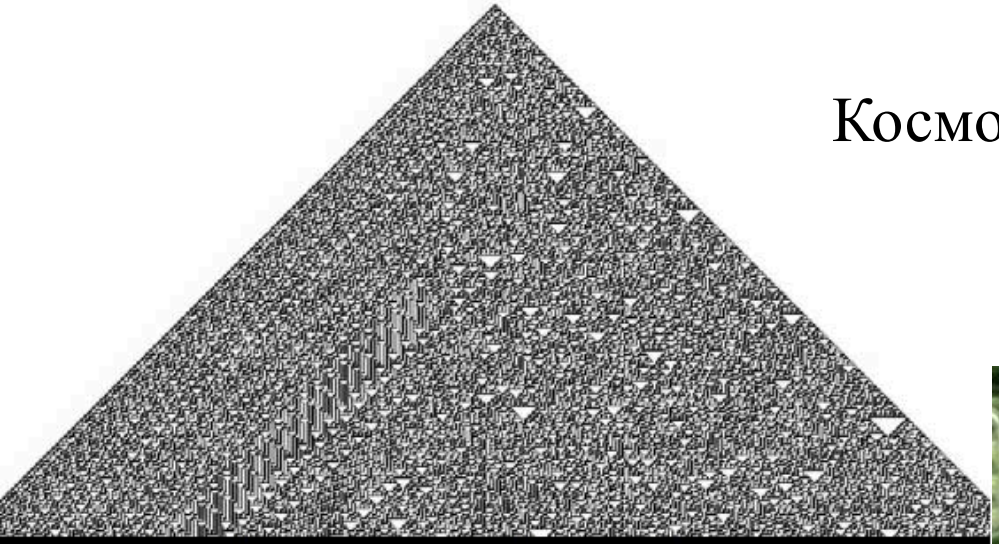






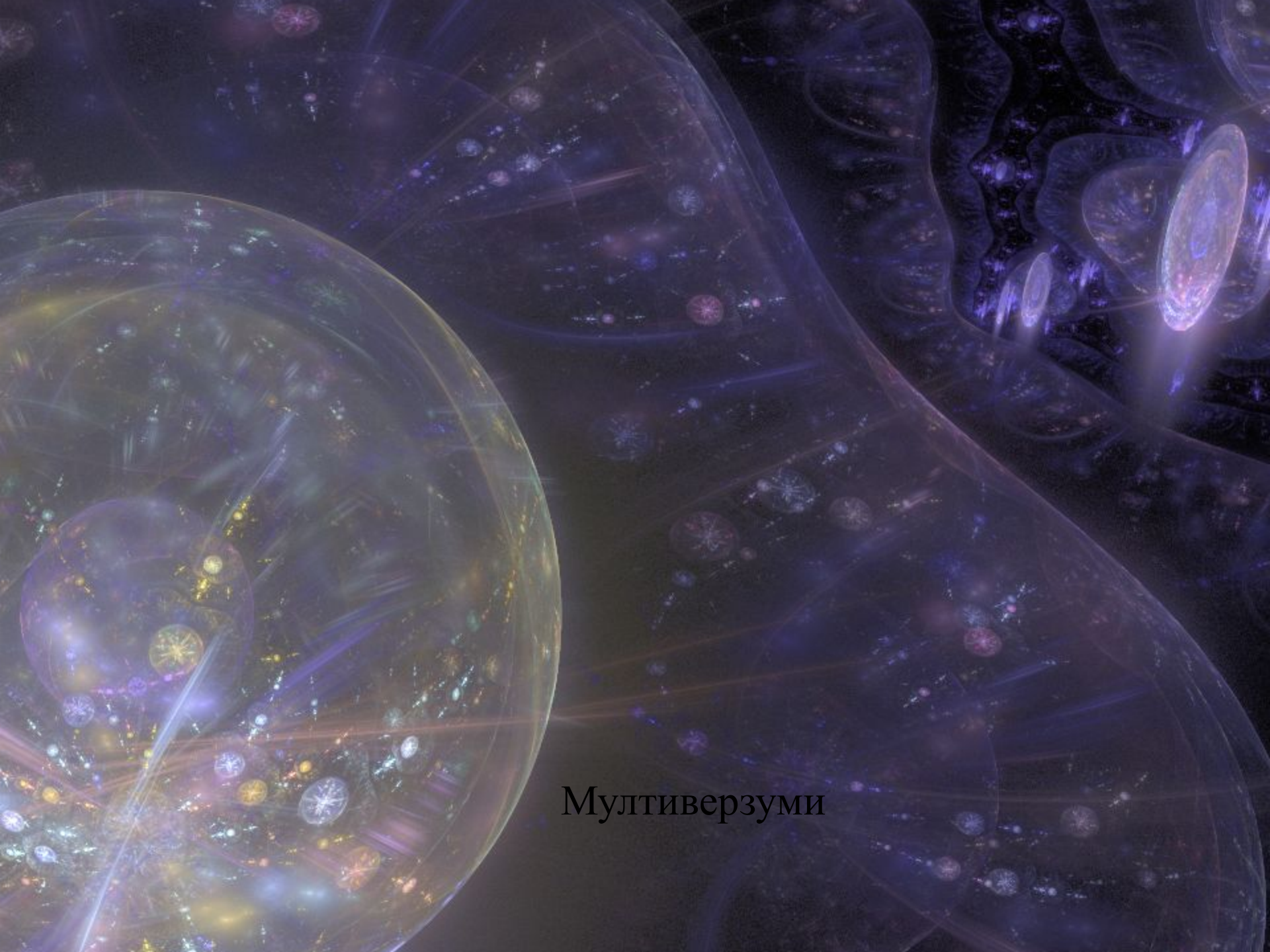
Простор је дискретан

Gravity is a manifestation of the geometry of spacetime. Loop Quantum Gravity is an attempt to merge quantum mechanics and general relativity. The main output of the theory is a physical picture of space where space is granular. LQG predicts that not just matter, but space itself, has an atomic structure.



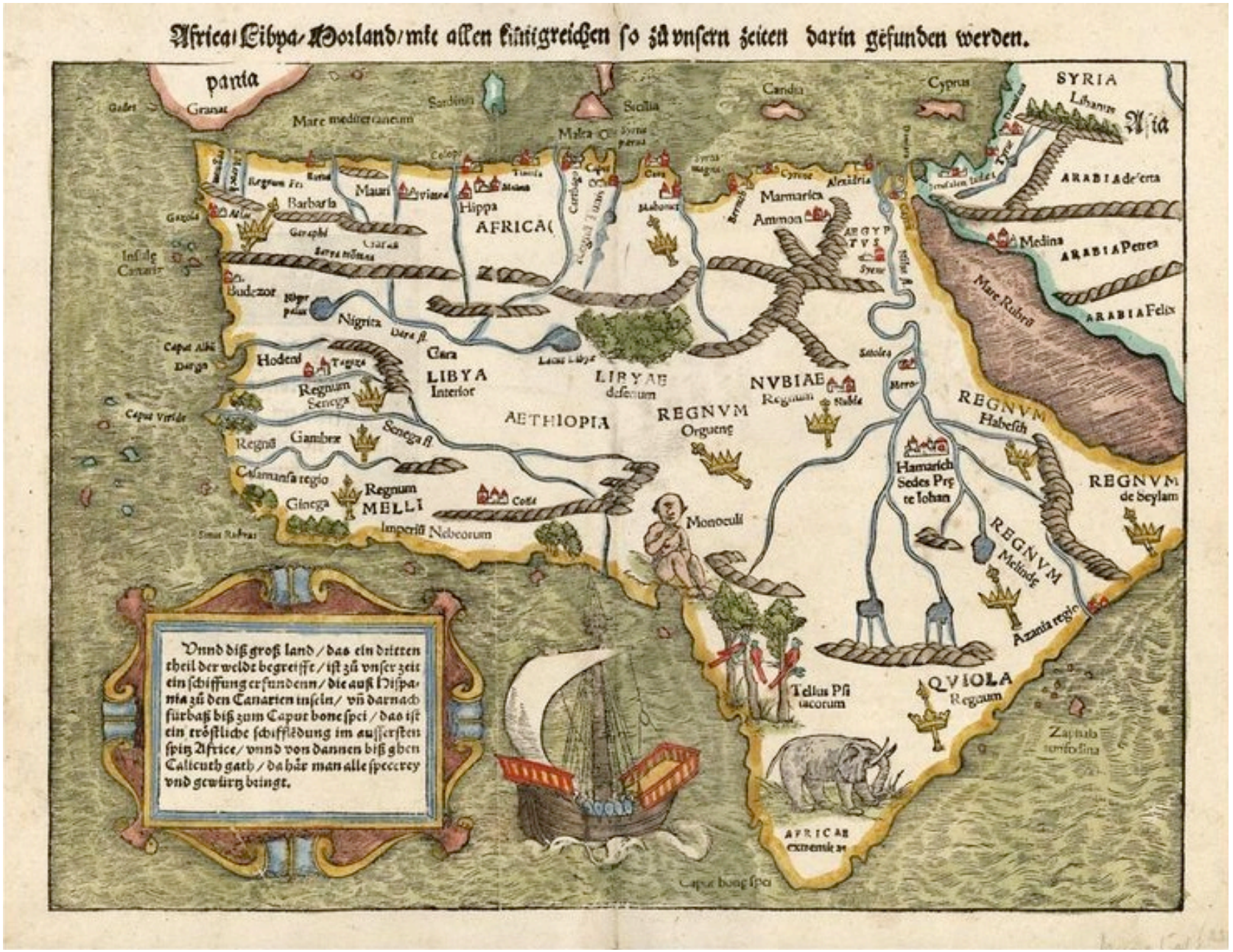
Each pixel of a cellular automaton can be either white or black, corresponding to 0 or 1 as in the binary math used by digital computers. Applying simple rules can result in complex patterns. Cellular automata may offer the algorithmic power to mimic the laws of physics and the evolution of life.

Космос је компјутерска симулација


Мултиверзуми


Africa/ Libya/ Morland/ mit allen künigreichen so zů vnsern zeiten darin gefunden werden.
Granat
Mare mediterraneum
Sardinia
Sicilia
Malta
Candia
Cyprus
SYRIA
Asia
ARABIA deserta
ARABIA Petrea
ARABIA Felix
Mare Rubrũ
Barbaria
Hippa
AFRICA
Marmarica
Ammon
Medina
Nigritia
LIBYA Interior
LIBYAE deserta
NVBIAE
AETHIOPIA
REGNVM Orgueng
REGNVM Habesith
REGNVM de Beylam
REGNVM Melinde
Hamarich Sedes Prę te Iohan
Monoculi
Imperiũ Nubeorum
Regnum MELLI
Ginega
Regnũ Gambræ
Regnum Senega
Senega fl.
Calamansa regio
Caput Viride
Caput Albũ
Insulæ Canariæ
Azania regio
QVIOLA Regnum
Caput bonæ spei
Vnnd diß groß land/ das ein dritten theil der welt begreiffe/ ist zů vnser zeit ein schiffung erfunden/ die auß Hispania zů den Canarien inseln/ vñ darnach fürbaß biß zum Caput bonæ spei/ das ist ein trösliche schifffärung im aussersten spitz Africe/ vnnd von dannen biß ghen Calicuth gath/ da här man alle specerey vnd gewürtz bringt.

1554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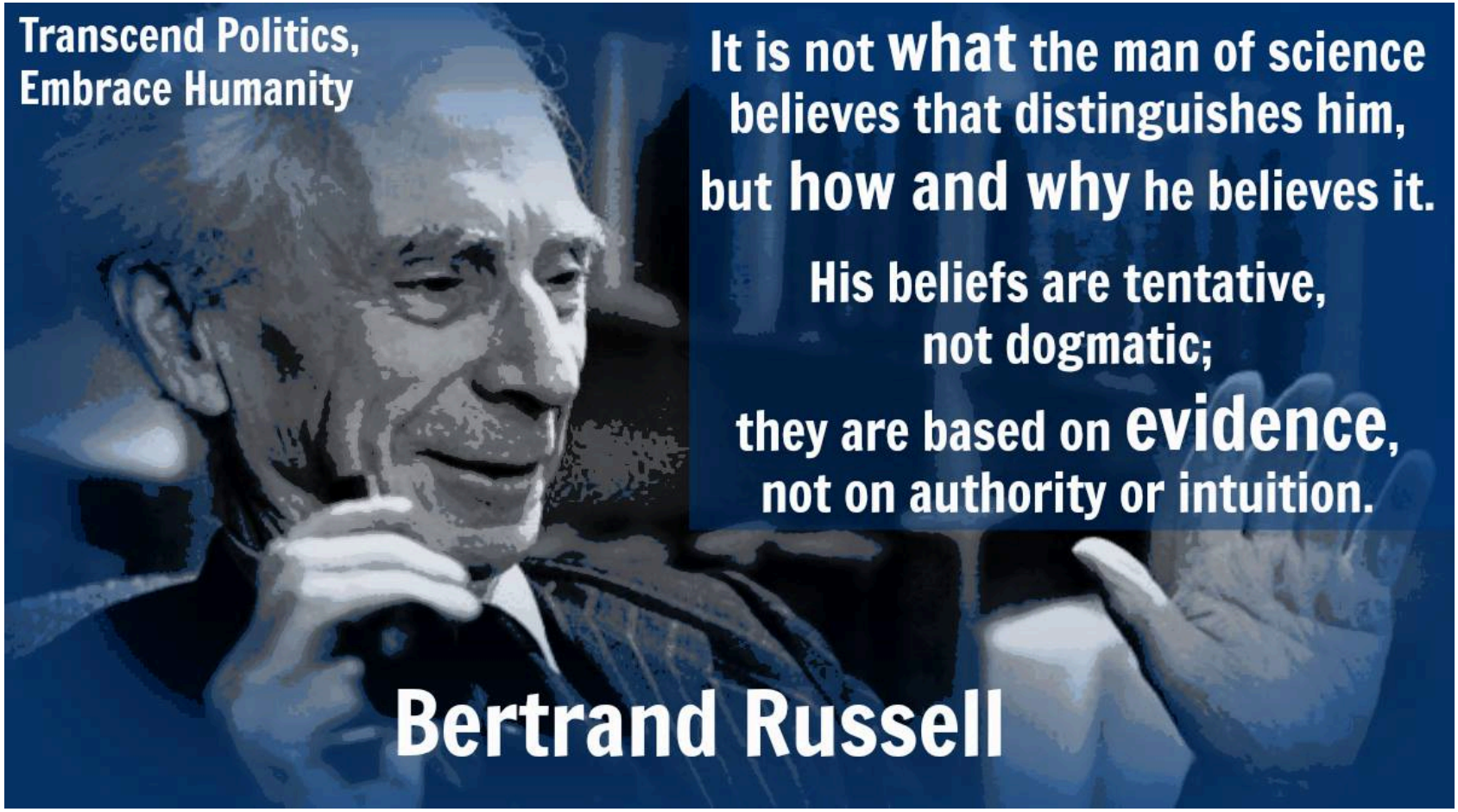
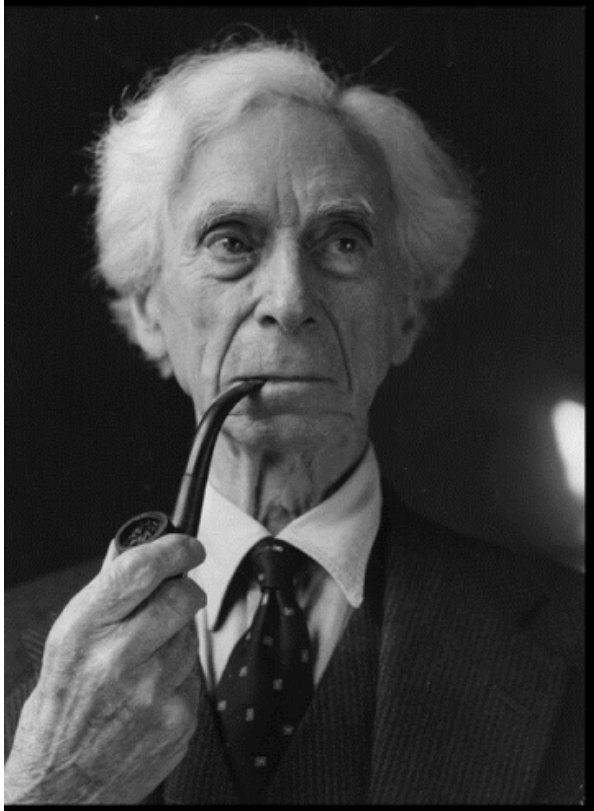
1554


Transcend Politics,
Embrace Humanity
It is not what the man of science believes that distinguishes him, but how and why he believes it.
His beliefs are tentative, not dogmatic;
they are based on evidence, not on authority or intuition.
Bertrand Russell



"Nevertheless the opinion of experts, when it is unanimous, must be accepted by non-experts as more likely to be right than the opposite opinion. The scepticism that I advocate amounts only to this: (1) that when the experts are agreed, the opposite opinion cannot be held to be certain; (2) that when they are not agreed, no opinion can be regarded as certain by a non-expert; and (3) that when they all hold that no sufficient grounds for a positive opinion exist, the ordinary man would do well to suspend his judgment."

-Bertrand Russell, "On The Value of Scepticism"