

Koinotda Materiyaning Yangi Formalari: Qorong'i Energiya va Qorong'i Modda

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Ulugh Beg Astronomical Institute, Tashkent

UBAI – Toshkent 28.04.2009



1 Kirish



- 1 Kirish
- 2 Koinotda qorong'i materiya



- 1 Kirish
- 2 Koinotda qorong'i materiya
- 3 Koinotda qorong'i energiya



- 1 Kirish
- 2 Koinotda qorong'i materiya
- 3 Koinotda qorong'i energiya
- 4 Xulosa



Mundarija

- 1 Kirish
- 2 Koinotda qorong'i materiya
- 3 Koinotda qorong'i energiya
- 4 Xulosa



Kirish

- 2007 yil kuzida UNESCO 2009 yilni Astronomiya yili deb e'lon qildi va bu bilan astronomiyaning inson sivilizatsiyasidagi muhim ahamiyatga ega ekanligini tan oldi
- Bugungi kun astronomiyasi olimlar oldiga yangi va yangi chaqiruvlar bermoqda. Yaqinda Koinotda tabiati mutlaqo no'malum bo'lgan materiyaning yangi formalari topildi. Ularning (Qorong'i Energiya va Qorong'i Modda) Koinotdagi tarkibi asosiy bo'lib 96 foizni tashkil qiladi
- Bizlarga ma'lum bo'lgan materiyaning barion formasi (atomlar va molekular) - yulduzlar, planetalar, odamlarning tarkibiy qismi - Borliqning atigi 4 foizini tashkil etadi
- Astronomiyaning bugungi kun yutuqlarining hisobiga olimlar - odamzodning atrofidagi hodisalarning bilmasligi qanday oqibatlarga - olib kelishi anglab olishdi. Bu fanning rivojlantirish uchun asosiy omildir

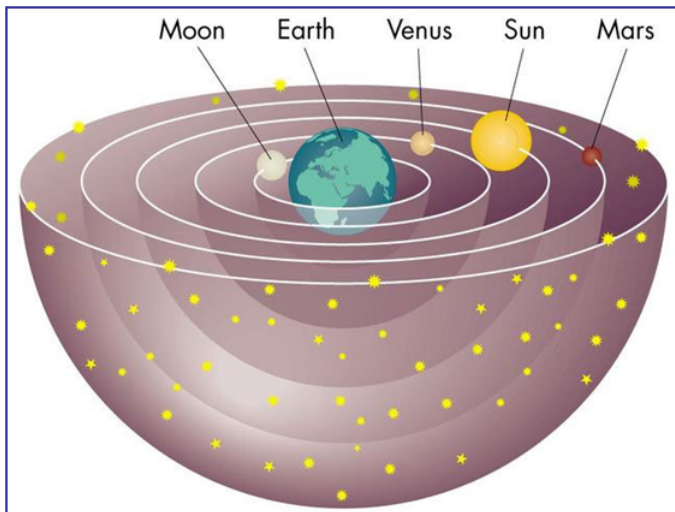


Kosmologiyadagi 3ta revolyutsia

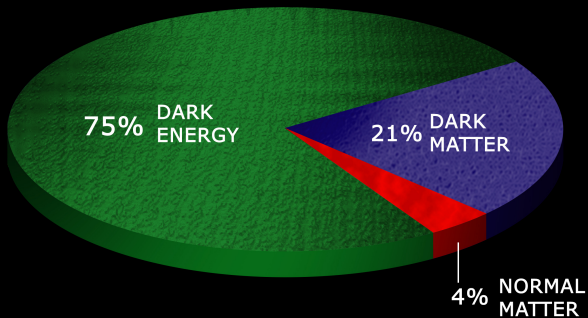
- 2chi Asr: **Claudius Ptolemy** (Aristotle Fizikasi)
Model: Markazda joylashgan Er-atrofidagi Kosmologiya
Asosiy G'oya: Erda va Kosmosda qonuniyatlar o'xshamasligi
- 16chi Asr: **Nicolaus Copernicus** (Newton Fizikasi)
Model: Markazda joylashgan Quyosh-atrofidagi Kosmologiya
Asosiy G'oya: Universal fizika; qonuniyatlar hamma joyda bir xilligi
- 20chi Asr: **Edwin Hubble** (Einstein Fizikasi)
Model: Buyuk Portlash Kosmologiyasi
Asosiy G'oya: Koinot o'zgaruvchan va kengaymoqda



Koinotning tarkibi - Ptolemey bo'yicha



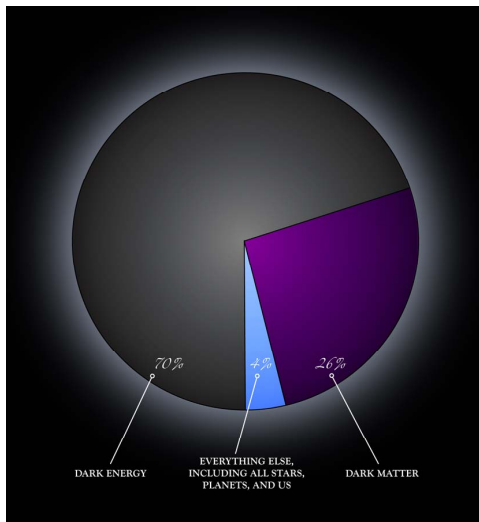
Koinotning hozirgi tarkibi





Chandra X-Ray Observatory

What the Universe is Made of



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ASTRONOMIYA YILI



Koinot Siz uchun

Mundarija

- 1 Kirish
- 2 Koinotda qorong'i materiya
- 3 Koinotda qorong'i energiya
- 4 Xulosa

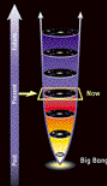


Koinotda qorong'i materiya

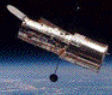
The universe is big, and getting bigger.

100
billion
galaxies

100
billion
stars per
galaxy



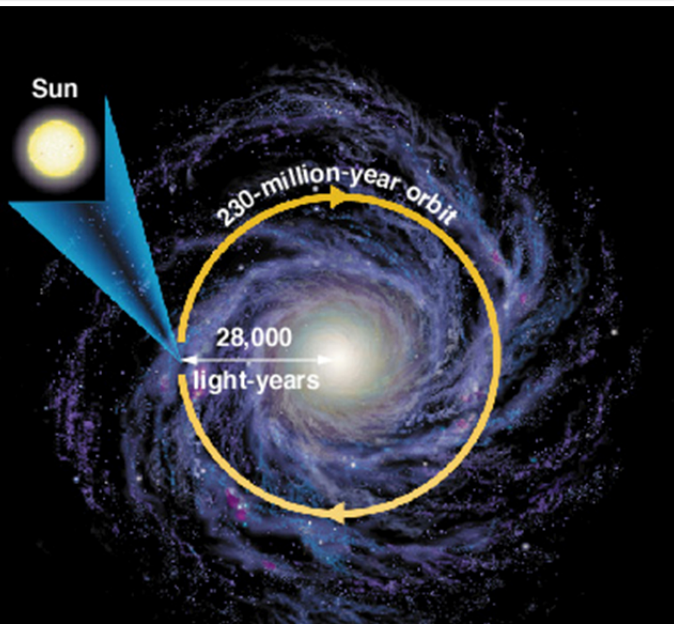
14 billion
years old



Koinotda qorong'i materiya



Quyosh Galaktikada



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Koinot Siz uchun

UzAstron UZBEK NATIONAL ACADEMY OF SCIENCES

Navigation icons: back, forward, search, refresh, etc.

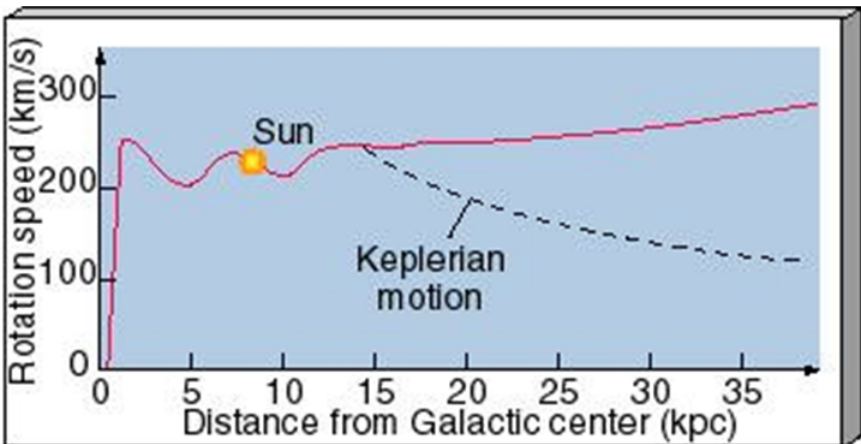
Koinotda qorong'i materiya



VERA RUBIN

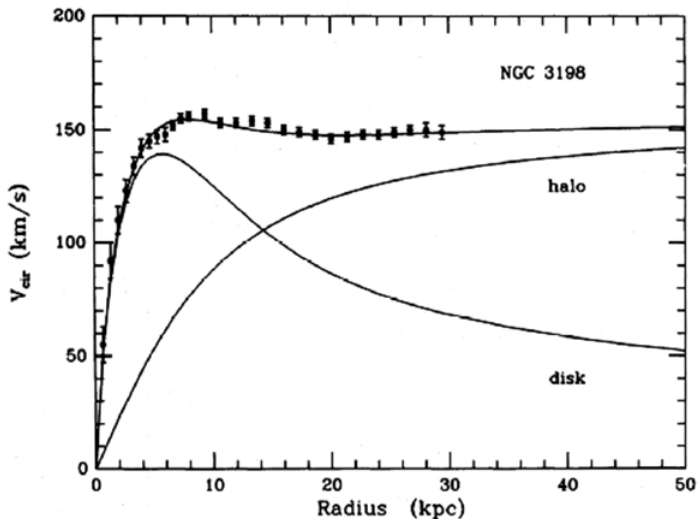


Koinotda qorong'i materiya

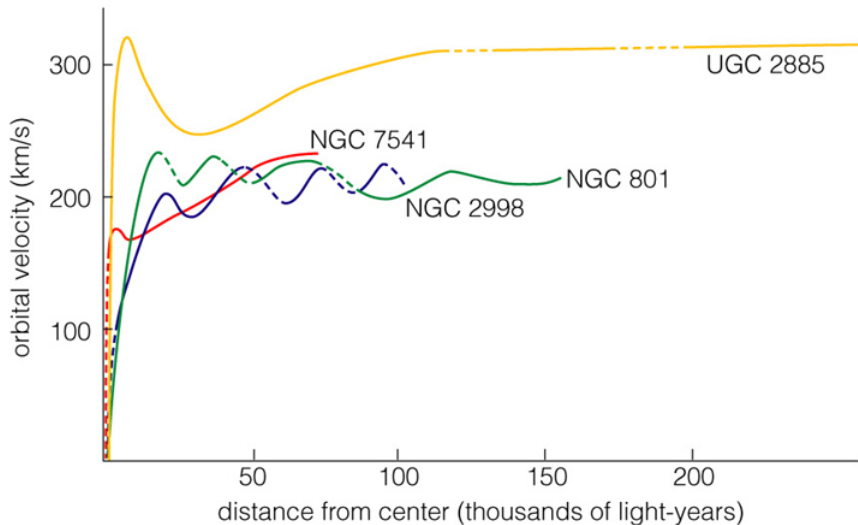


Koinotda qorong'i materiya

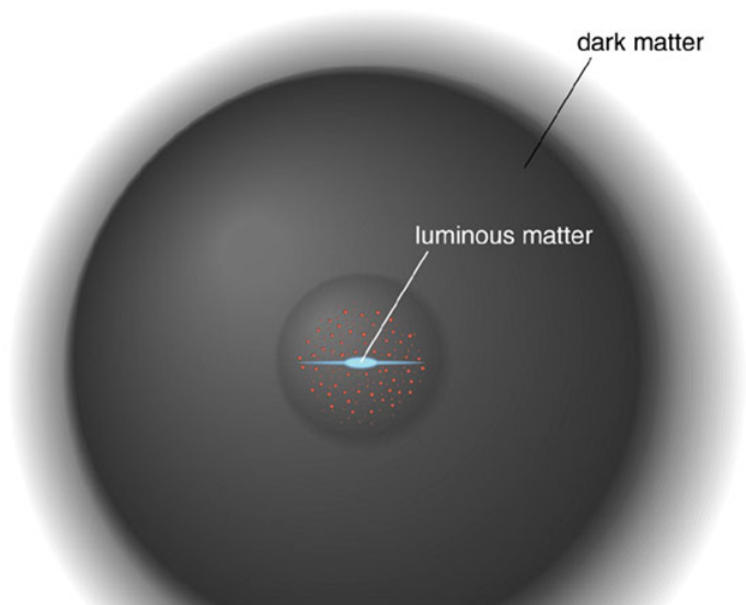
DISTRIBUTION OF DARK MATTER IN NGC 3198



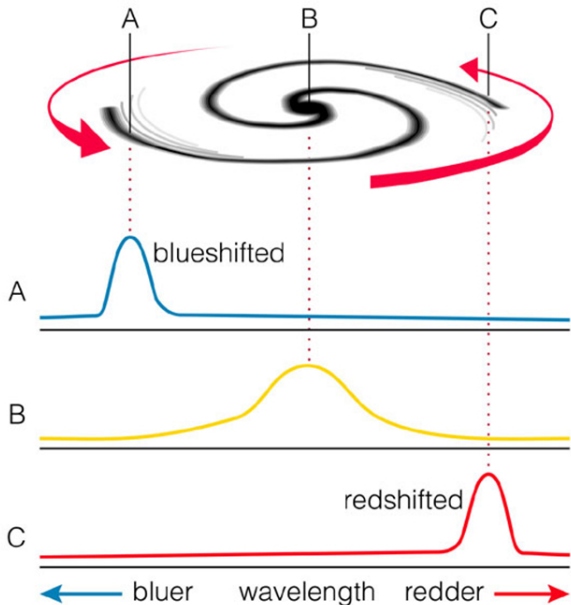
Koinotda qorong'i materiya



Koinotda qorong'i materiya



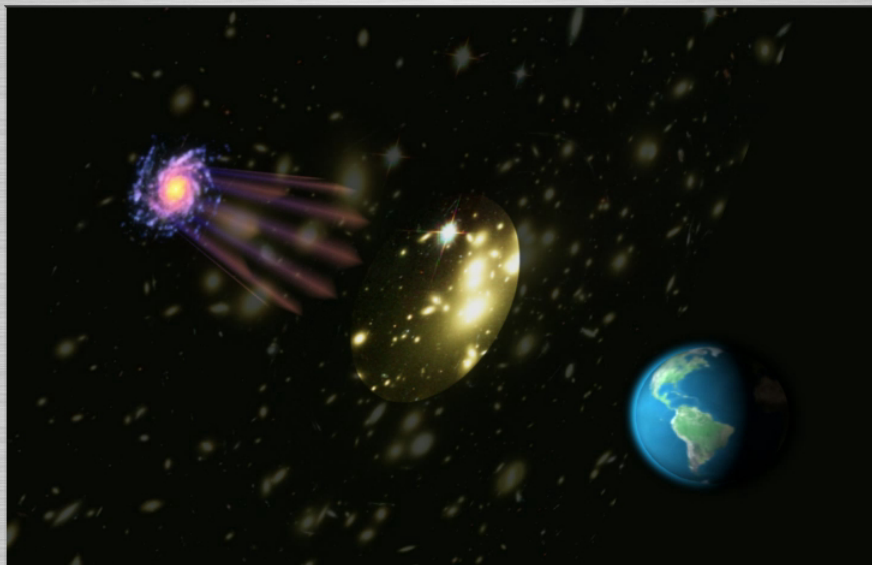
Galaktikalarda Yulduzlarning Tezliklarini O'lchash



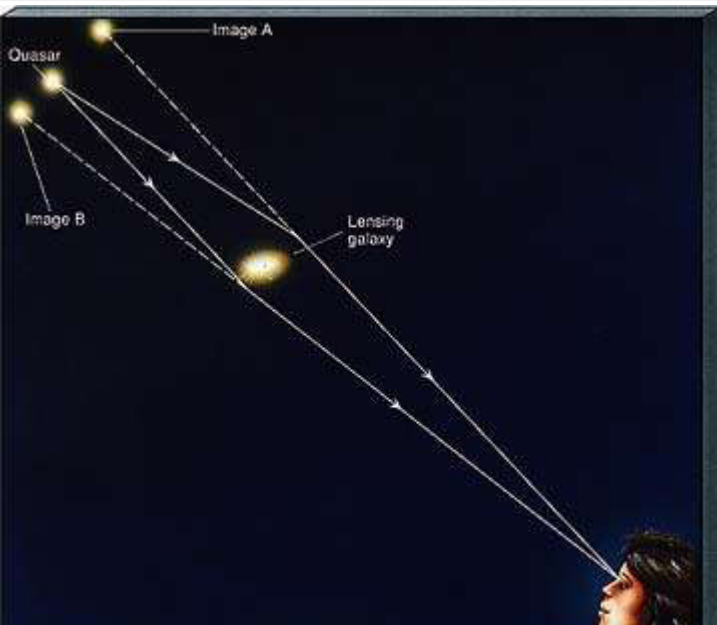
Gravitational Lensing

gravitational_lensing_illus.mov

File Edit Movie Favorites Window Help

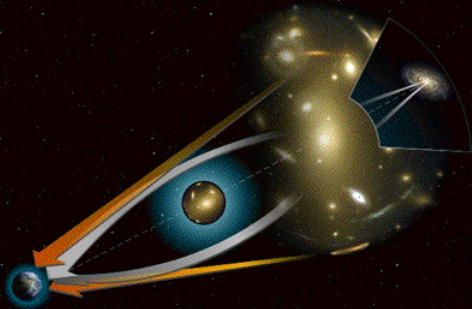


Gravitational Lensing



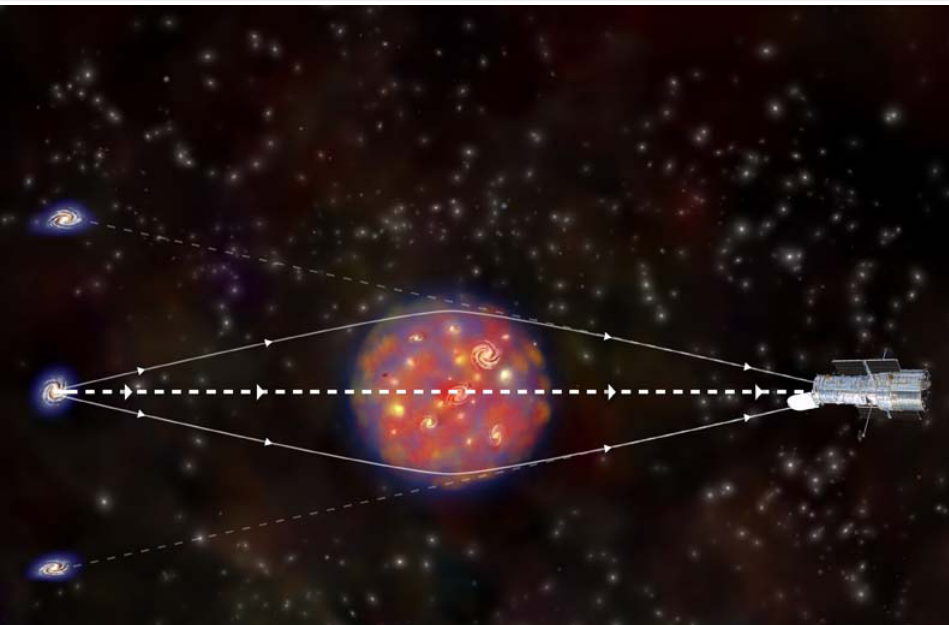
Gravitational Lensing

Is what we see all there is?

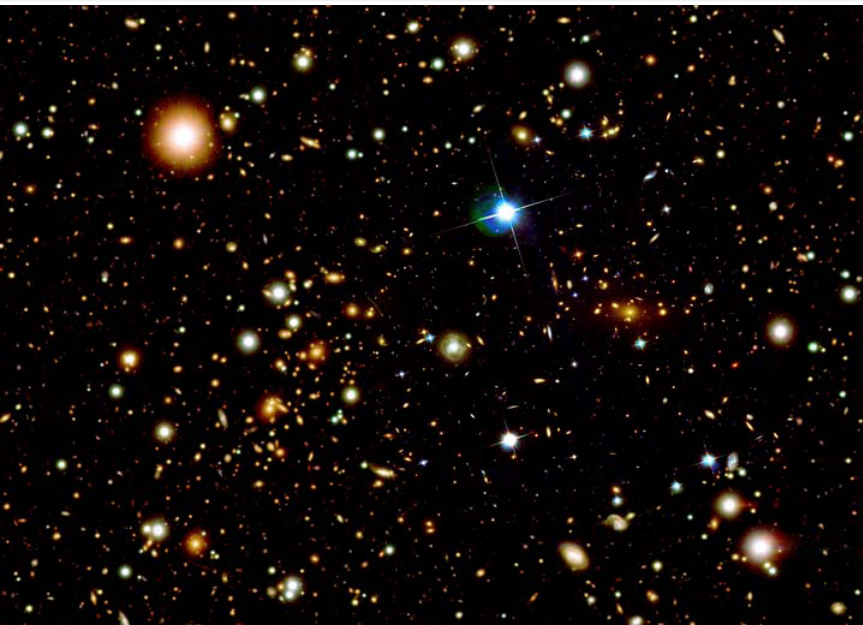


Einstein: all forms of matter and energy cause gravity, and are affected by gravity. By observing how light is deflected (“gravitational lensing”), we can detect gravitational fields, and *weigh the universe*.

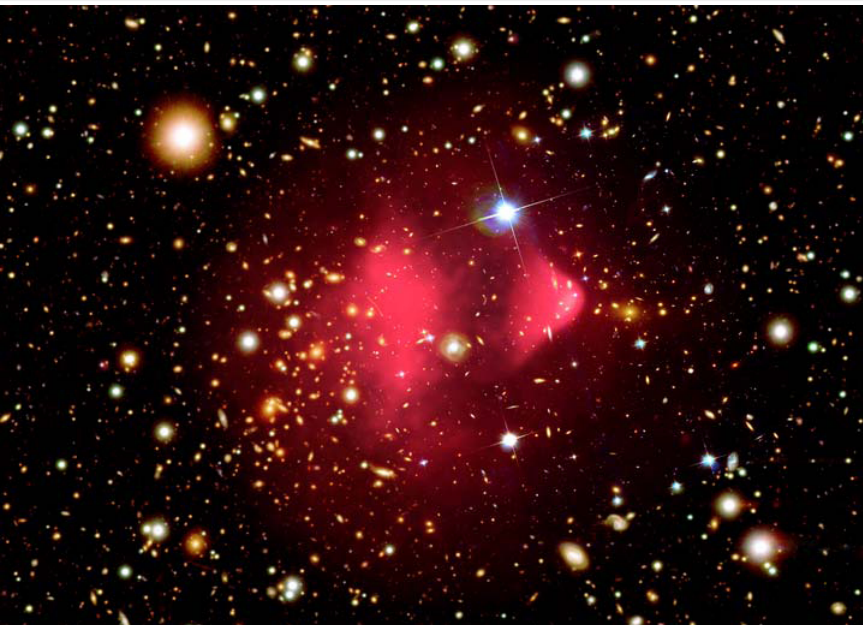
Koinotda qorong'i materiya



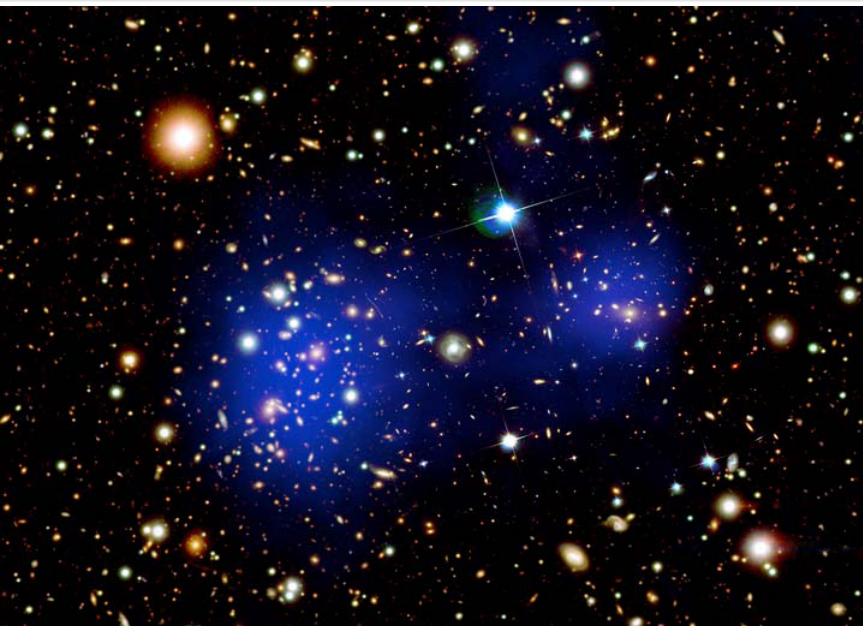
Bullet Cluster (optical)



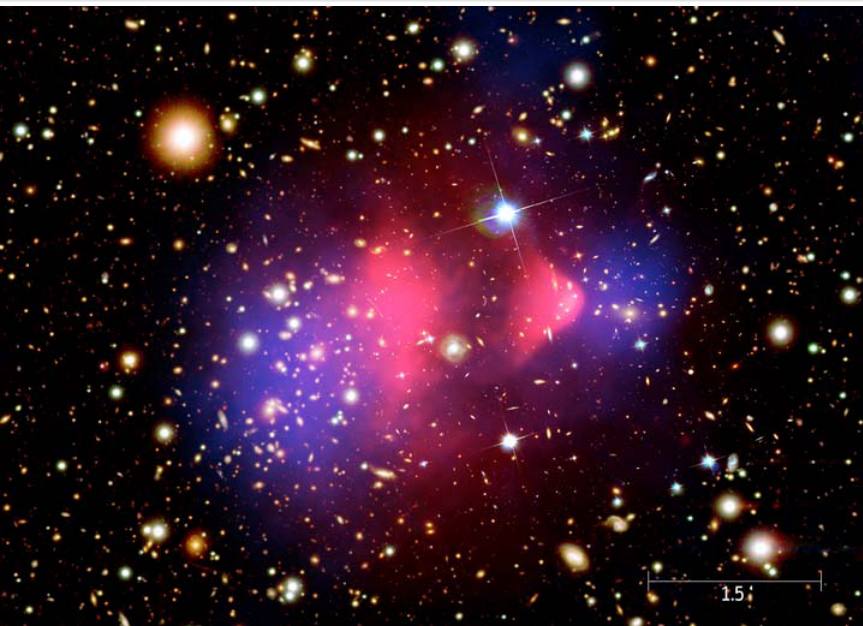
Bullet Cluster (X-ray + optical)



Bullet Cluster (optical + lensing)

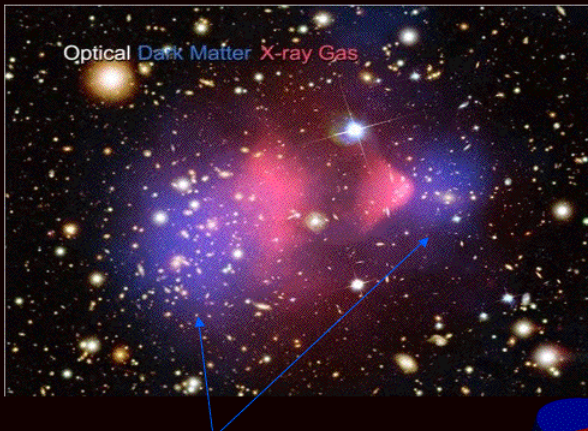


Bullet Cluster (all)

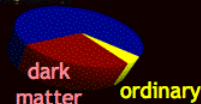


Bullet Cluster (all)

Bullet Cluster



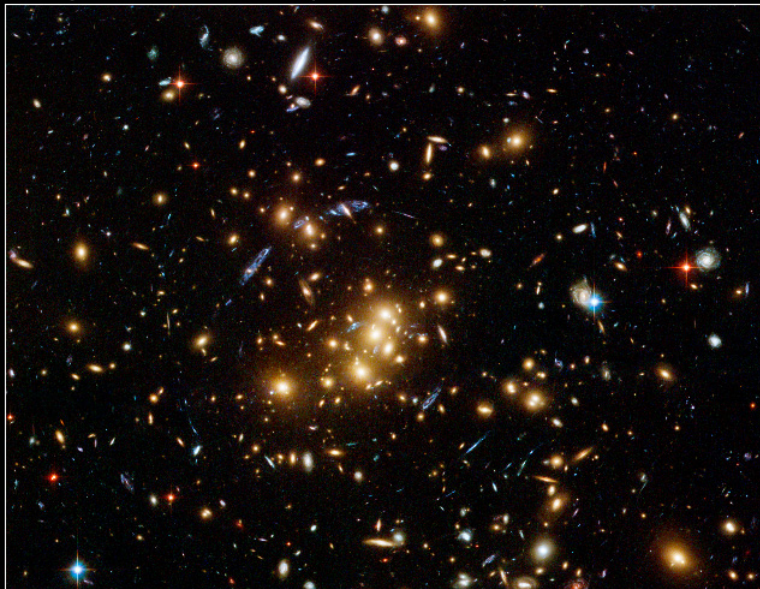
gravitational field is centered on a different source than the ordinary matter -- dark matter



Galaxy Cluster

Galaxy Cluster Cl 0024+17 (ZwCl 0024+1652)

HST • ACS/WFC



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Galaxy Cluster

Dark Matter Ring in Cl 0024+17 (ZwCl 0024+1652) HST • ACS/WFC



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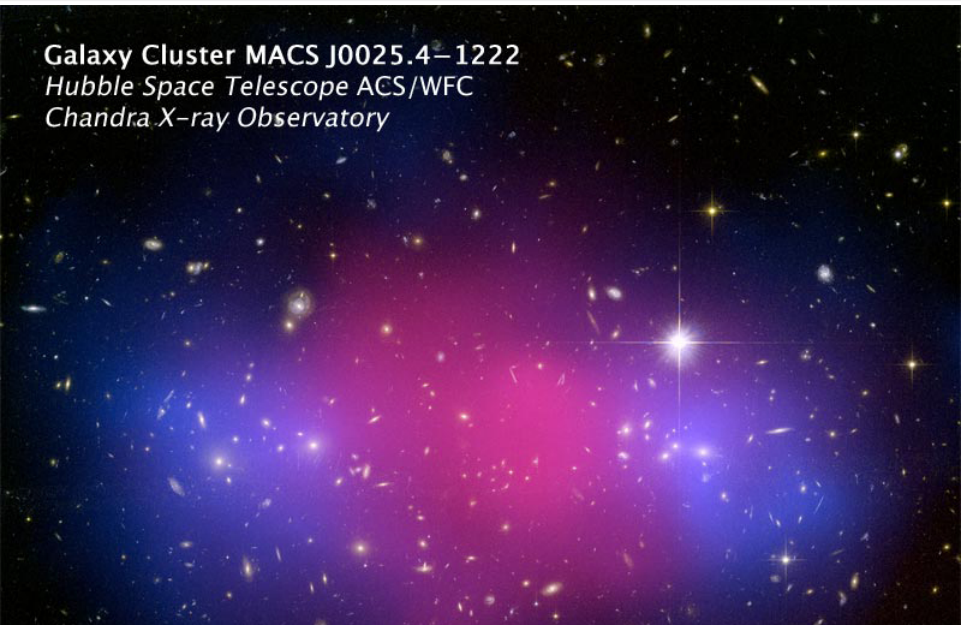
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Galaxy Cluster

Galaxy Cluster MACS J0025.4–1222
Hubble Space Telescope ACS/WFC
Chandra X-ray Observatory



Koinotning kengayishi



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Einstein, Friedman and Hubble



- Einstein



A. Friedmann

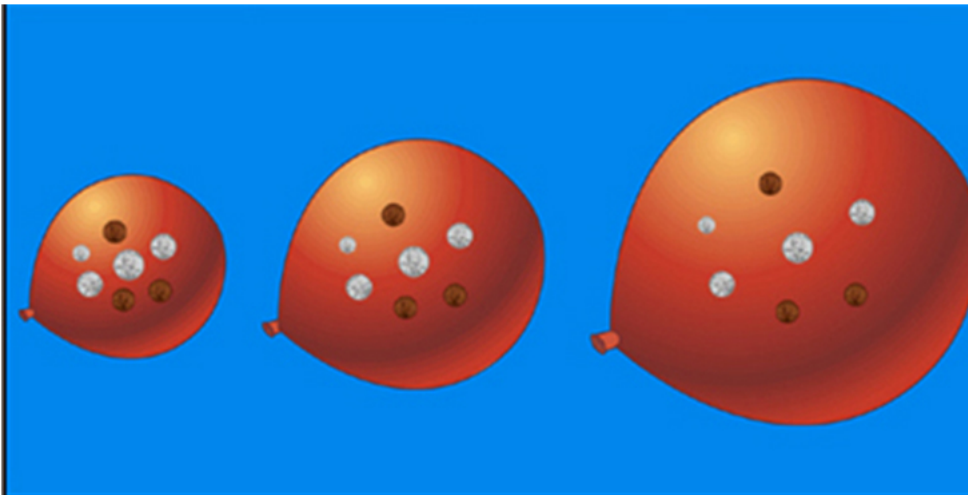
- Friedman



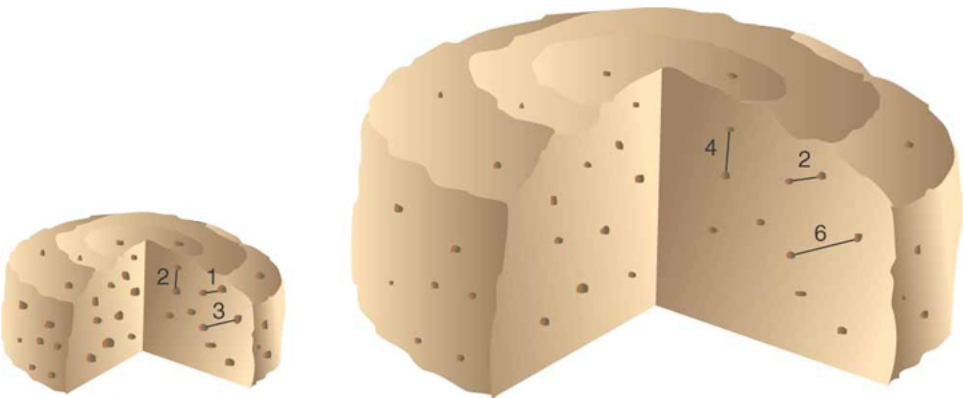
- Hubble



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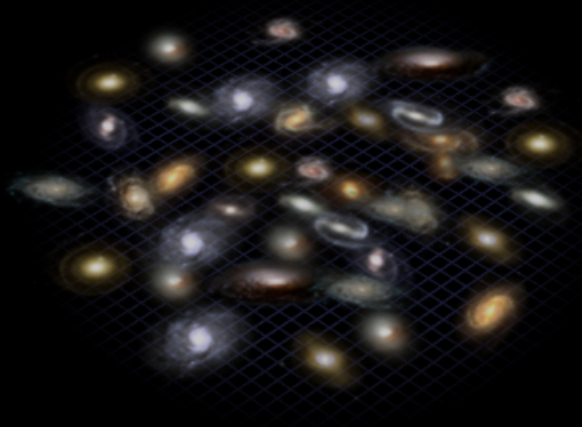
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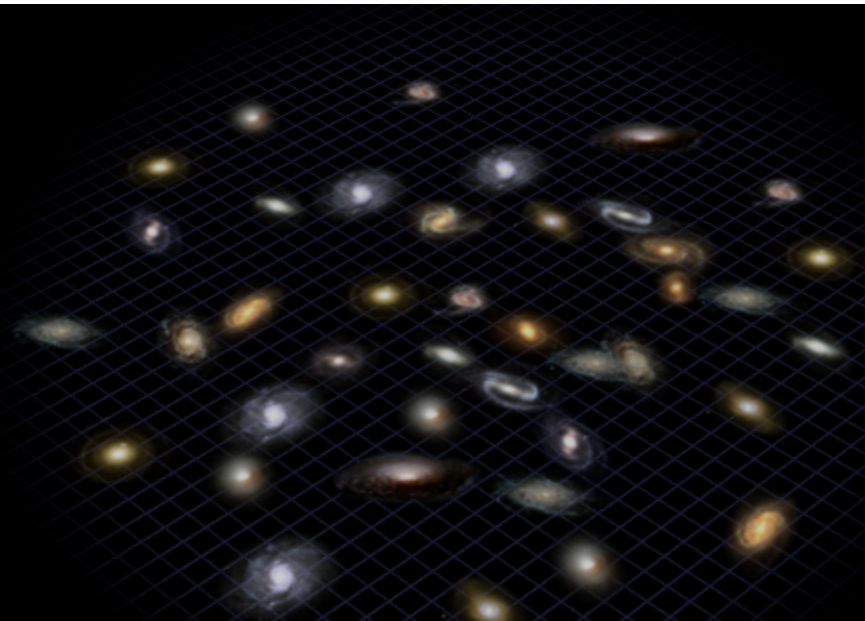
Koinotning kengayishi



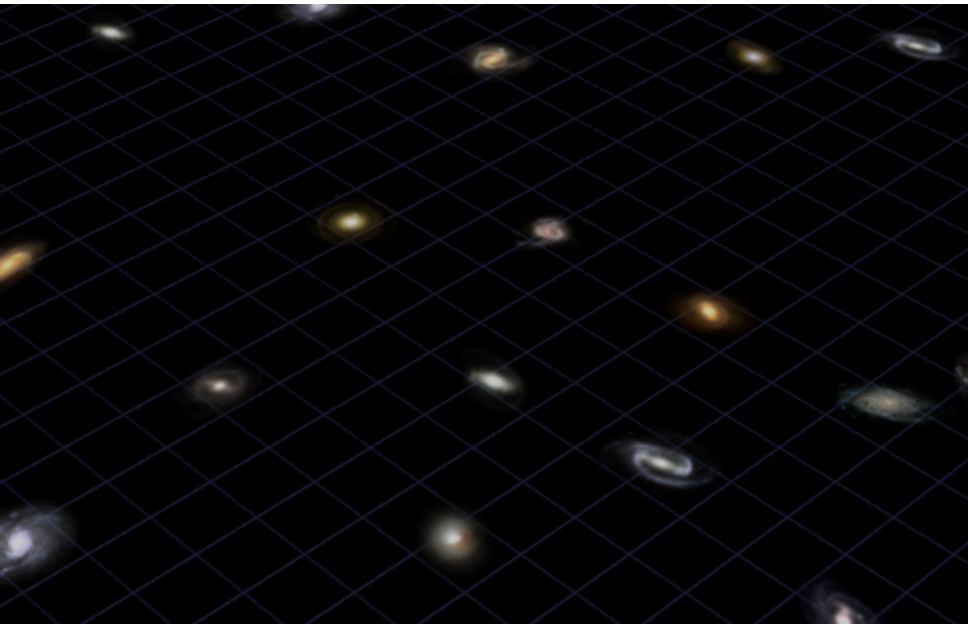
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Koinotning kengayishi



Koinotning kengayishi



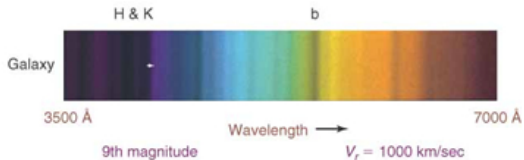
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Calculated
distance
for $H_0 = 71 \text{ km/sec/Mpc}$



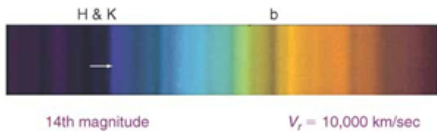
Galaxy in a
nearby cluster

14 Mpc
46 million lt yr



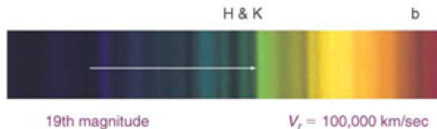
Galaxy in a more
distant cluster

140 Mpc
460 million lt yr



Galaxy in a very
distant cluster

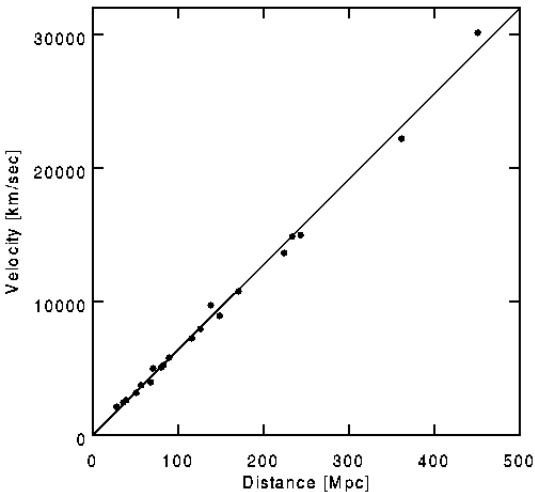
1400 Mpc
4.6 billion lt yr



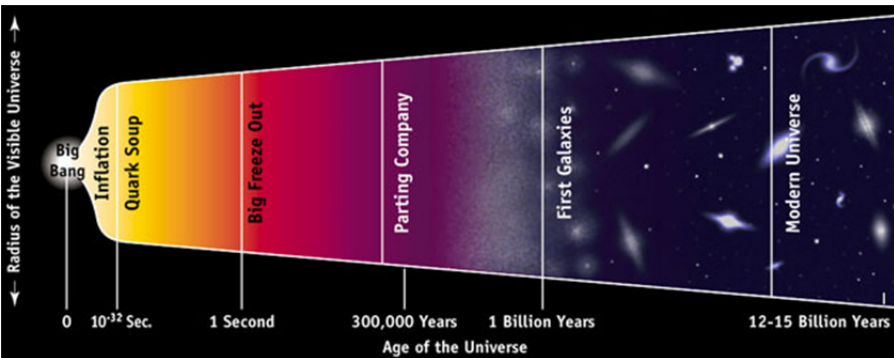
Koinotning kengayishi

Hubble qonuni

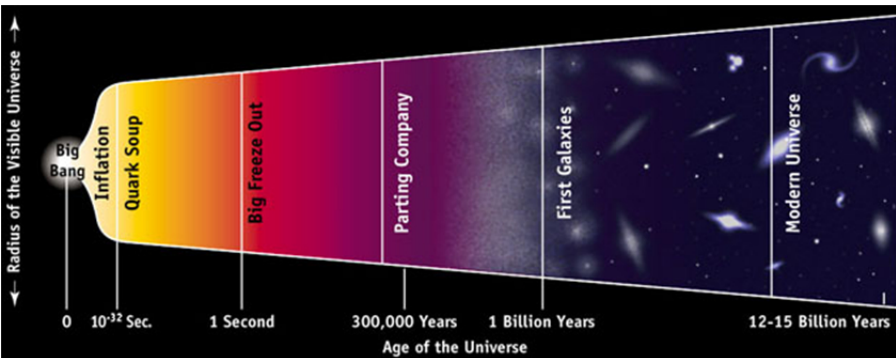
$$V = Hd$$



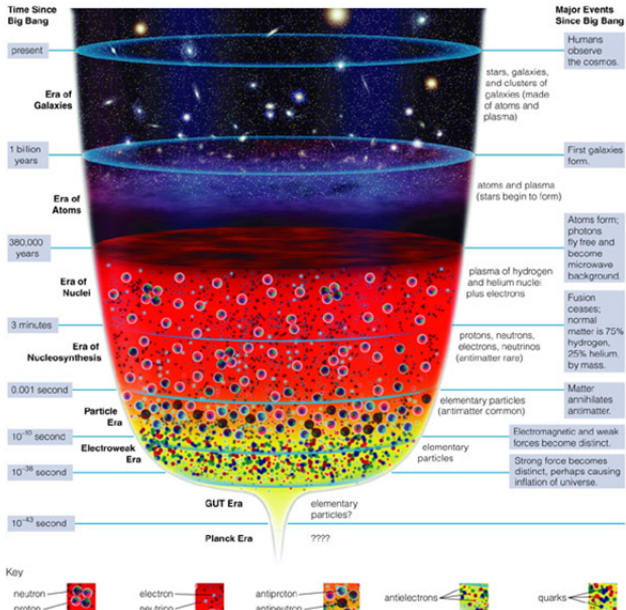
Koinotning kengayishi



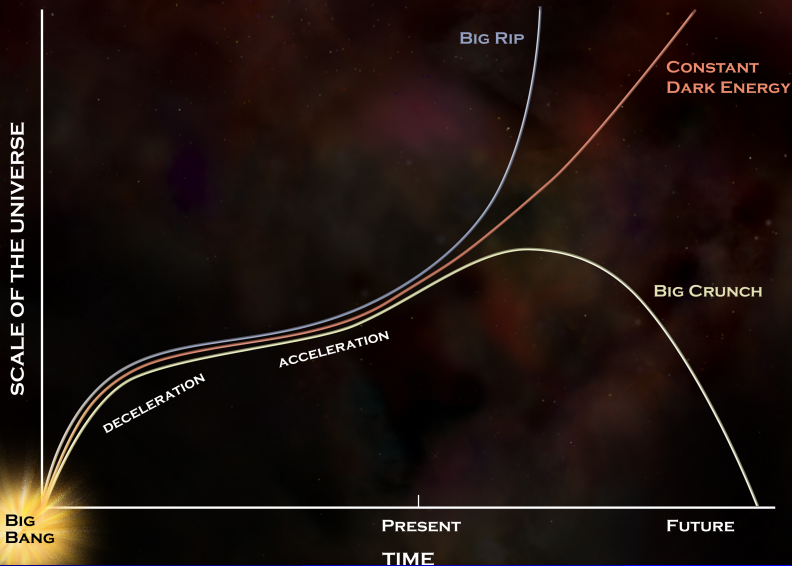
Koinotning kengayishi



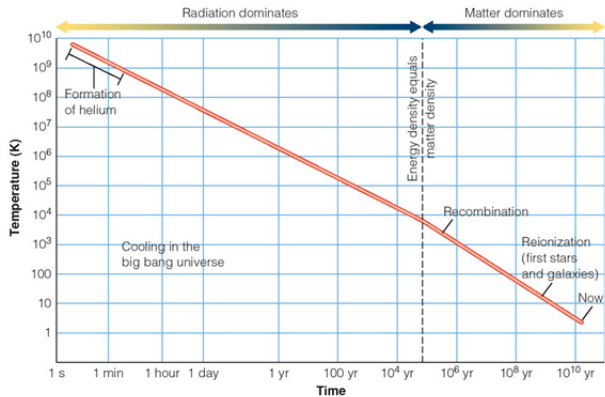
Koinotning kengayishi



Koinotning kengayishi



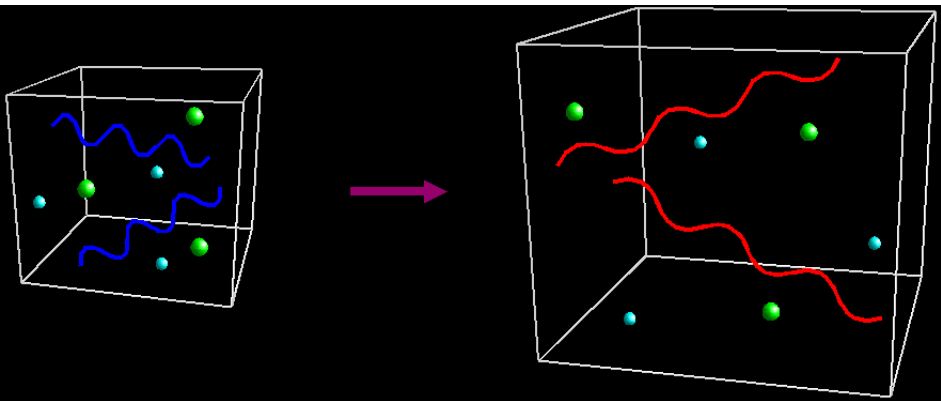
Koinotning kengayishi



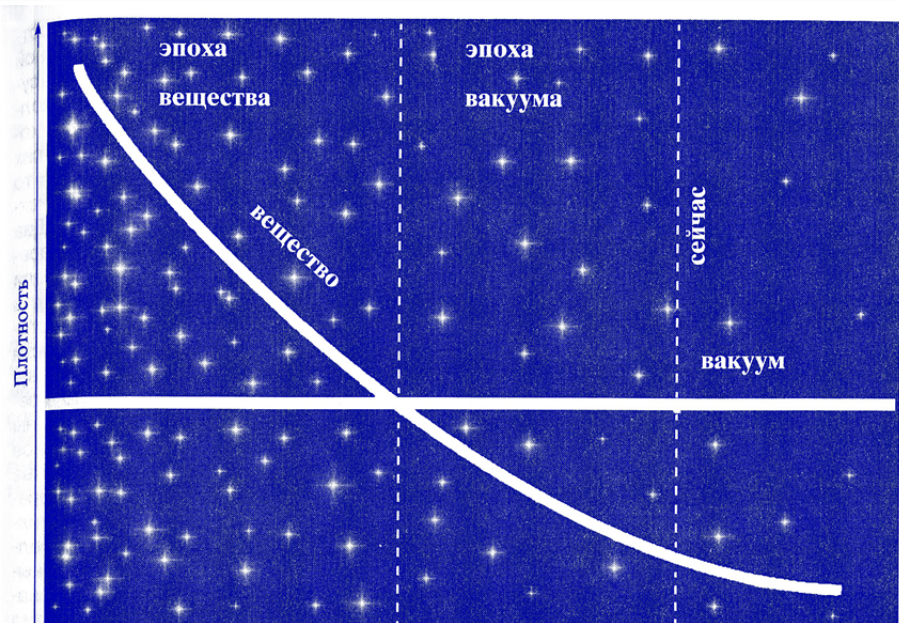
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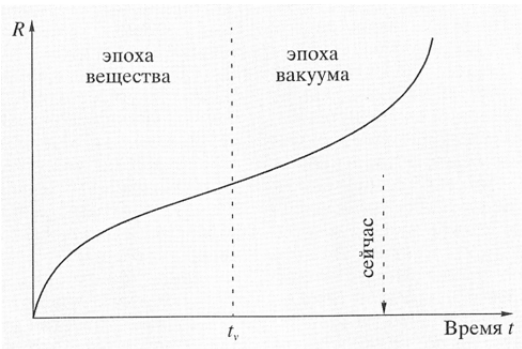
Koinotning kengayishi



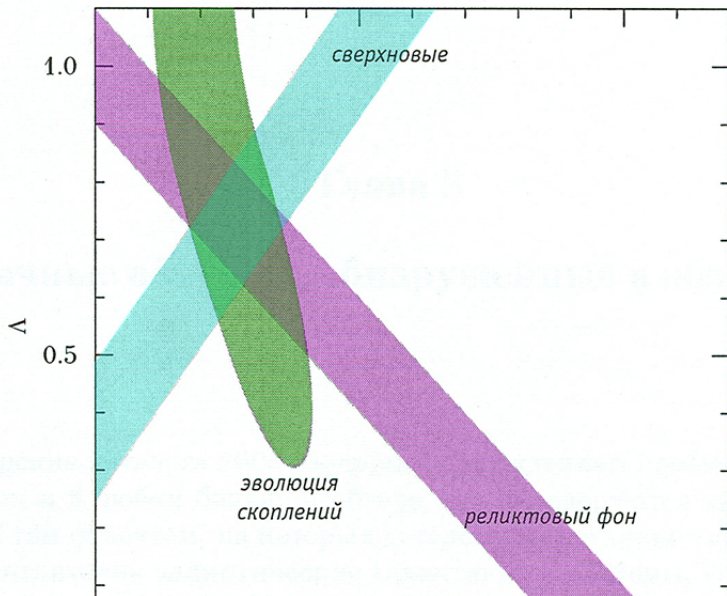
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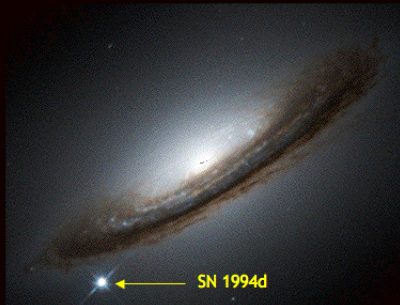


Koinotning tezlanish bilan kengayishi

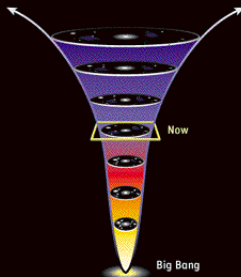


Koinotning tezlanish bilan kengayishi

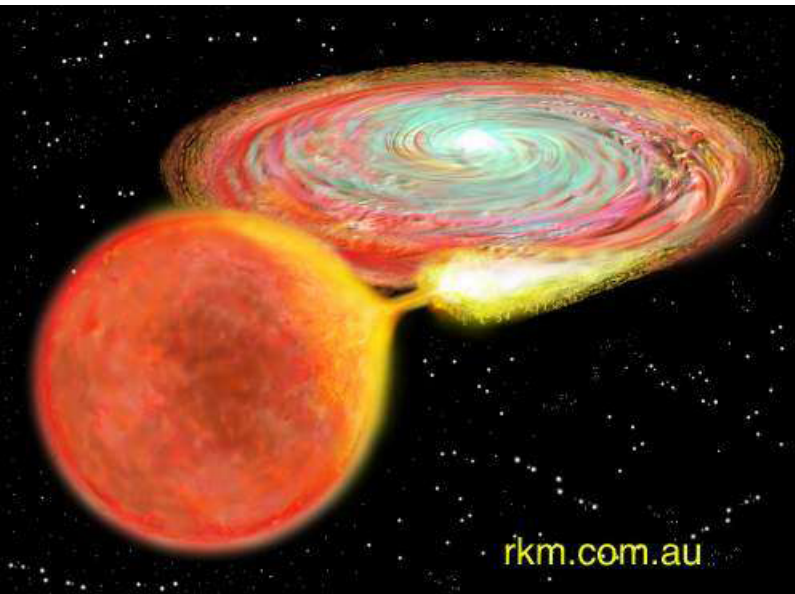
Supernovae in other galaxies reveal the expansion history of the universe.



Result (1998): the expansion is speeding up, just as dark energy predicts!



Koinotning tezlanish bilan kengayishi

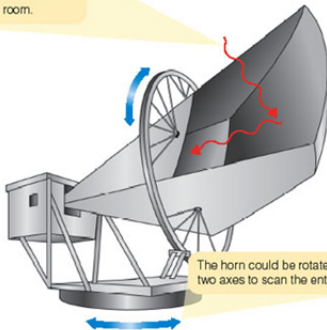
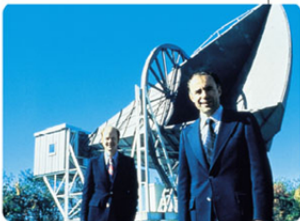


rkm.com.au

Koinotning tezlanish bilan kengayishi

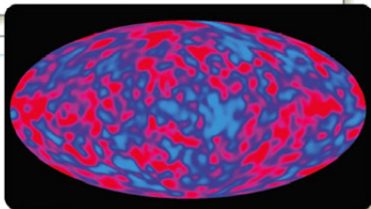
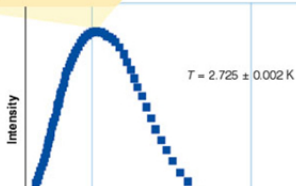
Microwave radiation from the sky enters the horn and is focused into the instrument room.

In 1965, Arno Penzias (right) and Robert Wilson first detected the background radiation with an unused horn antenna.



The horn could be rotated about two axes to scan the entire sky.

Launched in 1989, the COBE satellite showed the background radiation followed the black body curve.



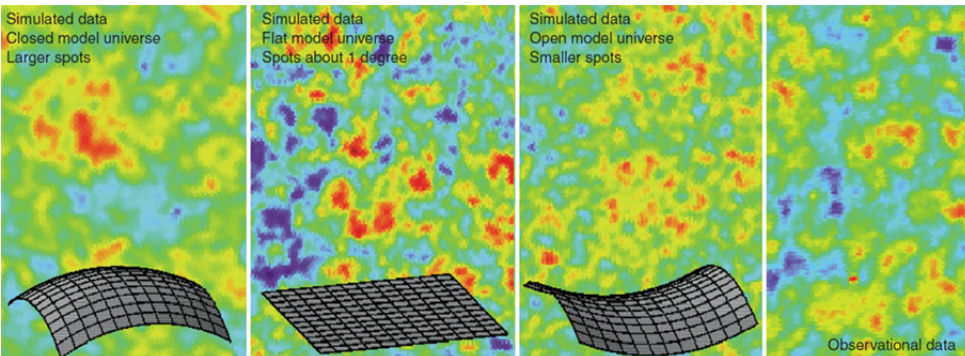
All-sky COBE map of tiny variations in the background radiation.

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of Siz uchun

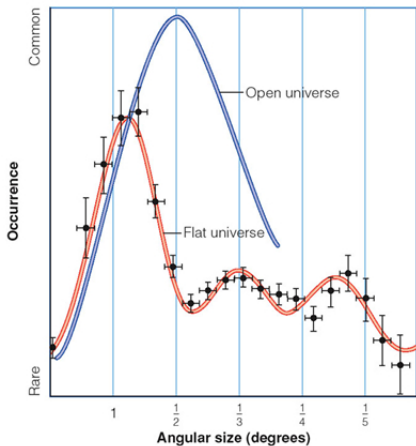


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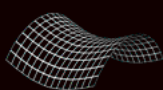
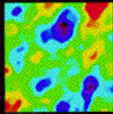
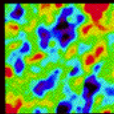
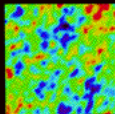
© 2006 Brooks/Cole - Thomson



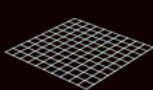
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Check: curvature of space measures the total energy of the universe (ordinary + DM + DE).

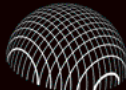
GEOMETRY OF THE UNIVERSE



OPEN



FLAT



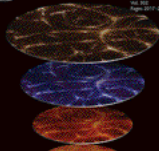
CLOSED

**Result (2003): Need for
dark energy confirmed!**

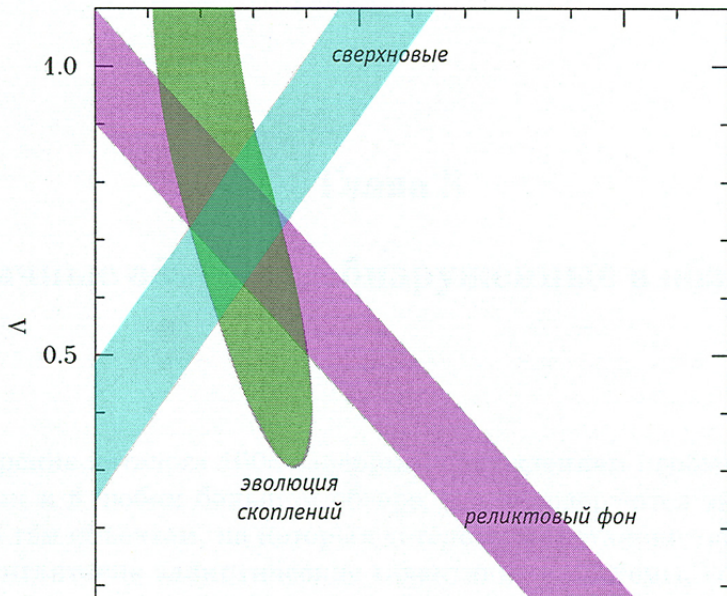


**Wilkinson Microwave
Anisotropy Probe (WMAP)**

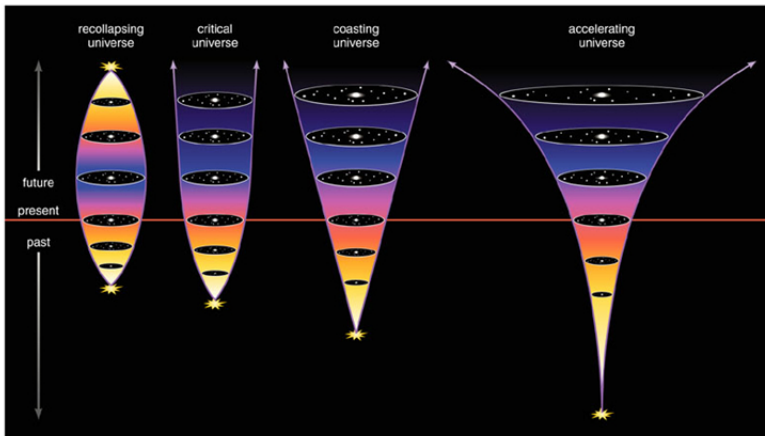
Science
19 December 2003
Vol. 302 No. 5625
Pages 2072-2073 510



Koinotning kengayishi



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Xulosa

Xulosa

- What is the nature of dark matter?
- What is the nature of dark energy?
- What is origin of supermassive black holes?
- What role does dark energy and cosmic acceleration play?
- What is the origin of matter-antimatter asymmetry?
- Is the inflationary theory correct?
- What is the inflaton or cyclic field responsible?
- How far does space extend?
- Is the Big Bang a beginning of space and time?
- Why are there three large spatial dimensions?



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- What is origin of supermassive black holes?
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- What is the origin of matter-antimatter asymmetry?
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TASHAKKUR ¹



¹ **Umid qilamanki siz zavq oldingiz ... va hozirgi payt uyg'oqsiz**