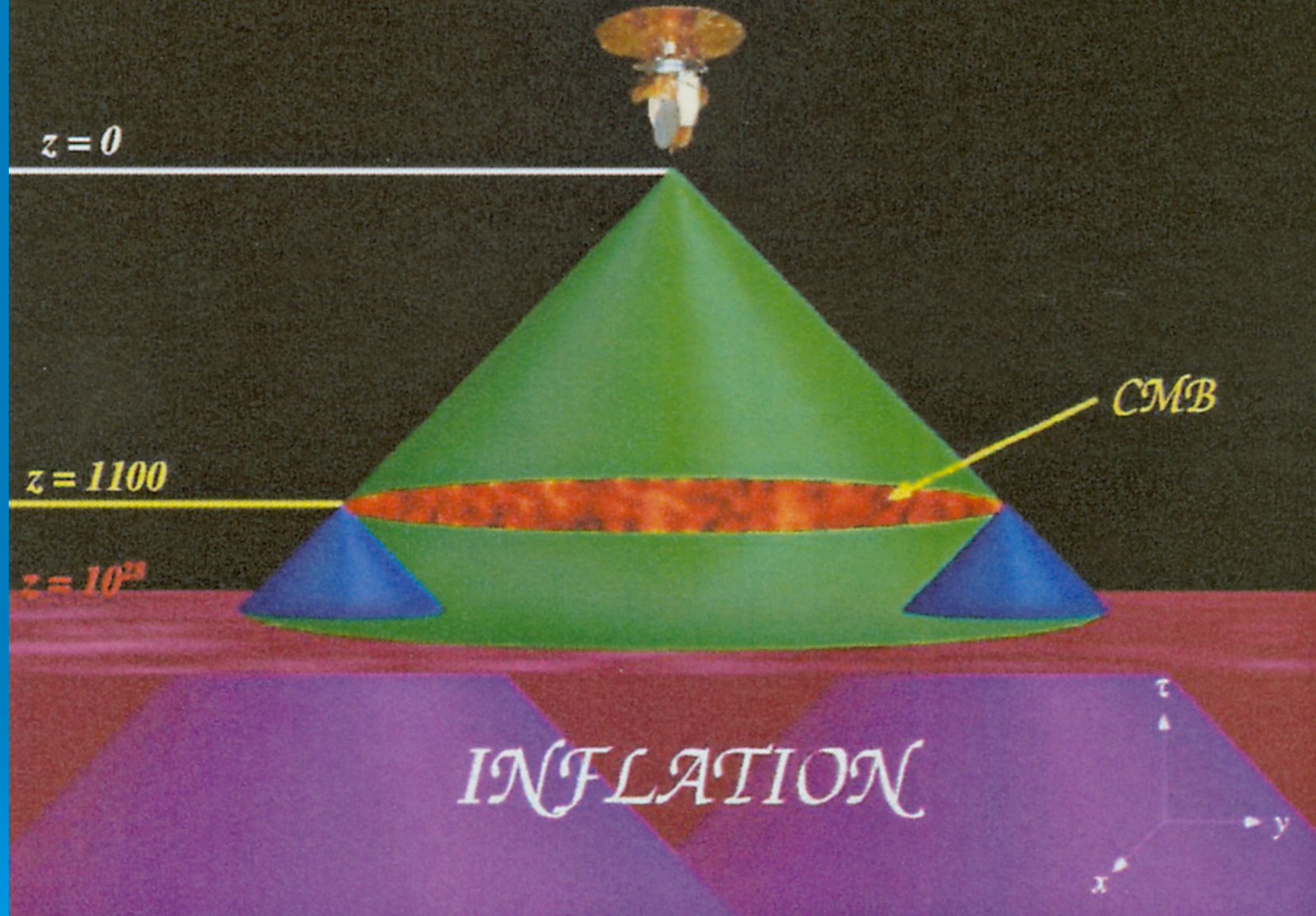


Inflation

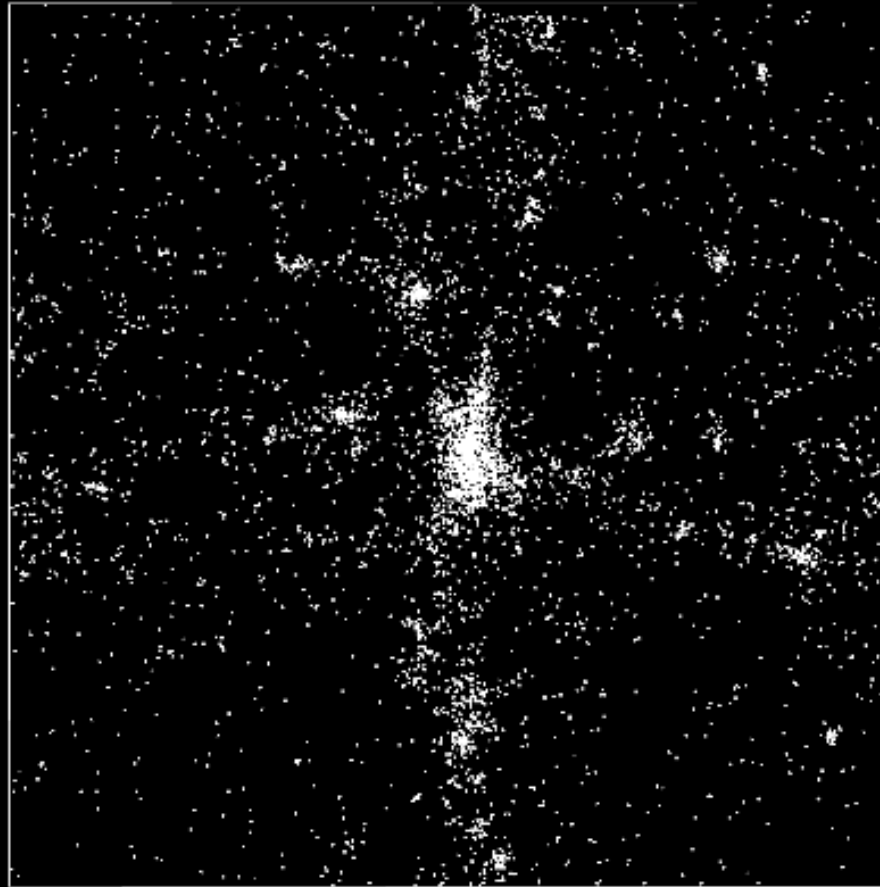
- The Higg's particle can inflate the universe which solves the horizon problem.
 - Gives mass to particles
 - Allows the unification of Weak and Electromagnetic forces
- Requires universe to be at the transition between collapse and expansion
- Provides structure for future

Inflation solves the Horizon Problem



**If you can look into the seeds of time
And say which grain will grow and which will not,
Speak then to me, who neither beg nor fear
Your favours nor your hate.**

-MACBETH (Banquo)



Cosmological Constant

- Modify Einstein's Equation

$$G_{\mu\nu} + \Lambda g_{\mu\nu} = 8\pi G T_{\mu\nu}$$

- Acts like matter with $p = -\rho$

$$\frac{\ddot{a}}{a} = -\frac{4\pi G}{3}(\rho + 3p) = \frac{4\pi G}{3}(2\rho) \geq 0$$



Einstein's Biggest Blunder?

1917 Einstein proposes
cosmological constant

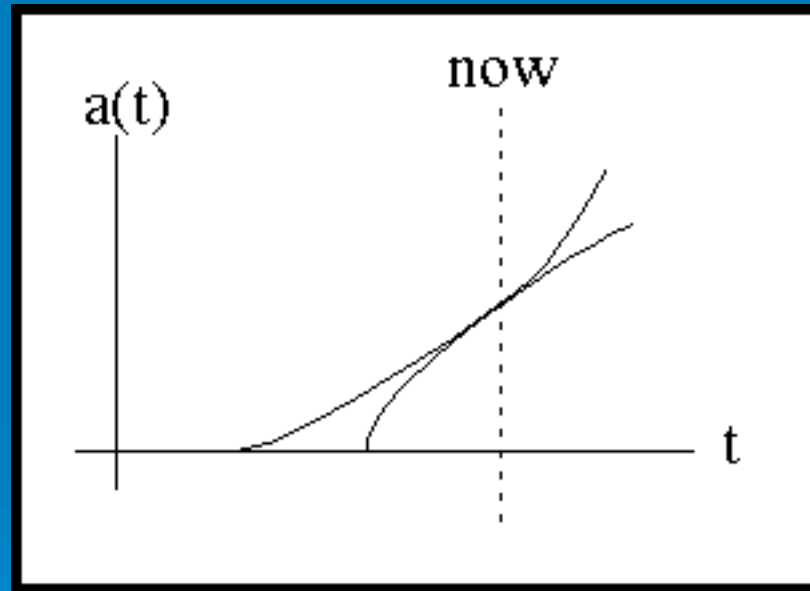
1929 Hubble discovers
Expansion of the universe

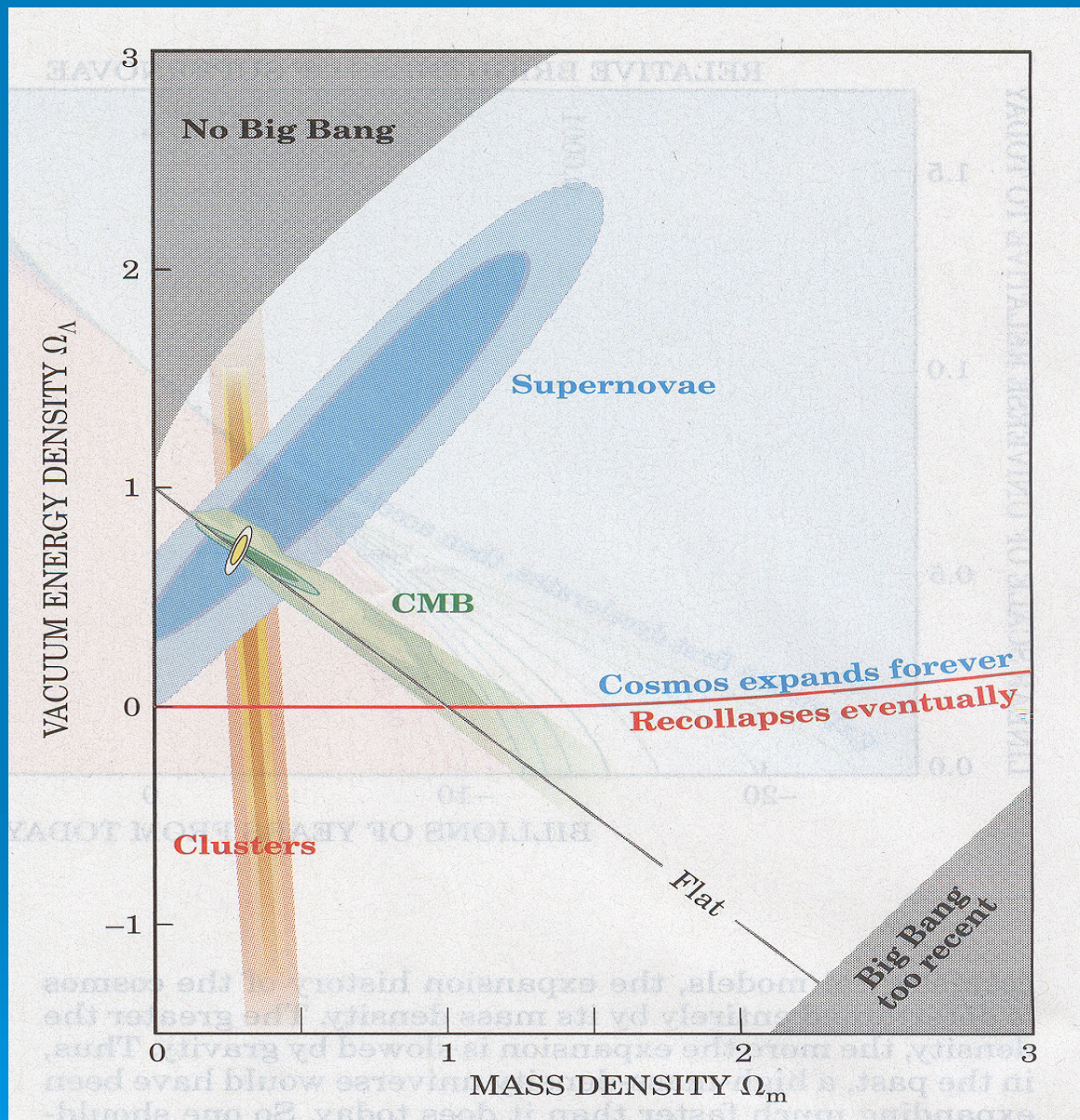
1934 Einstein calls it
“my biggest blunder”

1998 Astronomers find
evidence for it

Repairs Age Problem

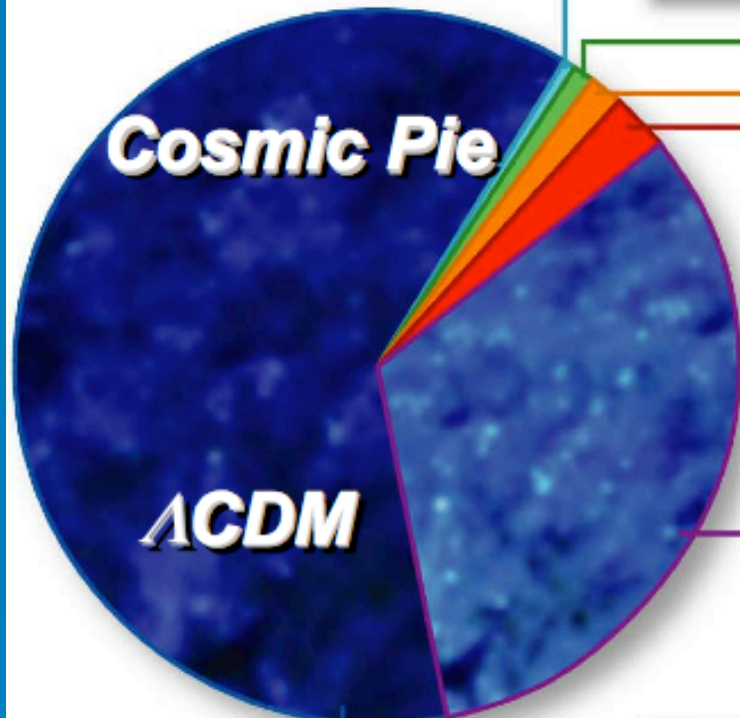
- Acceleration will extend age





$$\Omega_i \equiv \rho_i / \rho_{\text{CRITICAL}}$$

$$\Omega_{\text{TOTAL}} = 1$$



Heavy Elements:

$\Omega=0.0003$



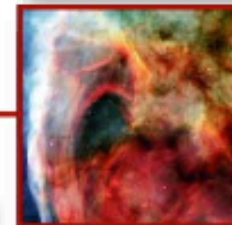
Neutrinos (ν):

$\Omega=0.0047$



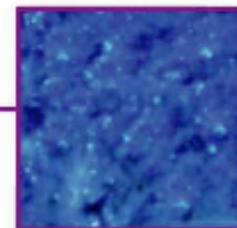
Stars:

$\Omega=0.005$



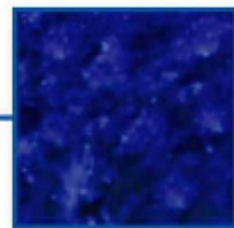
**Free H
& He:**

$\Omega=0.04$



Cold Dark Matter:

$\Omega=0.25$



Dark Energy (Λ):

$\Omega=0.70$