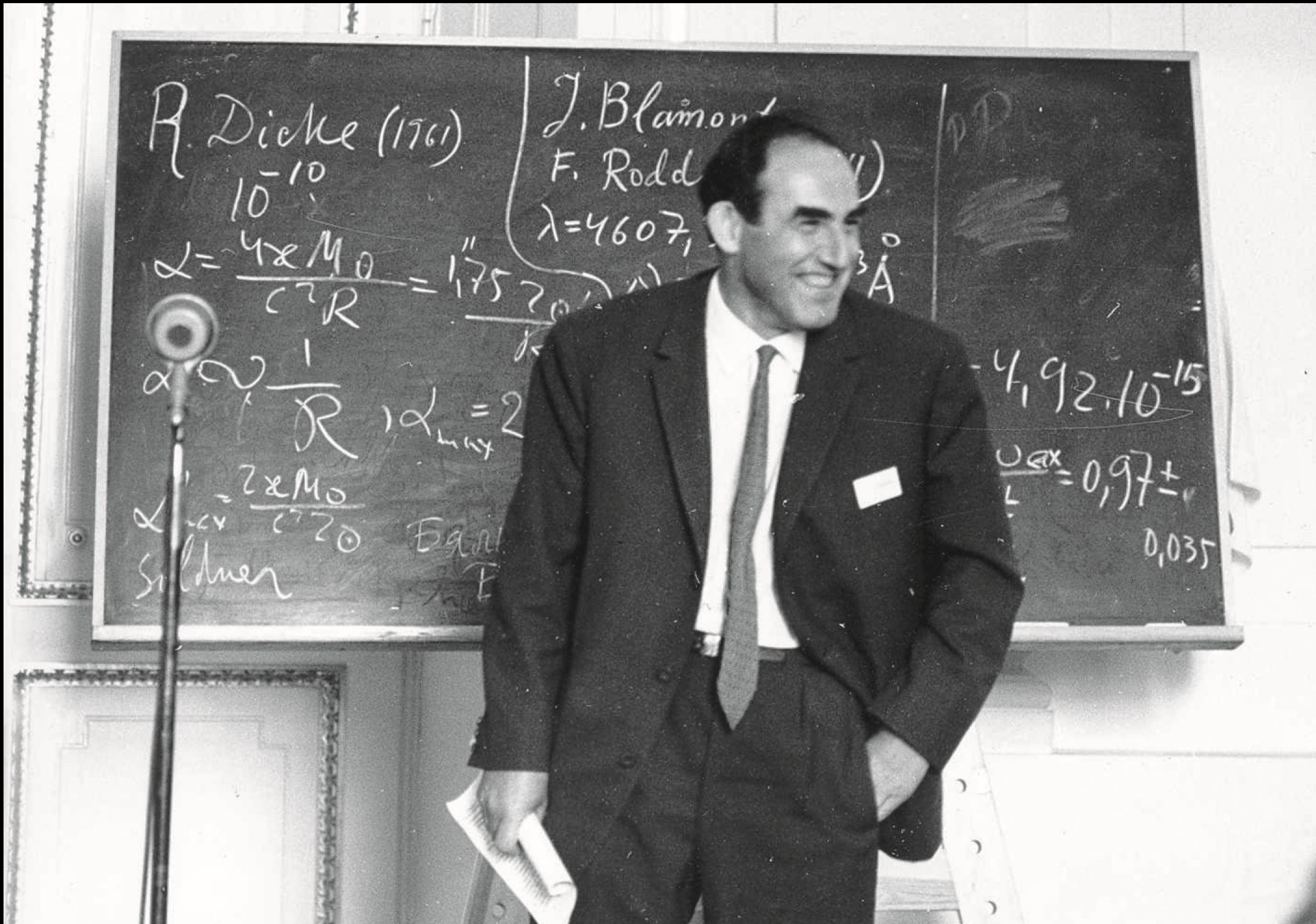
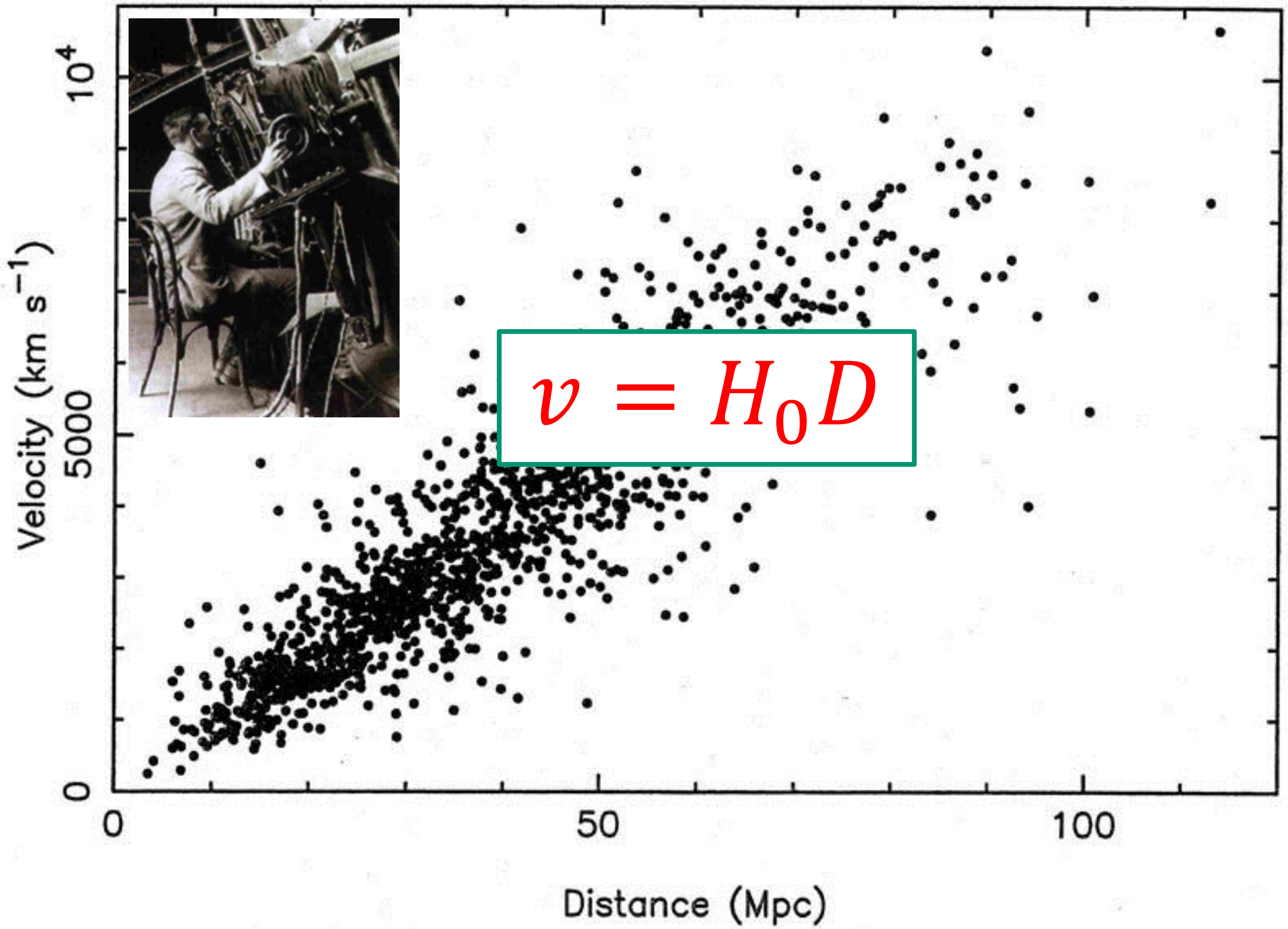
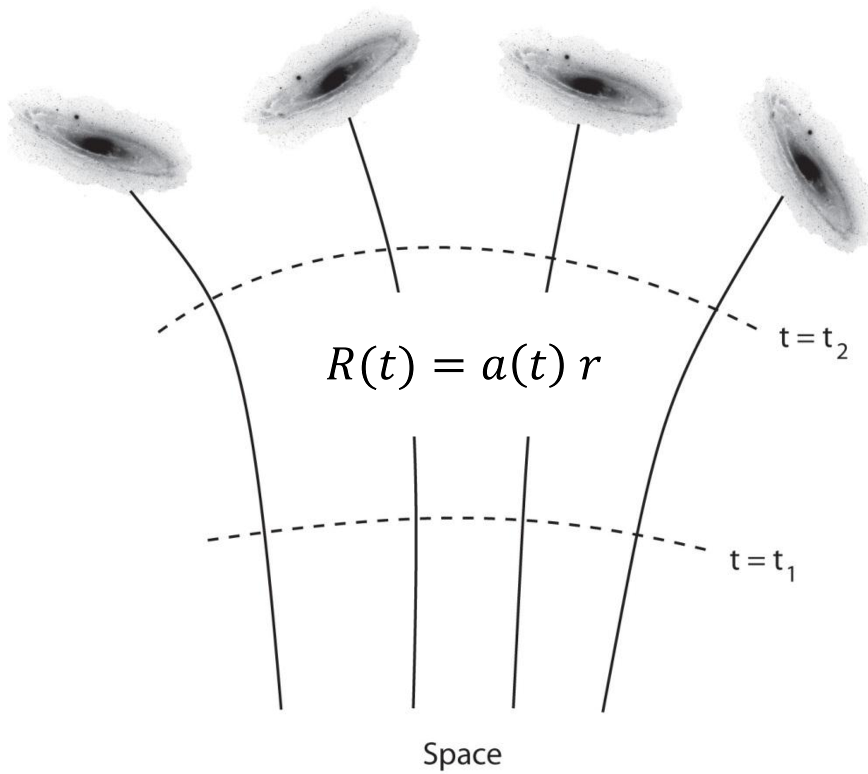

R. Dicke (1961)
J. Blamon
F. Rodd
0,035

The $R_h = ct$ Universe



$H_0 = 74.2 +/- 3.6$ km s^{-1} Mpc^{-1} (Riess et al. 2009)

Weyl's Postulate

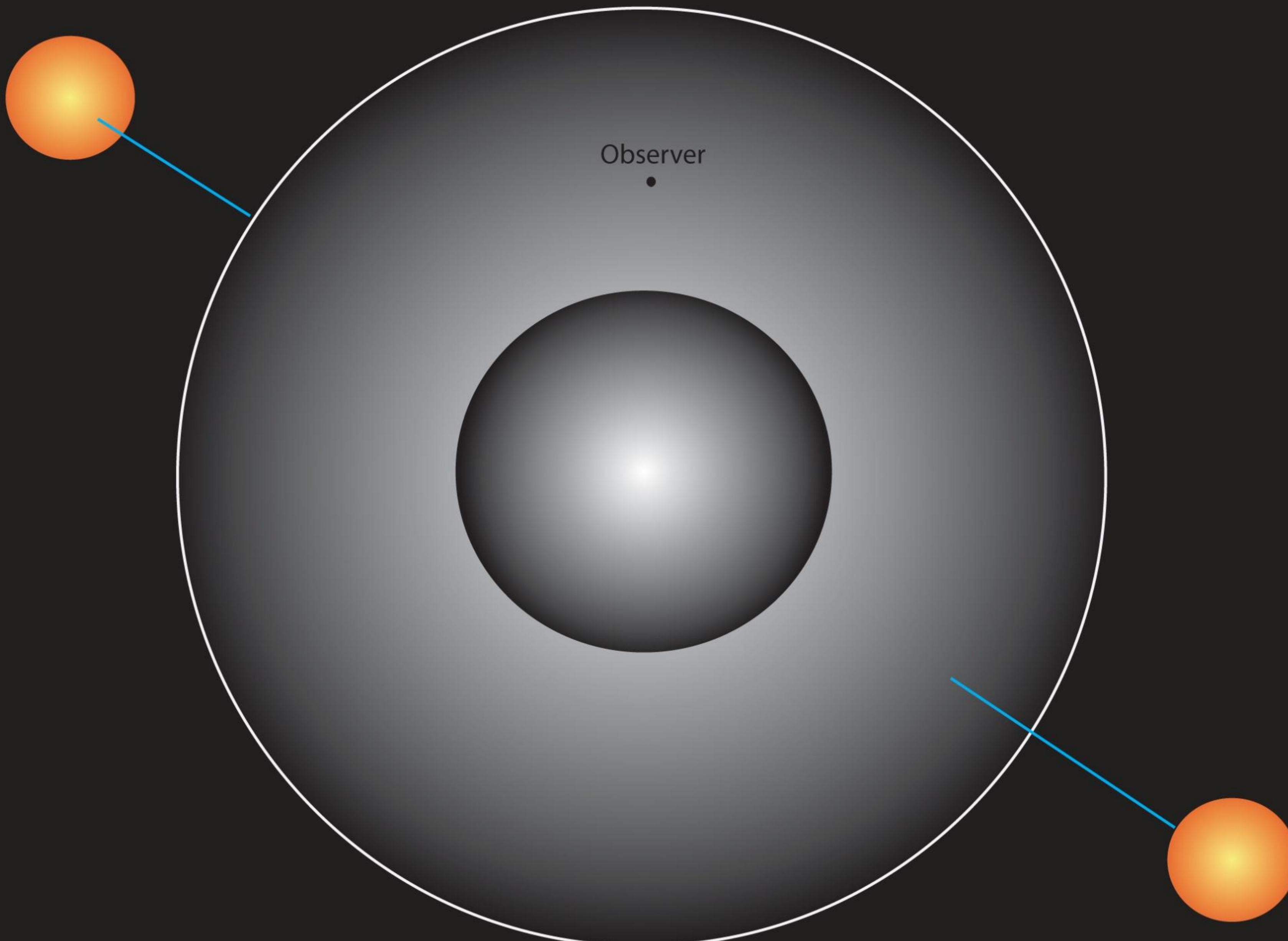


$$R(t) = a(t)\, r$$

The Hubble Constant

$$v = \frac{dR}{dt} = \frac{da}{dt} r \qquad v = \frac{\dot{a}}{a} a r \qquad v = HR$$

$$\boxed{H = \frac{\dot{a}}{a}}$$


Observer

The Gravitational Horizon

$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{8\pi G}{3}\rho - \frac{kc^2}{a^2}$$

$$R_h = \frac{2GM(R_h)}{c^2}$$

where $M(R_h) = \frac{4\pi}{3} {R_h}^3 \rho$

In a flat geometry (k=0),

$$\rho = \rho_c = \frac{3c^2H^2}{8\pi G}$$

Thus, $$\boxed{R_h = \frac{c}{H(t)}}$$

Weyl's Postulate Revisited

R_h is the proper radius that defines a proper volume

So according to Weyl's Postulate,

$$R_h = a(t) r_h \qquad r_h = \text{constant}$$

Therefore, with

$$R_h = \frac{c}{H(t)} = \frac{ca}{\dot{a}}$$

one gets

$$\dot{a} = \mathrm{c}\, r_h = \text{constant}$$

So

$$\boxed{R_h = ct}$$

The Standard (ΛCDM) Model

$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{8\pi G}{3}\rho - \frac{kc^2}{a^2}$$

$$\rho = \rho_m + \rho_r + \rho_{de}$$

$$\rho_m \propto a^{-3}$$

$$\rho_r \propto a^{-4}$$

$$\rho_{de} = \Lambda = \text{constant}$$

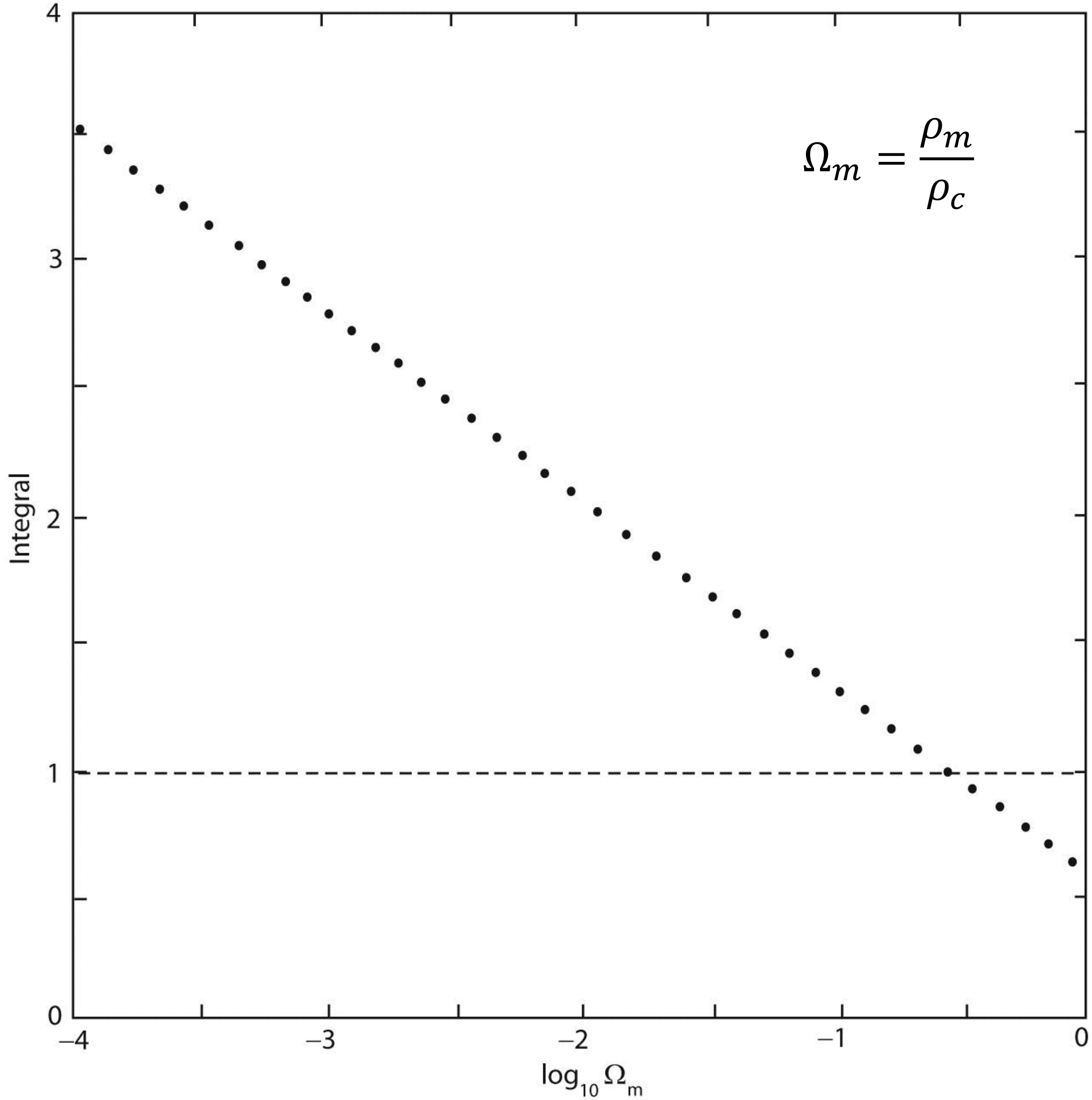
The Standard (ΛCDM) Model

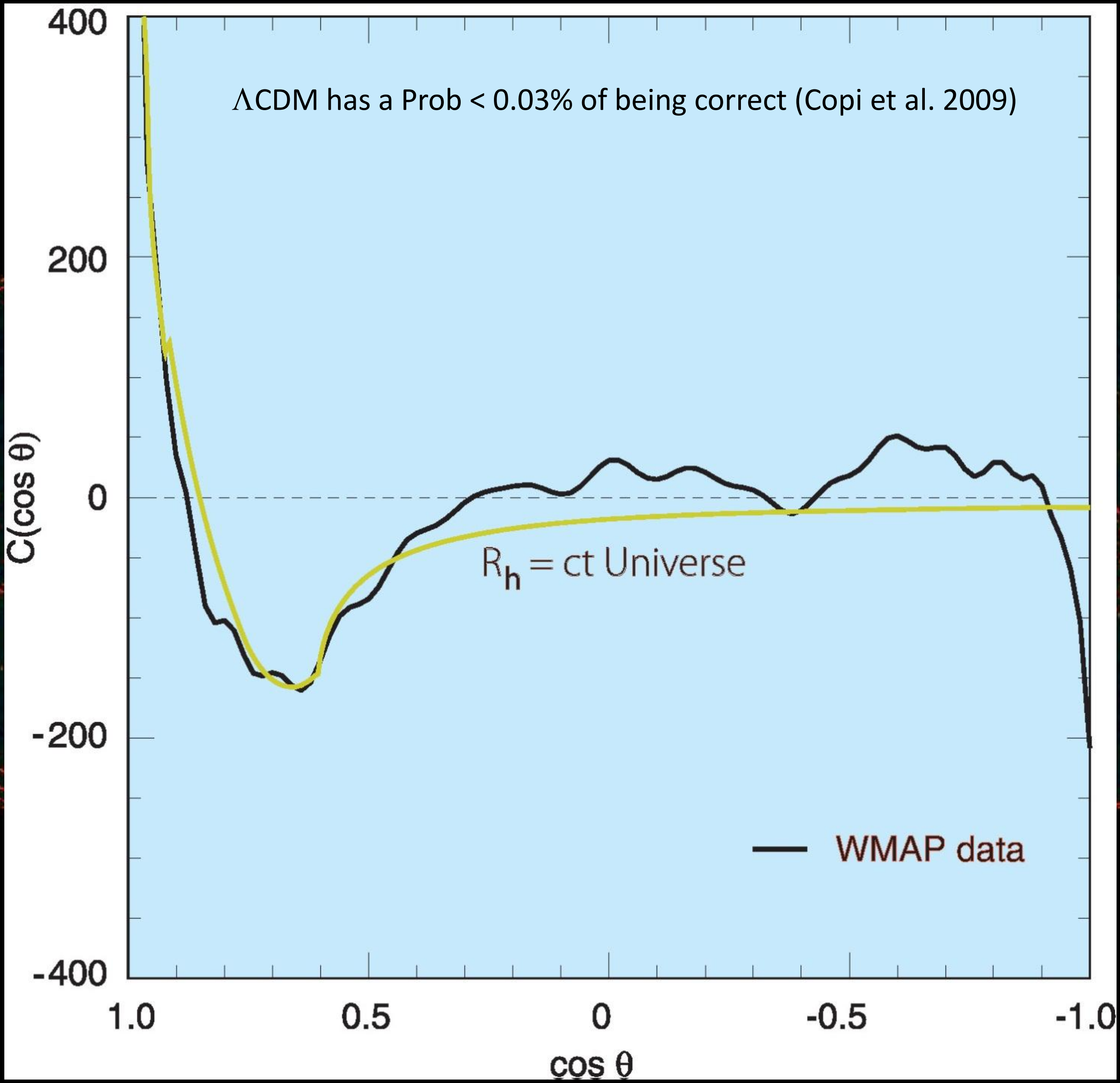
$$\left(\frac{\dot{a}}{a}\right)^2 = \frac{8\pi G}{3}\rho - \frac{kc^2}{a^2}$$

$$\int \frac{da}{f(a)} = \int dt$$

$$\boxed{ct_0 = R_h(t_0)\, I(\rho_m, \rho_r, \Lambda)}$$

So Weyl's Postulate requires $\boxed{I(\rho_m, \rho_r, \Lambda) = 1}$


$\Omega_m = \frac{\rho_m}{\rho_c}$
Integral
4
3
2
1
0
−4
−3
−2
−1
0
$\log_{10}\Omega_m$


ΛCDM has a Prob < 0.03% of being correct (Copi et al. 2009)
$R_h = ct$ Universe
WMAP data
400
200
0
-200
-400
C(cos θ)
1.0
0.5
0
-0.5
-1.0
cos θ

The Nearby Universe (Type Ia Supernovae)

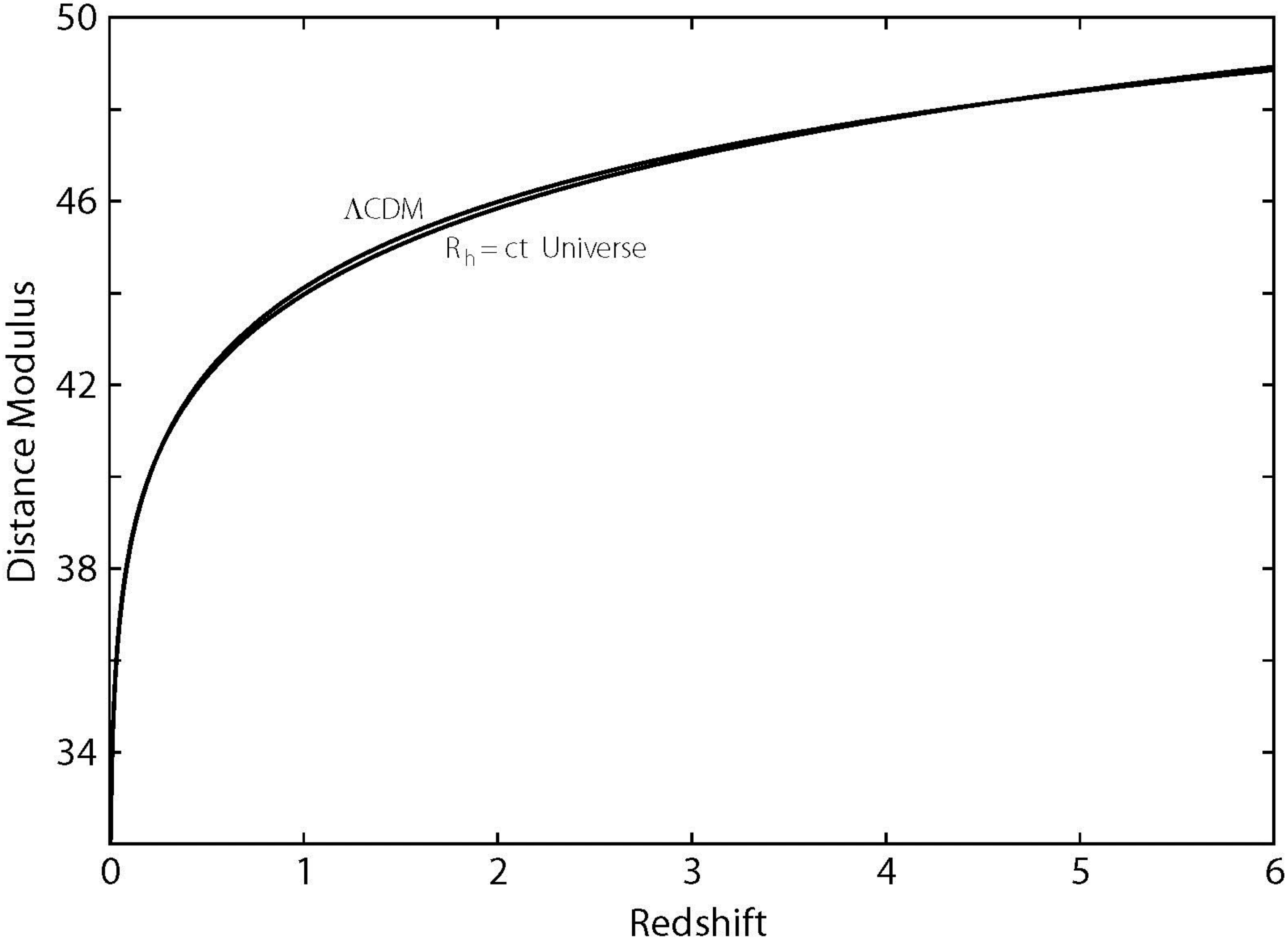
ΛCDM

$$d_L = R_h(1+z)\int_{(1+z)^{-1}}^{1} \frac{du}{\sqrt{\Omega_r + u\Omega_m + u^4\Omega_\Lambda}}$$

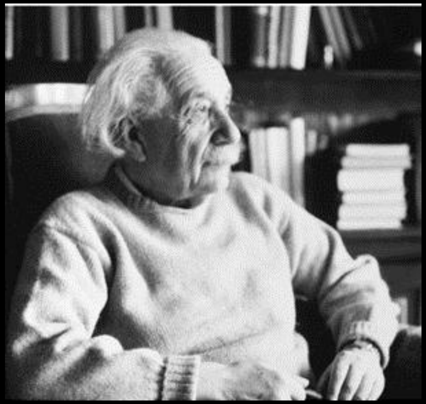
R_h=ct

$$d_L = R_h(1+z)\ \ln(1+z)$$

Plus 4 "nuisance" parameters that must be optimized along with cosmological model to determine the individual supernova distance moduli: (1) the normalization to the time-dependent SED of the SN, (2) the deviation from the average light-curve shape, (3) the deviation from the mean SN B-V color, and (4) a host-mass dependent correction.



50
46
42
38
34
0
1
2
3
4
5
6
Distance Modulus
Redshift
ΛCDM
$R_h = ct$ Universe



Einstein (1879-1955)

Friedmann (1888-1925)

BIrkhoff (1884-1944)

Weyl (1885-1955)

The Universe may turn out to be far simpler than we thought . . .

It is apparently flat (k = 0) so it has no net energy

Its size today is consistent with a constant expansion rate

And it may have expanded without any inflation . . .