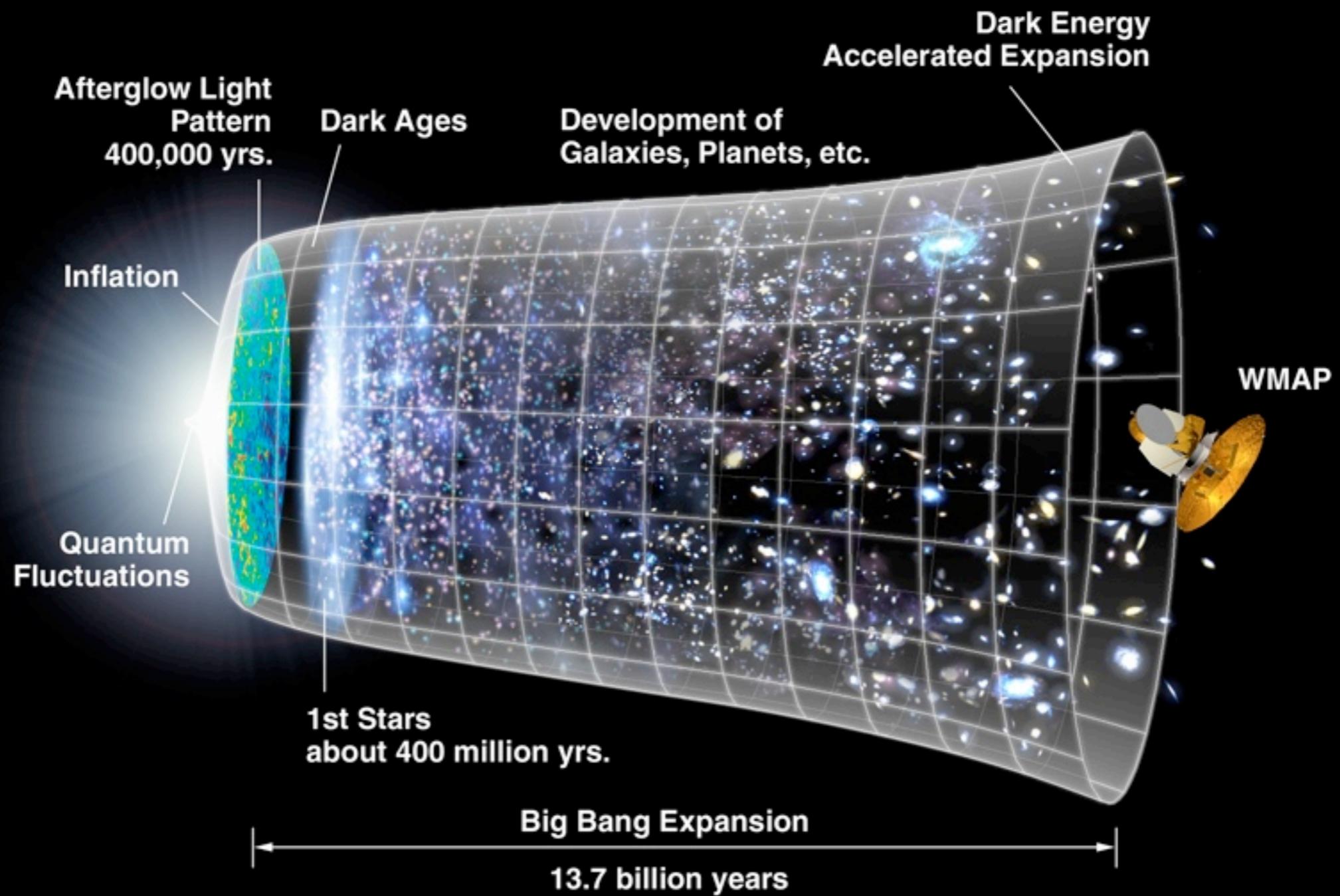


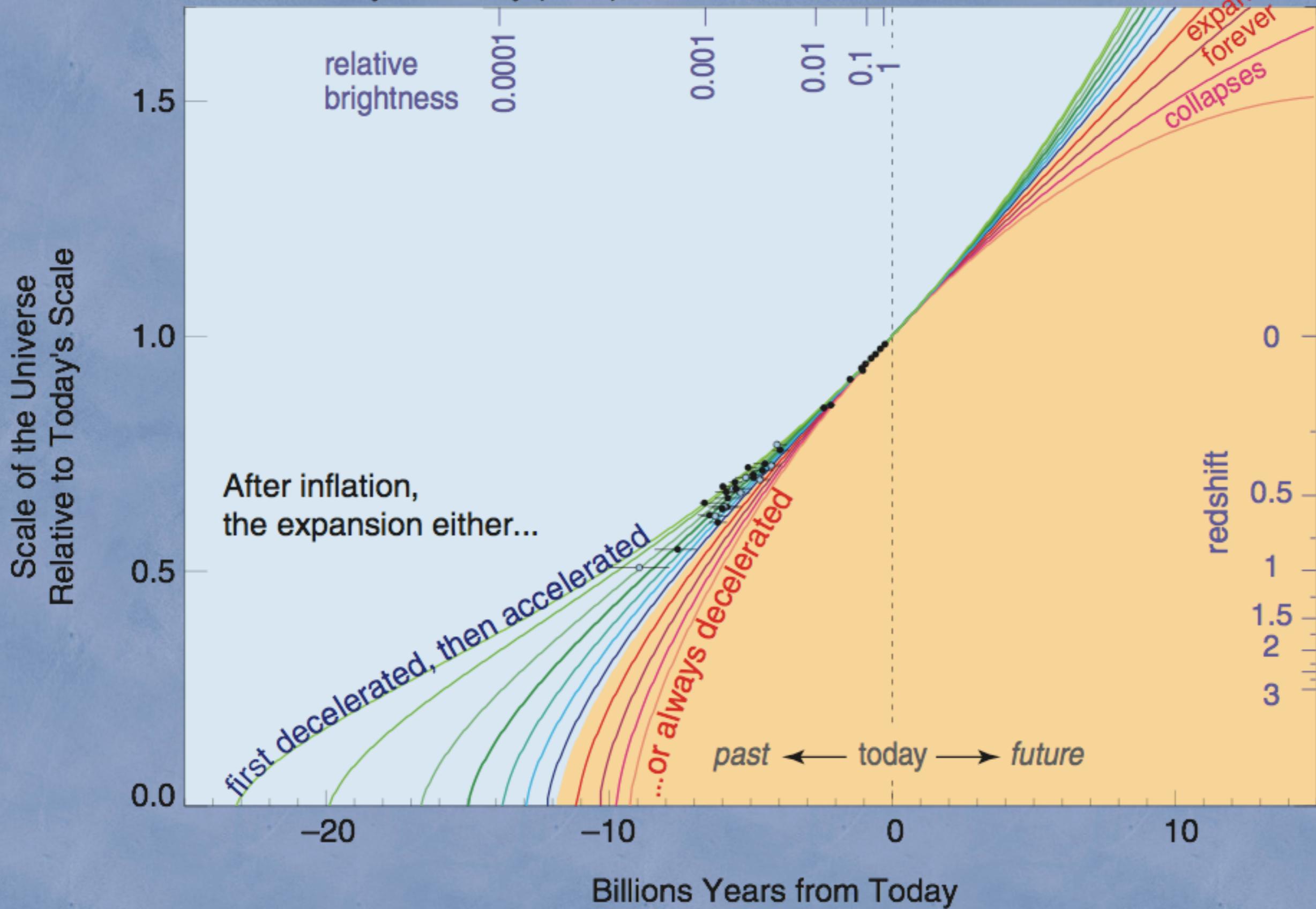
Observational Evidence for Dark Energy: Summary and Assorted Thoughts

Michael Wood-Vasey
Harvard University

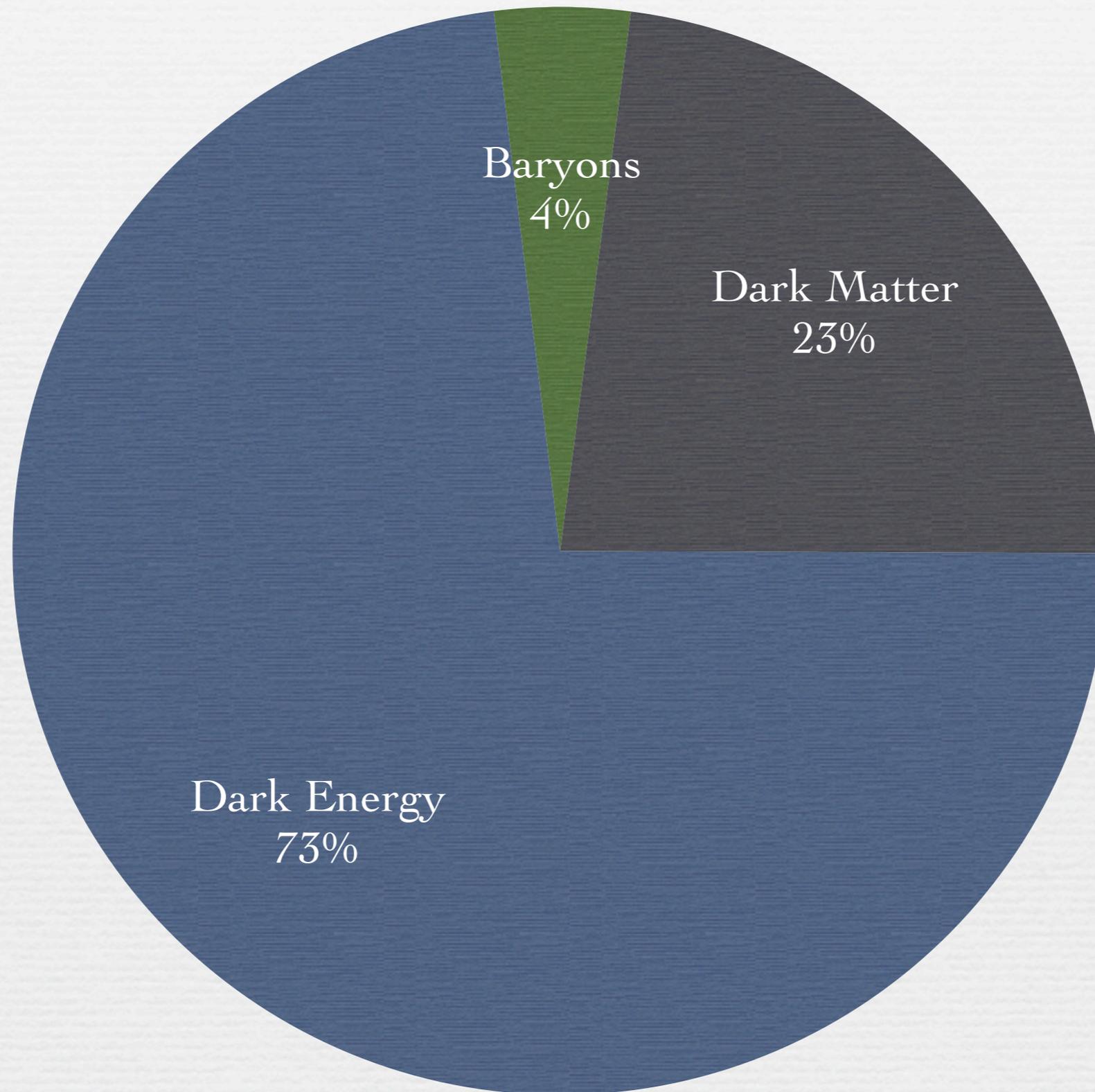


Expansion History of the Universe

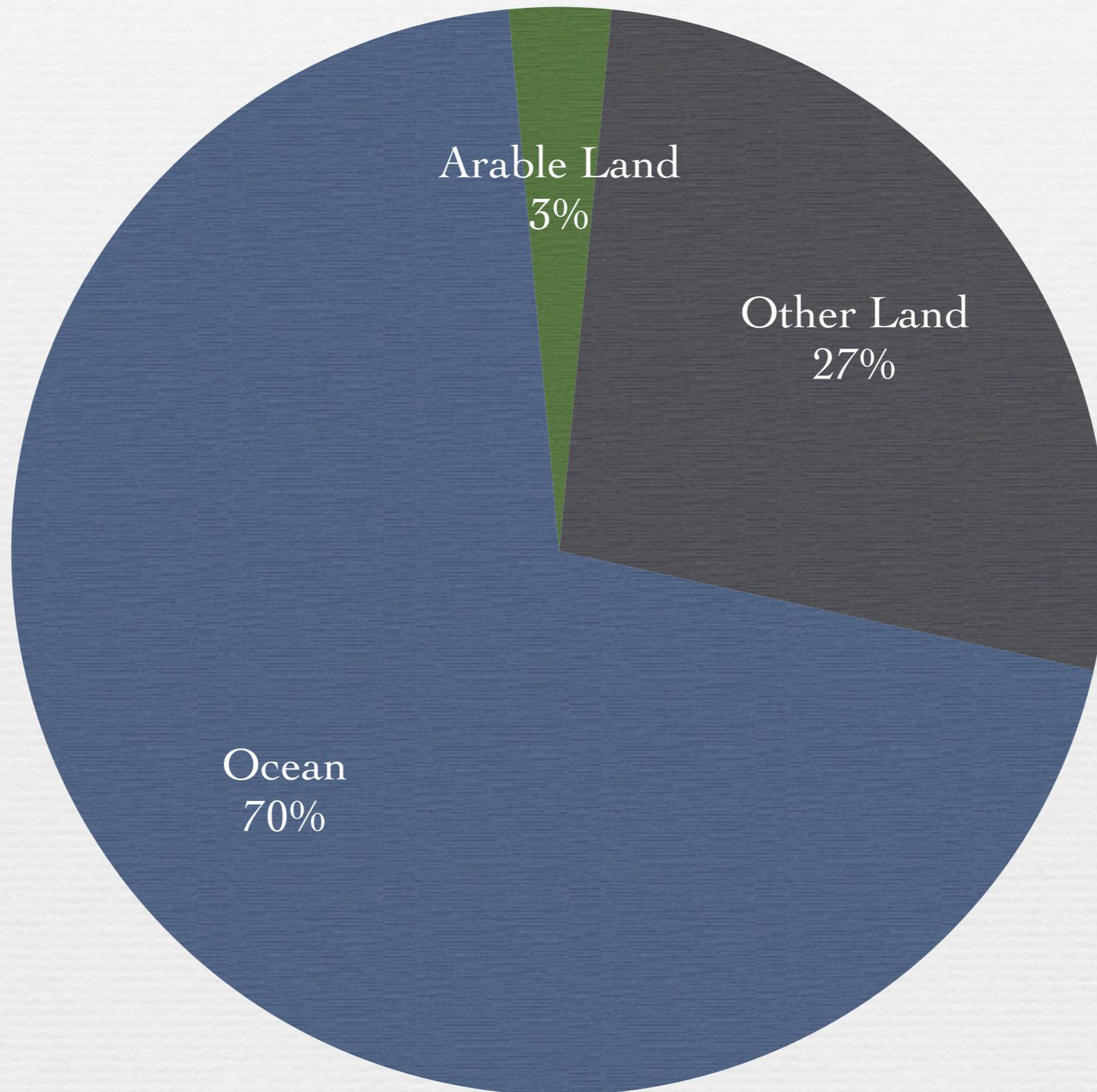
Perlmutter, Physics Today (2003)



Composition of Universe



Composition of Earth's Surface



What Is Dark Energy?

- Repulsive component
- Negative pressure
- Everywhere
- No observed structure
- Particle Physics?
- Cosmological Constant?
- Modification of GR?

The Basic Question:

Is a cosmological constant model
consistent with our observations of
the Universe?

The Basic Question:

Is $w = -1$?

How should we measure w ?

• Dynamic Methods to constrain theorists

• Baryon Acoustic Oscillations

• Galaxy Clusters

• SNIa Luminosity Distances

• Weak Lensing

• Basic Framework to test theorists

• CMB: curvature, GW -- test inflation

Dark Matter

- Have several decent theories
- Could find in next 10 years
- New particle
 - LHC
 - recoil experiments
- Astrophysics
 - Self-annihilation signal (e.g., GLAST)
 - baryon filling of DM structure
 - observations from sensitive large surveys
 - improved simulations

Dark Energy

- Have no decent theories
- Currently appears pervasive
- Maybe has structure?
- Variable with cosmic time
- Observations throughout cosmic time
 - Prioritization tricky w/o better theory
- \$100 million - \$1 billion to make progress

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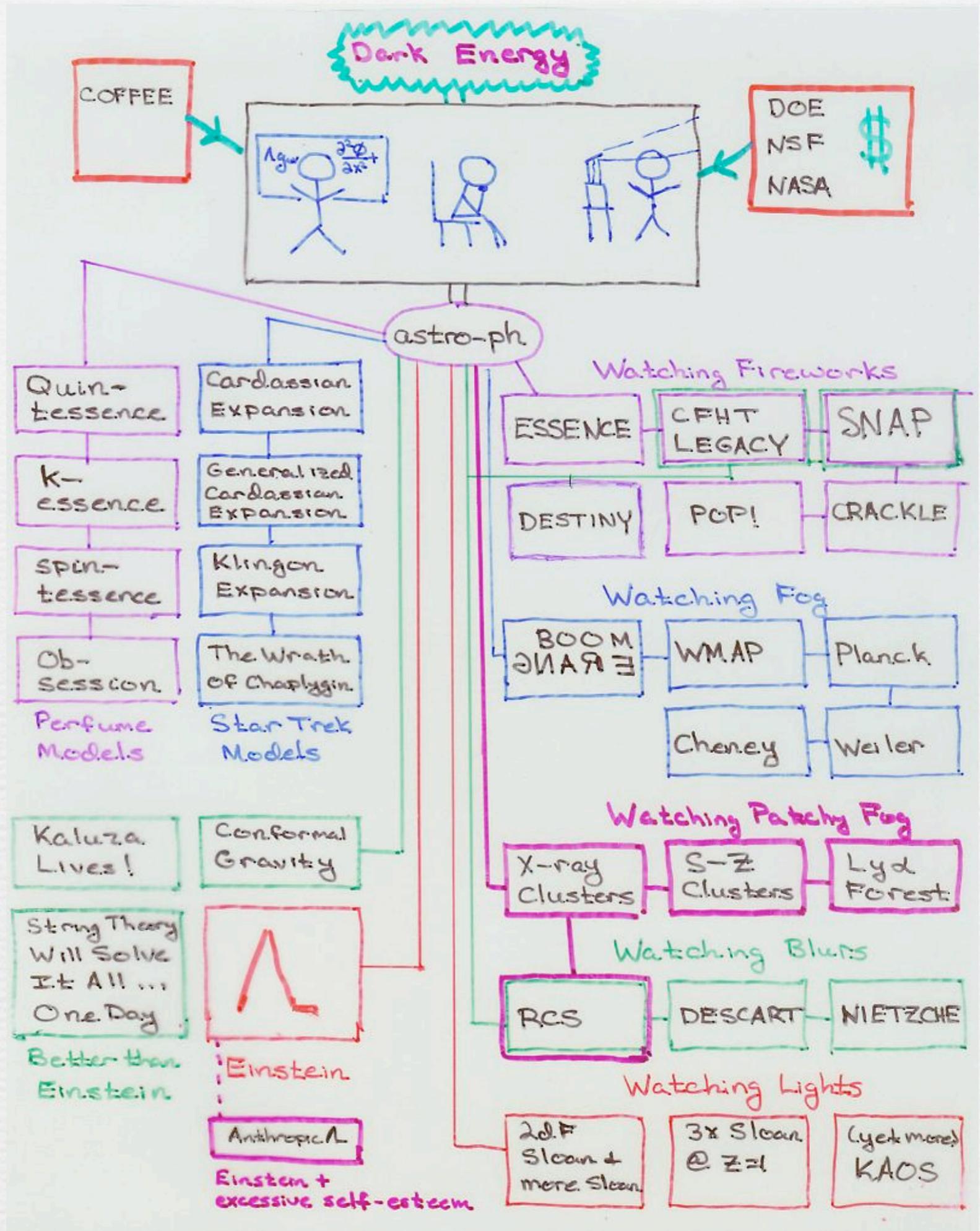
Potential donors please contact
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Is that too much to ask?

Is this really the path towards understanding Dark Energy?



Courtesy of David Weinberg