

What does all this have to do with religion?

Almost the Very Beginning: A Very Good Place to Start

In the first few fractions of a second after the Universe began, what were its characteristics?

What does Randall mean by “ballooniverse”? How does this analogy indicate the growth of space though not the growth of atoms or galaxies or other matter?

How large is the Milky Way across? Who measured it? What is its shape—and why that shape?

Describe the redshift of galaxies? What is the Hubble constant?

What is a parsec? A megaparsec? About how long has the Universe existed since the Big Bang?

How do we define *radiation*? What is the significance of these two sentences: “Matter and radiation dilute with the expansion, but radiation, which redshifts to lower energy—much like a siren decreases in frequency as it moves away—dilutes even more rapidly than matter. Dark energy, on the other hand, doesn’t dilute at all” (p. 41)?

What is cosmic inflation? When did that inflation occur? How much was it? How does the theory of inflation fit with the Big Bang? Are these still merely theories?

What happened after cosmic inflation ended? Describe the condition of the Universe this inflation produced.

How does “the inflationary Universe’s extremely rapid expansion explain the Universe’s enormity [sic], uniformity, and flatness” (p. 45)?

What are cosmic perturbations, and how do they support inflation and Big Bang?

A Galaxy Is Born

How strongly does ordinary matter affect dark matter? How did the collapse of dark matter result in creation of galaxies and galaxy clusters?

Why does it matter that originally the Universe was hot, dense, mostly uniform, and isotropic? What caused change?

What are galaxy clusters? How large are they? How large are galaxies? With what galaxy does the Milky Way constantly interact? When will the two merge?

How do we measure astronomical masses? For example, how large is the Milky Way in astronomical mass?

Contrast the speed and movement of radiation and matter, particularly of dark matter.

Explain how gravity pulls matter in and radiation pushes it out. What happens? What is the Jeans mass? How does it affect the seeding of galaxies and stars?

See p. 60: “Because of its immunity . . . wouldn’t have reached their current population and distribution.” Explain.

Examine Figure 6 on p. 62: what do we discern about the period of inflation, the dark era, the creation of earliest stars, the development of galaxies and planets—and when they occurred?

What happened to the first giant stars that formed in our Universe? When and why? Why are galaxies the building blocks of the Universe?

How do we imagine galaxies forming and operating and moving and dying? How does Randall reshape our ideas? What does she mean by saying “galaxy formation is hierarchical” (p. 63)?

Why do underdense regions expand more rapidly and overdense regions more slowly than the Universe as a whole?

What are the “nodes” that seed galaxies? How do they work?

What is the Local Group? What binds us together? What exactly is the Milky Way, and whence arose that name? What lies at the center of the Milky Way? What do we learn from Figure 8 on p. 68?

When did our Sun form? How close is it to the mid-plane of the Milky Way? Why does that matter? How fast does our Sun move as it circles around the galaxy? How long does it take for the Sun to orbit the galactic center?

Does this science affect our theology or philosophy? If so, how?

