The Dark Century: Matter, Energy, and the Future of the Universe

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"The greatest obstacle to knowing is not asking."

Every science has three parts: what we know, how we know, and why things are that way. Synopic sciences tell a story.

1 parsec = 3 x 10^{18} cm. The universe is CGS.

A parsec indicates 1" of parallax, and is also equal to the average distance between stars in the universe.

Facts about the universe:

13.76 GYr old
Observable diameter 5000 MPc
Lumpy up to clusters of 150 MPc, not fractal beyond that
4% baryons
23% dark matter
73% dark energy
<1% neutrinos, photons, gravitational radiation, isolated black holes

Many lines of evidence lead to the same numbers.

The observed expansion of the universe is actually space-time expanding. The evidence is that gravitationally bound clusters do not expand.

Distance to stellar objects is either luminosity distance, determined using observations of supernova events, or angular distance, if the body presents a measurable angle.

The rotation curves of galaxies provide evidence for dark matter. Close-knit clusters of galaxies eventually merge into a large elliptical galaxy with no net angular momentum.

The future of the universe depends on the cosmological constant. If it is decaying, then gravity will win, resulting in a Big Crunch in about 50 GYr.

If it is constant, there will be eternal exponential expansion. Local groups of galaxies will merge within 50 GYr.

If it is increasing, there will be a Big Rip in 50 GYr. The rip will destroy clusters, galaxies, solar systems, stars, and planets, in that order. Ten minutes before the end, it will rip out your hair. Then, it will destroy molecules and atoms.

"Theorists are cheap. Telescopes are expensive."