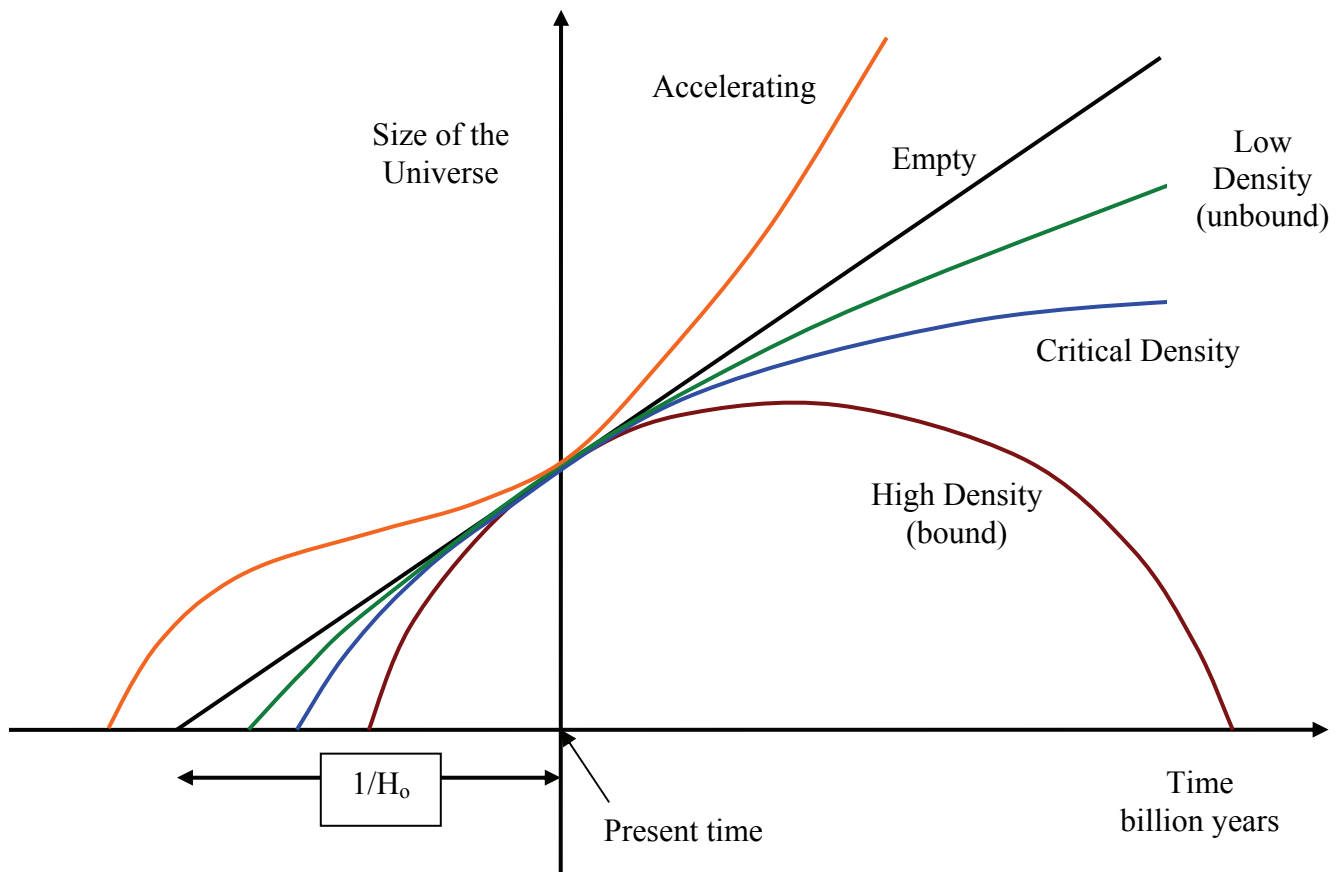


# Pre-Lab

## Galaxies in the Hubble Deep Field

or

### Determining the Ultimate Fate of the Universe



This figure shows several universe models: the closed universe model, the critically bound model, the open model, the empty universe model, and the accelerating universe model.

In this exercise you will estimate the total mass of all galaxies in the universe, and then you will determine the ultimate fate of the universe. However, a whole series of assumptions need to be made. In this Pre-Lab you will analyze some of those assumptions and also determine some factors that affect the age and fate of the universe.

Check your Textbook, your Notes and the Web and answer the following:

1. Think of a method of figuring out the total number of galaxies in the universe.

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2. What are the masses of the smallest and largest known galaxies? What is the mass of our Galaxy?

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3. How much dark matter do you find in typical spiral and elliptical galaxies?

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4. What is the currently accepted range of ages of the universe as inferred from the Hubble constant?

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5. If the universe turns out to have *more* mass than the so-called “critical mass”, what would that imply for the fate of the universe?

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6. If the universe turns out to have *more* mass than thought so far, what would that imply for the age of the universe? Explain if a dense universe is relatively “older” or “younger”.

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7. What is the so-called “accelerating universe”? Could the “accelerating universe” have more mass than the critical mass? Explain.

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