Space: Its Light , Its Shape.
Cosmology Part IV: The FRW Equations

Assignment: For Monday, April 11

- Read Harrison's *Cosmology* chapter 16, including the notes. It is available on eReserves.
- Please feel free to bring up other issues you find interesting or puzzling. If at all possible send an email before seminar to me. I will present this topic as my assignment or open it up to discussion by the whole seminar.
- Some of these require additional reading for the presenting team. If I don't explicitly give the reference then the additional information is easy to find on the internet.
- Though everyone is responsible for reading all of the material and for working out all of the exercises, teams have been specific material and exercises for which they are responsible in class presentations. You may want to come to class early to firm up and smooth out the exercises with your teammates.

I am not particularly fond of this presentation of the FRW equations. Read it carefully. I am curious of you have the same impression!

Dan: Remind us how 16.1 comes about.

Team 1 and 2: Write the steps on the board to show how Harrison finds 16.4 and 16.5.

Team 3: V represents the velocity of a unit mass particle in space. What does $V = a_o(\dot{R}/R_o)$ represent? Are these the same things?

Everyone: C in 16.2 is "twice the total energy." Harrison sets $C(R/a)^2 = -k$. Thus, C can be less than zero. Is this consistent? Why or why not?

Now putting the critiques aside, let's look at the FRW equations.

Team 4: Summarize the effect of the cosmological constant in this Newtonian model.

Team 1: Write the FRW equations 16.12 and 16.13 and explain what they do for us.

Team 2: How are the FRW equations modified when there is pressure?

Looking ahead - we will be reading chapter 17 and 18 in Harrison.