PHY 375

Writing Assignment 4

(*Due in D2L Dropbox by 5 PM, Thursday, 5/31*)

We know that there were acoustic oscillations in the early Universe. In lecture, we studied how an imprint of this can be seen in the Cosmic Microwave Background (CMB) radiation. Such oscillations also leave an imprint on the baryonic matter, and the phenomenon has come to be known as Baryon Acoustic Oscillations (BAO).

A very helpful reference on BAO is the page set up by Daniel Eisentein, who made the first convincing measurements of Baryon Acoustic Oscillations. The page is available at: https://www.cfa.harvard.edu/~deisenst/acousticpeak/

There is a lot of material on this page, and going sequentially down the page is not a good idea. To write your paper, you should (at a minimum) look at:

- Their illustrated technical explanation for the acoustic phenomenon; *they do provide a non-technical description, and another one which they call a "bit more technical" and you're welcome to look at all three, but start with the illustrated one first; I believe it is easiest to follow*.
- Their simulations, both for one wave and many superposed waves
- Their paper in the Astrophysical Journal

Once again, *all of these are linked from the web page given above*.

Write a (minimum) 2-page paper addressing the following:

- What are Baryon Acoustic Oscillations (BAO)?
- How are they observed?
- Why can BAO be used to measure dark energy?

The paper should be a minimum of 2 pages (double spaced, in 12 pt Times New Roman font, or equivalent, and 1 in margins on all sides).

Any sources you use should be cited in a bibliography at the end of your paper (this *should not* be part of the minimum 2-page count).

It is important to remember that you should not cut and paste material from the supplied paper or the Internet; everything should be in your own words.

This assignment is due in the D2L Dropbox by 5 PM on Thursday (5/31). Late assignments will not be accepted under any circumstances. Emailed papers will not be accepted; papers must be submitted to the D2L Dropbox.