**Astronomy 84: Black Holes**

***Appearance of Collapse to a Black Hole***

**Discussion 7.3 Fall 2017**

Figures 6.6 and 6.7 present a view of how different observers view the collapse of a star to a black hole. In particular, they indicate how an observer far away from the collapsing star would see the collapse to be “frozen in time” prior to collapse below the event horizon, whereas an observer traveling with the stellar surface would not notice any real change as the star contracted through that horizon – except of course the enormous tidal forces that would occur in the local frame.

Prepare a short presentation to lead a class discussion in which you explain the appearance of stellar collapse to a black hole from the points of view of a distant observer (at infinity, say), and that of an observer on the surface of the star. In your discussion you should explain:

1. The concept of a space-time diagram (Figure 6.7) to show the evolution of the star.
2. The different perceptions of time in by the two observers.
3. The reason Thorne measures space by the circumference of a region, not the radial distance of points from the center.
4. Photon trajectories outside and inside the black hole.
5. How the modern concept of a black hole using general relativity differs from the early conceptions of John Michell and Pierre Simon Laplace in the 18th century who also conceived of massive objects sufficiently large to prevent light from escaping their surfaces.