ASTR580: Assignment question from John Blakeslee

1. In class, we discussed at length the physical basis and usefulness of the surface brightness fluctuations (SBF) distance indicator. Pick *three* other extragalactic distance indicators that were mentioned in class (or any three you find interesting), and compare each of these with SBF by considering the following questions:

   (a) What is the physical basis of the method (i.e., why does it work)?

   (b) For what type(s) of galaxies does the method work?

   (c) How is the method calibrated to an absolute distance scale? (If there are multiple ways of calibrating the method, note them, but specify which calibration is most commonly used.)

   (d) What is the approximate internal precision of the method and over what distance range is it useful?

2. Imagine you want to measure the three-dimensional structure in and around a large, nearby (d = 20 Mpc) galaxy cluster. In particular, you're interested in mapping and inter-comparing the 3-D spatial distributions and possible infall motions of ellipticals, lenticulars, and spirals, including late-type spirals. What distance estimation method, or methods, would you propose to use for this project? What combination of telescopes, instruments (e.g., imager or spectrograph, and very general properties), and observing conditions would be required? What would you expect to find? Finally, would there be any hope of doing this project for a cluster at 200 Mpc? Why or why not?