MARIANGELA BERNARDI: TEACHING (July 2009)

Having been educated in Europe, I had not taught before arriving at Penn. At Penn, I have taught an introductory course for undergraduate non-science majors, and a graduate class. The enrollment in the undergraduate has been typically about 70, and student evaluations of my teaching and accessibility have been good. Somewhat to my surprise, I even managed to do a research project with one of these students! In general, I enjoy teaching such 'service' courses, because I myself never took such a course, so I find it remarkable that so much of what we know about stars and galaxies can be communicated over the course of just one semester, with minimal use of equations.

I also developed a new graduate course, *Galaxies: Structure, Dynamics and Formation*, which is intended to be one of the four pillars of the Penn Astrophysics Graduate Program. I taught this course for the first time in Fall 2008, and received positive student reviews. This course covered various observational aspects of the subject (the many details involved in going from the photon counts at the telescope to calibrated photometry of extended objects, how one estimates velocity dispersions, how one accounts selection effects such as those which arise from the fact that we typically see the most luminous objects to greater distances so most catalogs are biased against faint objects, and that the more distant objects appear redder than they are intrinsically because of the expansion of the universe), statistical estimation techniques to quantify the intrinsic correlations between observables (e.g., maximum-likelihood and principle component analysis), the physics of the objects (how to interpret the observed correlations using physical models of disks and triaxial virialized systems), and how one obtains information about their formation from data at a single epoch, or over a range of look-back times (e.g., using stellar population synthesis models). I also used the course as an opportunity to familiarize the students with the numerical nature of most astrophysical research – whereas class time was devoted to concepts, homework sets were computationally heavy. My experience convinced me that this would be better taught as a two course sequence – the first semester emphasizing the observations, and the second, the implications for models of galaxy formation (which are currently covered too rapidly at the end), particularly regarding the correlations between evolution and environment – i.e., the connection between cosmology, large scale structure, and galaxy formation.

In mentoring graduate students and postdocs so far, I feel I have had the benefit of sampling both the best and the worst experiences. Interactions with my first postdoc were not very productive; although difficult, I acted quickly to improve things, and happily, the person who replaced him has been much more productive. In contrast, my first graduate student, Joey Hyde, was smart, hard-working, and an absolute pleasure to have as a colleague. In addition to doing great work for his thesis, he served for a while as the computer support person for the Astro group. I view him as a particular success story because his admission to the program was due in part to my reassuring the Admissions committee that I thought he had 'what it takes'. He successfully defended his PhD within 5 years of his arrival at Penn; if I am able to identify another student who is even half as good as he, I will count myself lucky. In addition, I am also mentoring graduate students of collaborators at other institutions (both domestic and international). The students have spent some time at Penn and have co-authored publications (in one case, the student served as the lead author). I expect they will return at least one more time before completing their degrees.