Breakout Session on Interdisciplinary Courses (and programs)
Randall Kamien of U. Penn presented that department's relatively radical change in course structure that resulted from a drive to better accommodate interdisciplinary programs in soft condensed matter and biophysics. This involved reducing the required courses from 9 semester course to 6 semester courses (Math methods, E&M, QM (2 sem.), Statistical Mechanics, and one other in student's area of study), elimination of the comprehensive exam in favor of superior performance on required courses, and also a refocused admissions procedure that places a premium on previous research experience, particularly experimental research, by applicants. Intiial evidence suggests improved retention, diminished attrition, and an improved class. Penn faculty have now authored widely-used texts on interdisciplinary subjects (biophysics and soft condensed matter), Penn is educating a wider range of physicists from those who interests range from wet biology to astrophysics. There is also significant external supervision of PhD theses (with PH co-advising). Difficulties include the spiral that requiring fewer courses means students take fewer courses and it becomes difficult to offer electives. The 1-term E&M sequence has been difficult to navigate (some of the statics is taken up in Math Methods; more modern topics of transport and radiation remain). Kamien argues that our discipline is changing and we need to reflect that in our courses. If we don't move now, then when will we do it?

Naomi Halas of Rice University described the Laboratory for NanoPhotonics (LANP) program http://nanoigert.rice.edu/, an inherently interdisciplinary effort whose mission is to foster interdisciplinary interactions, and to lead and to follow this emerging field. Nanophotonics reaches across physics, chemistry, engineering (many types) biology, and computer science. Within the Applied Physics track, students take 4 core courses plus electives (different elective tracks for exp. Vs theory), Nanophotonics CAD Studio with a goal of 100% COMSOL/computation literacy, and a physiology course and an ethics course. She mentioned "supergroup meetings", weekly journal club meetings that often feature work in preprint stage has a glue that holds the fast-paced, cutting edge program together. She described the IGERT program that supports graduate students within the LANP collaboration. It features a multidisciplinary speaker series, a visiting scholar program, industrial internships, LANP seminars, international collaborations, a multi-year scholars and mentors outreach program called CONJUNTO. An interesting aspect is that the internships with companies, though plentiful, are not highly sought after by the students.

1. "*Maintaining standards and the traditional core*"
Discussion arose on whether fewer core courses constituted a "watering down" of the traditional canon. Several participants cited senior faculty members who staunchly defend the traditional core as a serious a barrier to change. One viewpoint is that if Physics refuses to accommodate students with interdisciplinary interests (biophysics in Kamien's example) by insisting on a core curriculum heavy in material largely irrelevant to that endeavor, bright prospective students will simply move to a very similar program housed within another discipline. Faculty may well move, too. Faculty members at Penn have written seminal texts in biophysics and find it desirable to foster this interdisciplinary option within physics.

Those departments who have reduced the number of core courses (whether to accommodate interdisciplinary courses or for other reasons) report satisfaction with the results, and no loss of quality. There was a question as to whether this watered down the program. The speaker said it had not – the curriculum had been adjusted to give the students what they needed and wanted to learn. “Graduate school is not a punishment” is the general rule.

Some were concerned about how to manage a scenario where students might use physics (with reduced course load) as an entry into research programs in other disciplines (for example a medical PhD program) and thereby be lost to physics faculty in search of RAs. However, this was superior to losing these students to other disciplines and department at the application stage.

2. Fewer required courses can result in fewer students taking optional courses, which then may be cut due to low enrollment.

The example of the IGERT led to discussion of other programs that support graduate students. U Oregon reported a highly successful GK-8 "scientist in residence" program that places grads in rural Oregon schools for three 2 week periods in a year. These programs enhance the graduate students' experiences and help to fund their research program, but the sustainability rests on the organization's ability to replace federal funding sources with other funds. Endowment of such graduate fellowships is a formidable fund-raising challenge.

Reported by Janet Tate.