REORGANIZATION OF THE PHYSICAL SCIENCES AT THE U OF A

Developed by Faculty of the Department of Physics

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The Department of Physics has begun discussions with the Department of Astronomy to explore new structures that would more closely associate teaching and research in the Physical Sciences. We see this as the first step in a process that could be extended to other units, such as Planetary Sciences and Optical Sciences, and would strengthen Physical Sciences campus-wide.

Rationale and Context. Perhaps more than at any Research I University, “physics” at the University of Arizona is widely distributed across different departments, centers and colleges. This “matrix” of physics-related resources provides both unique opportunities and unique challenges. In order to enhance the excellence of our teaching, research and service missions, we propose the following strategic plan to strengthen the interactions among the various units that constitute physical sciences at the UA. The plan should be considered a first draft on which further discussions can be based.

![Diagram of physical sciences units at the UA](image)

The schematic above gives our view of physical sciences at the UA, existing as well as in the future. While there already exist significant interactions among individual faculty members and researchers across the units indicated in the figure (and others), current boundaries among the units are rigid and antiquated. We envision a new structure in which the boundaries between the units are fluid and flexible. The redefining of the boundaries will involve restructuring of teaching and research at all levels. The flexibility of the boundaries will be enabled by the commitment from different departments/units to merge their interests.

For the Physical Sciences to be successful as a whole it is important that the units indicated above embrace the opportunity of working together to make the UA more competitive. Successful merging of interests will require care and enthusiastic participation of faculty, students and staff from the different units, as opposed to any top down plan that ignores legitimate concerns. The Department of Physics, for instance, has
considerable strength in high energy and nuclear physics, and the role played by UA scientists in the experiments to be performed at the Large Hadron Collider has brought the university considerable visibility and prestige. Similarly, the AMS Laboratory is a prominent national facility with interactions both local and external to the UA. This proposal envisages continued excellence of these and similar intra-unit activities.

**Actual Plan:**

A. **Consolidation of undergraduate education.** We propose a multipronged approach.

• Merge Introductory Physics from the current five to three tracks. Lectures with larger enrollments will be taught by fulltime faculty.

• Lectures to be accompanied by recitations taught by faculty members from both physics department proper and from sister units, as well as graduate teaching assistants. A larger pool of faculty from our sister units will become available as a consequence of the reorganization. We expect this to enhance the quality of the teaching. Master teachers will coordinate classes with very large enrollments.

• Support computer-based homework. Faculty take an active interest in creating such homeworks locally (as opposed to merely borrowing what exists in the market). This will lead to less grading but will again need recitations and tutorials.

• Increase honors class enrollments.

• Revise laboratory courses to introduce experiments with longer modules that require deeper thinking but fewer reports.

*We visualize that similar restructuring will occur also in our sister units. As we reduce the number of FTEs required, a large number of faculty will become available to co-teach courses across units. We anticipate that physics faculty will become available to co-teach in our sister units.*

B. **Consolidation of graduate education.** Our proposed reorganization emphasizes the need for major overhaul in graduate education that will cut across existing departmental and college organizational structures, and that will extend to the level of the graduate college. Current graduate college policies are outdated, and stand in the way of research active graduate programs. We strongly believe that our proposal will increase research productivity, will increase external support, will shorten average time to graduation, and will be enormously cost effective. Our proposal is given below.

• Reorganize grad curriculum. Eliminate (or reduce) minors requirements. Reduce number of courses required for Ph.D.

• Merge entry-level graduate courses across sister units. Courses are taught by faculty across units, which allows saving FTEs.
• Upper level graduate courses are offered as electives. Merge electives within units, as well as across units. Again, electives are taught by faculty across units. Exactly as with the undergraduate courses, it is anticipated that faculty from physics department proper will be available to teach in our sister units.

• Accelerate research productivity of graduate students. Make teaching assistantships more competitive. Increased visibility of Physical Sciences as a whole will lead to more selectivity, which in turn should lead to greater research productivity and external funding. We expect the above items, taken together, will reduce the median duration to Ph.D. considerably.

Enhancement of research activity. Interdisciplinary research across the units shown in the figure on page 1 already exists at the UA. Nevertheless, we expect the increased interconnectedness between units to lead to greater emphasis on interdisciplinary research and close collaborations. We suggest cross-unit hirings that eliminate duplication of research expertise at the University level. Shared and joint appointments will bring cost savings as well as increased productivity.

A Blue Ribbon Committee that visited the physics department in November 2007 recommended that future hires be in areas of strength for the entire University, viz., experimental astrophysics, condensed matter and nanoscience, and AMO physics. Growth in these and similar areas that cut across units will open up new funding opportunities, and that will allow us to address grand challenges as defined by DOE, NSF, NIH and other major federal and state agencies.

Coordination of administrative, business and support activities. Some business activities will be retained at the building level. We anticipate that others are centralized or merged, without, however, reducing access by students and faculty.
Budget. Negotiations with other units have not progressed to the point where we are able to project cost savings. Since the Department of Physics is at the opposite end of the campus from the other units, it will not be possible to reorganize many of the in-building operations that might be consolidated in the future if the Department were to become part of a Physical Sciences cluster at the eastern end of campus.

We do expect to see cost savings as we streamline the undergraduate and graduate curricula in Physics—especially in the introductory tracks (see discussion above). These savings will be realized as the number of tracks is reduced and teaching assignments across units are implemented.

Similarly, some administrative cost savings will appear as new University business systems are installed, with the corresponding centralization of basic business operations.