

Program Review Report

Department of Physics
Weber State University

To: Dr. Dale Ostlie, Dean, College of Science and Dr. Brad Carroll, Chair, Physics
April 4, 2008

Introduction:

The site visit for the Program Review of the Physics Department took place March 21, 2008 by the following members of the Review Team:

- Dr. Dan Bedford (Department of Geography, Weber State University)
- Dr. H. Laine Berghout (Department of Chemistry (Weber State University))
- Dr. D. Mark Riffe (Department of Physics, Utah State University)
- Dr. Paula Szkody (Astronomy Department, University of Washington)

Prior to the visit, our review team was provided with the Self-Study document from the Physics Department and during the one day visit we met with the College of Science Dean (Dr. Dale Ostlie), the Physics Department Chair (Dr. Brad Carroll), 8 faculty, a group of undergrad majors, the department secretary and lab manager, and had a complete tour of the facilities including classrooms, labs and outdoor equipment. The cooperation and candid conversations of all members of the department allowed us to obtain a good assessment of the various educational and research activities of the department.

Program Strengths:

The interviews made clear that the major strength of the department is the excellent faculty that are dedicated to providing the best physics education possible for undergraduates. This dedication is encouraged by the support of the faculty for each other and by the department in general. Every single member, from secretary and lab manager to Chair, mentioned the quality of their fellow workers and their working environment. The students praised the availability of the faculty and their real concern for students. It is obvious that the Mission Statement of the department to focus on the education of undergraduates (including general education students, students in service courses and Physics majors) is the actual practice of the department members.

The Physics curriculum is a second major strength. While most of the teaching and student credit hours are spent in service courses, strong preparation for the future is provided for Physics majors as well. Physics students feel well-prepared for graduate school and industry through both Physics and the Applied Physics majors. The curriculum includes all of the standard core Physics courses as well as some that students at other undergraduate institutions frequently do not have the possibility to take. For example, Computational Physics courses are new additions to the curriculum that give students state-of-the-art preparation for real-world problems in a modern computer lab.

A third major strength is the emphasis the department places on undergraduate research. This involvement of students (both inside and outside of the Physics Department) allows them to experience science in a way that encourages problem solving and creativity far beyond what textbook and lecture alone can accomplish. This helps students gain access to graduate schools and to industry and also serves as a source of inspiration for the faculty. For example, the new high altitude balloon initiative, which has been under development for the past year, involves many students from Physics and other departments at Weber State and other Utah universities. The opportunity that students have to apply for and receive internal grants to support their research projects is a valuable part of the undergraduate research program at Weber State.

The Physics Department is very active in community outreach with ongoing efforts associated with the Ott Planetarium and museum. The recent physics open house attracted 600 people to see the planetarium and physics demonstrations and higher numbers are anticipated for the second open house.

The Physics Department has a comprehensive program of assessment that goes beyond that of most Physics departments. In this respect, the Physics Department has more than adequately responded to the challenges of the last program review. Newly tenured faculty feel the path to tenure is clearly defined and followed.

Program Challenges:

The Physics department is a leader in transforming undergraduate education at Weber State by strongly emphasizing undergraduate research, but this emphasis creates a challenge for faculty

members who must balance their research (which encourages student participation), with the significant teaching loads required at Weber State University. For faculty members who are involved in research, the 12 teaching credit hours per semester is, in effect, an overload that cannot be sustained without burnout or loss of faculty to other institutions. The load is a challenge both for seasoned faculty members as well as newer faculty members who do not feel adequately prepared for the large workloads. This was the most frequently noted issue in the interviews. If the university administration truly values student research, they need to support and encourage it by developing a clear policy that grants meaningful levels of faculty release time for supervision of student research. Significant problems also exist with respect to the administration of external grants at Weber State University, which must be addressed. The committee feels that the undergraduate research benefits all majors and should be a required part of both Physics and Applied Physics programs.

The loss of a valuable young faculty member coupled with the anticipated growth from upcoming engineering and computer science gaming courses presents another challenge. Continuing the present curriculum and providing for significant increases in student numbers will require increased faculty and laboratory space, both for research faculty and for laboratory-based course work. Some of the students reported dissatisfaction with labs in the entry-level courses, with 4 students per lab station and labs mixing students from 2000 and 2200 series courses. Several faculty mentioned the need for a new experimental lab faculty member, but this will require additional faculty laboratory space. Both students and faculty mentioned the need for a new course in Mathematical Physics, as the currently required courses from the math department alone do not fully prepare students to apply their mathematical training to physics applications. A related challenge involves the Physics Department computer lab facilities. Students in Computational Physics courses, as well as those involved in research projects, use the computer lab extensively. This facility requires technical support beyond what can be supplied by regular faculty members in order to remain a useful resource. The current contribution of faculty member time to support the computer lab is a significant burden. A final issue affecting faculty moral and retention is the perceived lack of effort on the part of the university administration regarding retention. This is particularly the case with the most recent loss of an exceptional teacher and researcher in the department.

While students feel the advising is adequate and they commend the faculty for actively encouraging them to apply for summer and graduate school opportunities, the students thought a seminar each year on the grad school process and industry jobs would give them several opportunities to find out more information that they needed. They would like more emphasis on preparation for the Physics GRE Topic exam.

Major Recommendations:

To meet the challenges above, the committee recommends:

- Adequately reducing the teaching credit hour requirements for faculty that are involved in significant undergraduate research projects. Justification for this change might be found through a survey of teaching loads at comparable 4 year universities. With research becoming expected of undergrads, and with larger Physics courses and labs, more time is required for mentoring, grading, etc. The department Chair should be encouraged to provide as much comp time as possible.
- Ensuring that the Office of Sponsored Programs provides better service for grant support. A clear policy for indirect cost return to the department needs to be created. A knowledgeable person at the college level to help with all science grants is urgently needed.
- Providing a full time technical person at the college level to provide support for the computer labs in all science departments. This individual must be able to deal with the customized hardware and software configurations that are common in the College of Science, which will require creation of a permanent position with that responsibility. Faculty do not have time to constantly deal with security and maintenance issues such as managing user accounts and updating computer hardware and software on top of their teaching loads.
- Providing sufficient student lab space so there are not more than 2 students per lab station and there are separate labs for calculus based physics courses and trigonometry based physics courses.
- Adding a Mathematical Physics course for majors.

Other Recommendations:

Several faculty mentioned possibilities of an astrophysics major or a master's program, while others thought this could not be done without further resources and less attention to current programs.

While the committee heard both sides of the issue, it was not clear that the entire faculty were aware of the possibilities so there is a need for a further discussion of these issues.

Summary:

It is clear that the Physics Department is highly functional and is a leader in the College as regards student involvement in research and computational projects that provide students with the best preparation for their future in graduate school or industry. The basic challenge is to provide the necessary support for those faculty who are involved in these research programs by reducing teaching credit hours, providing technical support at the college level for IT and grant application, and ensuring adequate lab space for students and faculty. These changes will help the Department retain its high quality faculty without burnout or loss to other institutions.