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Hi JD and Sudha:

I'm fairly sure neither of you will be able to read my attachment so here it is as a paste in.

Sudha: This is it so use it as you like.

Cheers,
Ruth

Site Visit to the University of Wisconsin-La Crosse
March 6-7, 2002

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Background

The University of Wisconsin-La Crosse is a comprehensive state-supported university with a total enrollment of 9200 students of whom 8,500 are undergraduates. Enrollment is capped, and admission standards are second highest in the Wisconsin system. Entering students have average ACT scores of 24. The university has recently hired a large number of new faculty. Expectations for promotion and tenure today include expectation of scholarship as well as excellent teaching and service.

The Department of Physics has seven tenure-line faculty members and two part-time faculty members, one who holds a Ph.D. in space physics and whose wife has tenure in mathematics and a second who is abd in physics and is married to a member of the department. Tenured faculty include two full professors, an associate professor and an assistant professor. Two of the untenured faculty are associate professors and one is an assistant professor. In addition, the department has a 3/4 time program assistant (departmental secretary) and a full time electronics technician who also maintains the departmental computer networks. They use capable students as lab assistants in upper division labs, as tutors and as graders in large sections. They do not have any student assistants in most of the labs because they have a limited number of capable upper division students who are not so involved in research that they have time to teach.

In 1990, the department had approximately five majors in all four years and graduated one every other year. They had four tenured and one contract faculty members who focused exclusively on teaching and service. The faculty lacked any sense of a common mission within the department and were content with doing a good job on the individual courses they taught. Students did not perceive the courses as particularly exciting nor consider physics a desirable and exciting major. At that time, the central administration of the University of Wisconsin system conducted an audit of all campuses in the system. The central administration proposed to abolish departments with fewer than five total majors. The Department of Physics requested two years to make radical reforms to change this situation, and the Dean of the

College of Science and Allied Health gave them this time.

Physics faculty rose to the challenge and attempted major revisions in the curriculum, particularly the introductory course where they attended workshops and introduced an entirely new year-long course. Students did not share the faculty enthusiasm for the new courses. These revisions were not terribly successful, and the number of majors remained low. The Dean of the College decided that it was necessary to conduct a search for an outside chair to replace the contract faculty member. A search was conducted. In the fall of 1992, John Norbury came to campus as chair of the department. As a condition for accepting the position, Norbury, a theorist, persuaded the administration to create a new position for a tenured experimentalist, Gubbi Sudhakaran who arrived on campus in the fall of 1993. Sudhakaran ("Sudha") was able to bring his laser lab with him to La Crosse, thus providing the department with a ready-made research grade laboratory.

Norbury and Sudhakaran arrived with a plan for revitalizing the department and began to implement it. Some aspects, for instance Sudhakaran's efforts to involve undergraduates actively in his research, began to see immediate success. On the other hand, efforts at significant curricular reform met with opposition from many faculty members. The administration backed Norbury and Sudhakaran with resources and moral support throughout this period. For example, when they arrived, there were only a few antiquated computers available for either faculty or students. Norbury immediately arranged with the administration to provide each faculty member with a laptop computer. The new chair made sincere efforts to utilize the skills of existing faculty members in the revitalized department.

Four years later, Norbury left the department for strictly personal reasons. It is significant that the reforms were well enough underway that Sudhakaran was elected chair to replace him. Sudhakaran has since been reelected chair for a three-year term. Of the original faculty, one has retired and two contribute actively to the reform efforts in the department. These two are not research active, however, they have assumed their share of labor and are respected for it. For example, one serves as planetarium director and brings thousands of people to campus each year while generating many student credit hours in introductory astronomy. The third "old timer" remains out of sympathy with the departmental efforts. For example, he did not meet with the SVT or attend any social events. The chair and the rest of the faculty respect his teaching skill and his ability as a researcher in testing of composite materials. The department has hired three young tenure-line faculty, two as replacements for Norbury and the retiring faculty and one to fill a new position added as enrollments grew.

At present, the Physics Department graduates 15 majors a year about half of whom are on dual-degree engineering programs. The overall physics program continues to grow. All of majors are required to participate in research. Both faculty and students obtain external funding to support their activities. Students present papers in regional and national forums. In the past two years, La Crosse physics students have been selected to present posters on Capitol Hill as part of the Council on Undergraduate Research lobbying effort. Students opting for the 3/2 program generally enter the job market. Of the remaining students, about two thirds enter graduate school, usually in optics, and the others seek employment.

The department prides itself on excellent teaching. Two of the faculty have recently won teaching awards. There is no single pedagogy in place, but faculty experiment with a variety of methods. For example, they use context-rich problems in their upper division courses, and the course for pre-service teachers is completely inquiry-based without any lectures. Students praised the department's responsiveness to student requests and evaluations.

The Site Visit

The SVT met with all but one members of the department including part-time faculty and the valuable electronics technician at lunch and dinner and with all but one tenure-line faculty in individual sessions. We had separate meetings with the college dean and the provost. The Chancellor of the University delayed a trip to Madison in order to meet with us over drinks on the evening of our arrival. He testified by his words as well as his presence to the great value that the university places on the Physics Department and its work. That dinner was also attended by two associate deans. We met with students from all classes who are physics majors but did not have time to meet with students from the service courses although they were certainly present in the department.

Throughout the visit, the SVT was impressed with the openness of everyone we talked to and the consistency of the picture they gave us of the Physics Department. We are grateful for their open-handed hospitality and the trouble taken to make our visit a productive one.

The SVT did not meet with chairs or faculty from other departments and has no information on their attitudes towards the changes in and growth of the Physics Department.

What Has Been Done

1. The undergraduate physics curriculum in the department has been revised to introduce four important reforms. First, the department has introduced 3/2 dual degree programs with engineering schools at the University of Wisconsin campuses at Madison, Milwaukee and Platteville and the University of Minnesota. Students earn a bachelor's degree in physics from La Crosse after their first year in engineering school and a bachelor of science degree in engineering in the second. Agreements have been worked out so that acceptance of students with adequate grade point averages into engineering programs is automatic.

Second the major has been revised to introduce specialization early. Students can graduate with a traditional physics major or a physics major with emphasis in astronomy, computational physics, optics, business or biomedicine. So far, the optics emphasis has been the most popular because of the larger number of opportunities for undergraduate research in the area and the well-trodden path to some of the finest graduate schools in the country. However, the department hopes to build up the other options in the future. The business emphasis is suggested for students whose math skill may keep them from success in a research-oriented career.

The department has also introduced a number of pedagogical reforms into courses. For example, their computational physics course is very modern and based on Java and Mathematica. Once a week, faculty teaching the algebra-based physics course hold problem solving sessions, and they use student tutors to encourage group problem solving. Majors form informal study groups that benefit from close

interaction with faculty members who happen to be in the building late at night. It appears that faculty members frequently try new techniques for presenting physics to their students.

Third, the department recruits majors from the algebra-based first year course (enrollment ~300) as well as the calculus-based course (enrollment ~50). This not only allows all potential physics majors to immediately become involved with their discipline and get to know the faculty but offers a much larger pool of potential recruits. Students on both tracks take modern physics in their sophomore year where calculus is used and there is a rigorous lab. By junior year, the program is a standard, rigorous undergraduate program. In the first year, they take in about 35 potential majors. After the first year, they lose 10-15 primarily because they have weak math skills, but they recruit 10 students from other majors. After the first year, retention is 95%.

The chair is very careful to assign the best teachers to the introductory courses. The department clearly regards them as crucial to the program. A faculty member no longer at La Crosse was assigned to these courses for two years and his style resulted in a significant drop in the number of majors entering sophomore courses.

Finally, all laboratories have been revised and upgraded to use modern computer-based equipment. At the time Norbury and Sudhakaran arrived, there were few computers in the department. One of Norbury's first acts was to arrange to provide each faculty member with a laptop. Today there are many desk-top computers and four work stations through out the department.

2. Students are required to participate in research and receive course credit for doing so. Faculty seek to involve them as early as possible and to integrate them into the work of the lab. Four of the faculty are very active and successful in getting grants and publishing, frequently with student co-authors. The department calculates loads on the basis of contact hours and is thus able to give some credit for work with undergraduates on research. They are the only department in the university to do so. Teaching loads are heavy (14-18 actual contact hours), and they have little assistance in the labs.

The department has some funding for summer support of students both from grants and from in-house programs, and they encourage students to apply for REU programs. Faculty can also obtain summer salary for research from the university through a competitive grants program. The students gave us a picture of real faculty concern for the application process, not only for in-house and external grants but also for graduate and professional applications. (One faculty was quoted as telling a student, "Sit down at that computer. You're not leaving here until you finish this application!")

3. All freshmen and sophomore physics majors are very strongly encouraged to enroll in a one credit hour seminar course that meets on Wednesdays. The department uses this time to present speakers from the local area who demonstrate career opportunities to the students. A recent example is that of a local ophthalmologist who discussed laser surgery to correct vision. This system allows students to get to know one another as well as keeping them aware of opportunities inside and outside the department. Fifty plus students and faculty generally attend each seminar, and it has proved to be a powerful technique for building community within the department.

4. The Physics Department aggressively recruits students, and once they arrive in the department, works to retain them. Recruiting efforts include a nice set of glossy brochures, a very popular laser light show for local middle schools which has just now generated its first majors, excellent relationships with local high schools, and a physics open house for students admitted to La Crosse and their parents. They can apply for freshman scholarships that the department has managed to make available. The chair and other faculty always take time to give interested students a personal tours of the department. A member of the department addresses students and their parents on each campus visit day.

Recruitment strategy has been modified to make most efficient use of limited resources. The initial approach of sending a brochure to 1000 high school councilors didn't work. They then invested \$1000 for a list of students who scored high on the ACT in the region and targeted likely prospects from that list. This year, admission to La Crosse closed so early that the department decided to target only students already admitted to the program with an open house for them and their parents.

The department regards advising as a key to students' success in the physics major. Until recently, the chair advised all students but has recently had to share the responsibility with two other faculty members. Advisors, indeed most professors, seem to know each student personally. Students feel free to approach any of the faculty with academic and even personal problems. One of the great successes of the department is that students greatly value their collegial relationships with faculty members. The department has a SPS chapter and a physics club that host occasional social events, however, they consume less pizza than other departments visited. Community is built around the seminar and close contact with faculty and other students during class work and research. They have no undergraduate room, but students say they have little difficulty finding a place to work together. Janitors know upper division majors and will allow them into unused classrooms at night.

5. The Physics Department runs summer workshops for in-service teachers. They clearly have excellent relations with area teachers, and that serves them well in their recruiting efforts. They have completely revised the course in physical science for elementary teachers offered in the department so that it has no lectures and is completely inquiry based. The course, supported by NASA funding, has proved so successful that other areas of the university want their students to take it. They recognize that this course is expensive in terms of faculty time and must have a limited enrollment. Even though there is a demand for this course from other students and departments, it is limited to pre-service teachers. The department has produced few secondary teaching majors.

6. The chair and his faculty pay great attention to publicizing their program within the university and the community. In fact they say, "What good is it to have an excellent program if nobody knows about it?" In a typical example, they received local radio and television of OUR visit, pointing out that we were there because the program is considered excellent. The chair clearly has good relationships with the local media and has received coverage of his research as well as that of the department. All the administrators know and respect his efforts, and he is careful to know key players and place faculty on key committees. In fact, the dean remarked that when Sudhakaran comes

into his office, he "covers his wallet", but acknowledged that if he provides resources, he knows that Sudha will deliver a product.

A particularly excellent example of the Department's attention its public image is the annual Distinguished Lecture Series in Physics which has so far brought two Nobel Laureates to campus. The program is funded by a private donor with a small match from the university. The visitor not only gives a public lecture and a physics seminar, but is featured in the local media and is a guest a banquet for faculty, administrators and local community leaders. The result is a greatly improved image of physics within the community. They are already advertising Doug Osheroff's visit next September!

7. The chair and the other faculty members work to maintain a sense of community within the department. Faculty value one-another's diverse contributions to the department. The chair mentors new faculty and works with them on an annual plan that should lead to tenure and promotion. He helps them focus their efforts on what is important. Junior faculty recognize that there can be tenure for all, and competition, while it exists, is not cut-throat. Students consider themselves members of the departmental community. Although they are not formal participants in the departmental governance, they feel their suggestions are heard and frequently implemented.

Perhaps the most significant change in the department is the sense of community that is felt by the faculty and the students. Decisions at the departmental level seem to be primarily by consensus with most faculty members, especially the most junior ones, feel they are "in the loop." Faculty members act on their belief that they know what is best for students, and the students respect them for it. The key in this case seems to be personal contact. The faculty are all connected by a very active chair and the students are connected to the faculty. Faculty are around the department a great deal and are accessible to students for questions and discussions.

Keys to Making Change

1. The Physics Department has benefited from sustained administrative support that has survived personnel changes in both the dean's and the provost's office. Once the administration had committed itself to keeping physics on campus, they provided the substantial funding needed to lure two established professors to campus and keep them there. The supply budget in the department has increased and space has been provided for research labs. Matching funds have been found for grant applications. The philosophy seems to be to bring in good people and back them in the changes they wish to make.

2. The chair has provided very skillful personal leadership to the department. He leads by example and works consciously to build consensus of his faculty for his ideas. He commands enormous respect from the university and college administrators and is known for delivering what he promises.

3. The department has worked hard to build a common sense of mission and to use all members according to their strengths. For example, the junior faculty member not doing advising takes care of recruitment efforts. They have made careful and excellent hires. The new faculty have been critical to building the department's strengths.

4. The curricular revisions have been carefully designed to meet the

needs of students. The department is unusually sensitive to the needs of the students in its programs.

5. The department has increased its emphasis on research but has maintained a stress on excellent teaching. All faculty currently on the staff are known as very good teachers, and while they do not necessarily share a philosophy of instruction, they clearly care deeply about their students. They are not afraid to try new pedagogies, and they acknowledged some effort they had made that had not worked for their students. When this happened, they changed the way they presented material. The genuine concern for students is one of the hallmarks of the department and contributes enormously to its success.

6. During the buildup of its research effort and while maintaining a teaching excellence, the department continues to pay attention to all aspects of its program such as advising and recruitment. The environment in the department is humane. One faculty member had a new baby in the family and this was celebrated. Families are given importance.

7. The department has taken pains to publicize its efforts to university administrators and prospective students as well as to the local community. This has helped it in its search for resources and provided the community with an appreciation of physics.

For the Future

The major challenge facing the department is its own success. As the number of physics majors increases, it is hard for the department to provide the personal attention that has brought its success. Older students contrasted the situation when they arrived on campus to the current situation. In addition, the department needs more research opportunities for students. They are currently heavily concentrated in optics which limits the graduate schools their students attend and the careers they pursue. They hope to add a condensed matter experimentalist, and they need to do so soon. Finally, space is a problem for the department. The administration has helped them negotiate with other science departments for more room to house a lab full of lasers given to one of the young faculty by a retiring NIST employee, but the problem is severe.

The faculty currently work hard and seem to enjoy doing so. Burn out may become a problem, and they will have to pace themselves. New hires will have to be as carefully chosen as the recent ones because a department this size cannot afford a "wet blanket." It may be difficult to find the combination of research enthusiasm and teaching excellence that has made them so successful today.

Finally, the chair is an excellent leader of the department. Should he leave, it may be extremely difficult to replace him.