

**Career Pathways Project
University of Wisconsin – Eau Claire Site Visit
23-24 February 2012**

Site Visit Team

Brian Beecken, Physics Department Chair, Bethel University

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I. Context

A. The Institution

Located in northern Wisconsin, the University of Wisconsin-Eau Claire (UWEC) has approximately 11,500 undergraduate students and awards around 2,000 bachelor's degrees each year. U.S. News & World Report ranks Eau Claire among the top public universities in the Midwest. Nursing and health sciences, chemistry, and history are among the departments with the strongest reputations on campus.

Eau Claire is one of thirteen schools within the University of Wisconsin System that awards bachelor's degrees. Eau Claire does not have an engineering emphasis like some of the other schools in the UW system (for example Madison and Platteville), but Eau Claire has been recognized as the UW System's Center of Excellence for Faculty and Undergraduate Research Collaboration.

Over the period of 2007-2009 the Physics Department averaged over 14 graduates per year, placing it among the top 20 bachelor's-only degree producing Physics Departments in the United States. The Physics Department consists of approximately 15 fulltime faculty and staff members, and a few members of UWEC's recently established Material Sciences program also teach physics. Two of these positions are supported by a student-approved differential tuition fee that provides UWEC with approximately \$1,500,000 in annual funding to support enhanced student experiences. One of the primary areas for which this funding has been approved is adding faculty positions, in an effort to increase the faculty-student ratio.

The department offers four physics-related majors: physics, physics teaching, physical science teaching (physics and chemistry), and physics-math teaching. Within the physics major students can have an emphasis in liberal arts, applied physics, or in engineering via a Dual-Degree Engineering program with the University of Minnesota or the University of Wisconsin, Madison. All students who graduate from Eau Claire are required to have a minor unless they are in a special comprehensive program of study; the most common minor for physics students is mathematics.

B. The Site Visit

The American Institute of Physics (AIP) Career Pathways Project seeks to learn, and then disseminate, the effective practices of Physics Departments that are successful in placing students who receive the bachelor's degree into STEM (Science, Technology, Engineering, and Mathematics) careers. The University of Wisconsin – Eau Claire was chosen for a site visit on the basis of data collected by the AIP

SRC (Statistical Research Center) indicating that it had a strong record of granting physics bachelor's degrees compared to other Physics Departments within its type of institution, and it was among national leaders in terms of the percent of recent physics bachelor's recipients who entered the STEM workforce within one year of earning the bachelor's degree. In addition, the Eau Claire Physics Department was chosen because of a more subjective examination of its website, with an eye to how well career issues are discussed there.

The site visit itinerary appears as an appendix. The team met with Department Chair Lyle Ford, Provost Patricia Kleine, Dean of the College of Arts and Sciences Marty Wood, Associate Director of Career Services Staci Heidtke, STEM Admissions Counselor Creanna Cote, most of the department's faculty members and staff, and 15-20 students.

The site visit team was both impressed and inspired by this visit. The Eau Claire Physics Department faculty and staff are clearly committed to helping students succeed in physics regardless of career or graduate school ambition and academic potential. The department has created a supportive and inclusive culture that attracts students with varied interests and addresses career preparation for these students in way that is both intentional and thoughtful.

II. The Department

A. The Faculty

The Physics Department has 11 full professors (including one shared with the Materials Science program), one associate professor, two assistant professors (including one shared with the Materials Science program), a lecturer, instrumentation specialist, and one staff scientist shared with the Materials Science program.

During the visit, it became clear that the department has carefully fostered a culture where students are the top priority—as evidenced by hiring decisions, curriculum revisions, and the amount of non-required contact hours that the faculty spends with students. Faculty seem to invest themselves fully in all their students and value them equally, regardless of the student's potential or career plans. Additionally, the administration has given faculty members the freedom to develop programs and projects that engage their individual interests and benefit students, such as the LabVIEW course sequence developed by Kim Pierson and the Science Theatre presentations led by Erik Hendrickson.

Both students and administrators told the Site Visit Team that the Physics Department at UWEC has some of the best teachers in the university, and it was evident through discussions with faculty members that a number of them are familiar with physics education research results and teaching pedagogy (for example, effective use of clickers in the classroom). In addition, significant investment is made in new faculty members through mentoring and teaching support. One faculty member commented that the expectation of the department is "When you're here, you're student-centered."

This holds true in the department's attitude toward research, which is that faculty research projects are expected to involve students and be at an appropriate level for student contributions, even if this negatively impacts the amount of scholarly work a faculty member is able to produce.

In addition to being involved in teaching and research, faculty members are encouraged to be active in their local communities. One faculty member commented that everyone does something not physics---ranging from volunteering with a program that feeds the homeless to working with a Scout troop to coaching Frisbee golf. Such activity is recognized and considered "normal" within the department. This helps students see the faculty as "real people", speculated one faculty member, "not just as teachers."

B. The Support Staff

The Site Visit Team met with John Stupak, Senior Instrumentation Specialist. John is responsible for teaching some labs in addition to setting up for labs and repairing equipment. He manages 2-4 students at any given time who help with these tasks. John also does some work in the machine shop, and trains his students and others in shop skills as needed. John credited the department's supportive atmosphere and hands-on approach for its successes. He told the team that "Everybody talks to everyone in the halls all the time," and that there is a tradition in the department of getting students involved in hands-on, applied research right away—through the laboratory experiences associated with classes and in individual research labs.

C. The Curriculum

Physics majors have four degree options: physics, physics teaching, physical science teaching (physics and chemistry), and physics-math teaching. All of the teaching options lead to licensure.

Within the physics major, students can have an emphasis in liberal arts, applied physics, or engineering via a Dual-Degree Engineering program. The liberal arts emphasis is the more traditional graduate school track, with students taking upper level experimental and theory courses. The applied physics emphasis doesn't require as much quantum theory as the liberal arts degree and incorporates more experimental physics. The physics major with a Dual-Degree Engineering emphasis is flexible in that it enables students to take upper-level classes that align with their desired field of engineering.

A unique feature of the UWEC curriculum is the optional LabVIEW certificate program. This is a set of elective courses through which students learn and apply LabVIEW and can test for certification. The Site Visit Team was impressed with the way this course sequence has developed and how it has prepared students to use LabVIEW in industrial settings. The students seem to value these courses, as this elective sequence of three LabVIEW courses, which can only be taken after two electronics courses, seems well-populated. The LabVIEW program has been a great source of opportunities for the UWEC Physics Department and students, as evidenced by partnerships between the department (primarily via Kim Pierson) and industry.

The Physics Department recognizes the importance of communication and has found ways to incorporate writing and presenting into the physics curriculum. Some classes require students to write

traditional laboratory reports, while others require more formal papers. Kim Pierson told the Site Visit Team about how students in one of his classes write about each experiment for a different audience, such as the general public, a boss or manager, or a colleague.

The department has a senior capstone class that currently consists of a half credit class in the fall of the junior year and a half credit class during the spring of the senior year. The first class, taken in the junior year, focuses on practical skills like writing a resume, applying for a job, and interviewing. Several times during the semester the instructor brings in Staci Heidtke, the Associate Director of Career Services, to teach these skills. The second half of the capstone class, which takes place the senior year, focuses on presentation skills. The students must complete a research projects before taking the class, and during the class they create a presentation on that project.

Originally both semesters of the capstone class took place during the senior year, but student feedback indicated that students wished they had learned the skills that it covers earlier. Therefore, the class is now taught in the junior year. However, the department is planning to move the first semester of the class even earlier so that students applying for internships and research experiences can take advantage of the skills it teaches.

The site visit team believes that this level of responsiveness reflects the extent to which faculty members solicit and carefully listen to student feedback.

D. Research and Internship Opportunities

The students told the Site Visit Team that they receive lots of emails about summer research and internship opportunities, mainly from the SPS advisor. They saw research as highly valued by the department. In fact, every physics major has to do research in order to graduate. Students commented that there were many research opportunities on campus. Those involved in research laboratories advised fellow students not involved to “just ask” faculty members if they wanted to know about research opportunities. Some indicated that they were advised to do research on campus the summer after their second year, and that the summer after their third year was a good time to do off campus research (like an NSF-funded REU).

E. Advising

Within the first few weeks of the fall semester each year, the Physics Department hosts a “mandatory” one hour meeting for all majors. A variety of things happen during this meeting, but a large portion of the meeting is dedicated to reviewing requirements for the major and going over the different emphasis options. For part of the meeting, the students split into groups based on the type of degree they are seeking (education, Dual-Degree Engineering, etc.), to discuss requirements and other relevant announcements.

Advising responsibilities are split among the Physics Department faculty. Students are required to meet with their advisors before registering for the next semester if they have less than 60 credits or are not in

good academic standing. Otherwise, they typically meet with their advisor one or two times each semester to discuss course scheduling and planning. However, much of the advising takes place informally, as faculty regularly talk to students about their classes, future plans, and summer opportunities throughout the semester.

III. Students

A. Overview

Here is the setting in which we were first introduced to the UWEC physics undergraduates:

About sixteen undergraduates were gathered around a food table in a comfortable Thursday afternoon routine, convincingly demonstrating that they were in their own element. The location was the astronomy lab, which serves as an overflow student lounge when the regular “seminar room” is filled and/or boisterous. Usually, this would have been a “Cookie Time” in which the students would have listened to one of their own talk about a research project as part of their capstone course, but today was a little different, with pizza instead of cookies and guests who wanted to chat with them about their undergraduate experience in the Physics Department at UWEC.

In conversations with the students, several things emerged as high on the list of what they liked about the department, including:

- Faculty members are always there for students, often after hours and regardless of whether or not the students are in their classes; Faculty members often eat lunch with students in the seminar room.
- The seminar room is a key element in their social life, for doing homework and learning more about all things physics.
- Camaraderie with other students is built through activities: group homework sessions, weekly “Cookie Time”, cribbage tournaments, SPS meetings and other pizza events, the “contraption contest”, kickball with ACS students, occasional potluck meals and road trips to science sites like FermiLab.

The students seemed tightly interwoven, familiar with each other’s routines, using the seminar room often for socializing and homework. The seminar room walls were covered with a variety of inviting postings including photos of about 150 current physics majors with each name shown in their own magic marker handwriting. These pictures were taken during the previously mentioned “All Majors” meeting, a mandatory hour-long gathering early in the fall semester in which students hear about career guidance opportunities, meet the faculty, and separate into various groups according to their degree plan (liberal arts degree, dual engineering/physics degree, physics teaching degree) to learn more details about curricular changes, deadlines and other information.

There was some mention of alumni returning for informal visits, but the younger students did not seem to know much about what former graduates were doing or about career options for physics majors. They knew about the LabVIEW courses, connected them to real-world utility, and seemed to have a

positive attitude about those courses and other lab experiences. They were aware of tutoring opportunities and other opportunities for students to serve and/or work within the department.

The Site Visit Team met a number of students who seemed eager and well-qualified to attend graduate school in physics or related fields. At the same time, the team met several students who were enthusiastically considering other possibilities, such as entering the workforce immediately after receiving a bachelor's degree in physics, earning a dual bachelor's degree in engineering, or teaching high school physics. Regardless of their future plans, the students felt supported and encouraged by faculty members, and felt that they were valued by the department.

B. Student – Faculty Relations

Students were especially keen to talk about how exceptional the professors were as teachers and mentors---challenging, but inspirational. The intro sequence was seen as particularly homework intensive, and yet appreciated. The interactive engagement methods of instruction that some of the faculty members employ were not mentioned explicitly by the students, but there was no doubt among the majors that they thought they were getting a good education, and that the quality was high throughout the department and not localized to one or two professors. They seemed to know that research was a requirement to graduate, and that you needed to initiate a research project yourself, either through an REU or through one of the professors. There seemed to be some awareness of the Materials Science major and its new equipment, perhaps providing an avenue for research. Many mentioned how common it was to have a meaningful after-hours discussion with a professor. It was apparent that students are regularly attracted to this Physics Department from other departments (music, math) and from other campuses by the appealing nature of the classroom learning experience and the camaraderie of the students and faculty in the department.

The students apparently initiate many of the social events themselves, but it is also clear that the traditions and rituals established by faculty members (access to seminar room, Cookie Time, a book sale fund-raiser for student events, contraption contest) played a key role in developing the nurturing and vibrant social atmosphere that was evident in the department. The collegiality evident among the faculty members and students in the department is truly remarkable; the commitment to high standards, quality instruction and mentorship is remarkable as well.

C. Student Demographics

Despite the friendly and collegial atmosphere, and the variety of physics curricular options available, the male-to-female ratio evident among the students we met seemed larger than one would expect based on national statistics for physics bachelor's degree recipients (perhaps 7 to 1 vs. 4 to 1), and perhaps not surprisingly, other traditionally under-represented groups in physics (namely African-Americans and Hispanics) seemed less represented at UWEC. Of course, the demographics of the surrounding region from which the university draws most of its students, the statistics of small numbers, and perhaps even sociological effects, conspire to make the distribution of under-represented groups in an otherwise welcoming Physics Department low and/or clumpy over time, so this certainly might be a natural fluctuation. However, it should be pointed out that the nature of the degree programs added (such as

Dual-Degree Engineering), and to which the recent burgeoning of the department has been credited, seems to attract males more readily than females nationwide, so this fluctuation can perhaps be understood via this explanation.

IV. The College Administration

A. The Academic Administration

The Site Visit Team met with Dean Marty Wood and Provost Patricia Kleine. Both administrators had definite knowledge about the Physics Department that they had clearly obtained independently by observation and other sources, not merely repetition of departmental publicity or reports.

The administrators stressed the excellent quality of the teaching in the department, and both noted in different ways that this quality was not simply confined to classroom lectures. The Dean mentioned that whenever he passes through the department every professor's office door is open and most of the offices have students inside receiving help; he also mentioned the laudability of the willingness of the members of the department to teach "across the discipline". The Provost was very impressed with how the department has embraced "everyman's physics," expressing great surprise ("it blows me away") that so many UW students, being required to take one lab science to graduate, choose physics. She attributed this to the many ways the department strives to make physics relevant to the student's everyday life, citing examples such as the use of women's high heels to demonstrate the concept of pressure. Their approach was described as "compelling" and "hands on."

The department was lauded for its efforts to reach out to the greater community, specifically through the planetarium, connections with local industry, and demonstration shows for retirees. Strategic partnerships were also appreciated, with special citations for work with the new Material Science major and collaboration with the University of Wisconsin, Madison and the University of Minnesota.

The emphasis that the department places on undergraduate student research was described as "a natural extension of what they do," and was particularly important in light of the fact that UWEC considers such research a hallmark of the institution. The university has a fellowship program—student recipients are called Blugold Fellows—which fund students for research. In addition, UWEC holds a campus wide Research Day at the end of the academic year. This event is an opportunity to display student research and is utilized by the Admissions Department in the recruitment of new students. Such university-wide support and recognition of student research is obviously valuable help in the growth of the Physics Department.

Overall, the site visit team was impressed with the level of support and enthusiasm the administration has for the Physics Department, and in particular how much detailed knowledge the administrators had of the department.

B. The Admissions Office

A very impressive and apparently important characteristic of UWEC is the way the Admissions Office is organized. At most schools, admissions counselors are designated for specific geographical areas. At

UWEC, however, the STEM fields have their own STEM Admissions Counselor. That individual, Creanna Cote, was hired in 2008 with funding that was originally intended for a faculty position in starting the new Material Sciences program. The funding was diverted to a STEM admissions position on the supposition that for the program to work it would need to have majors. The resulting change has clearly been a boon to all STEM majors, and in particular, to the Physics Department.

Ms. Cote has developed more knowledge of the operational strengths of and better working relationships with each of the STEM departments than a normal admissions counselor could possibly achieve. She does High School visits, including visits to STEM charter schools. She does demonstrations. She goes to the Wisconsin science teachers conferences. She does exhibits at career fairs and passes out literature and brochures. She even goes to science fairs held at other, competing institutions. In general, she raises awareness throughout the state of the STEM opportunities that exist at UWEC.

Ms. Cote is in charge of developing brochures and websites that promote the STEM fields. She works with the Publications Department to produce these materials, but she consults with the departments for information and has them proof the products. She meets with all prospective students interested in the STEM fields and takes those interested on tours of the STEM facilities.

Cote says that “honestly” her favorite department to work with is physics, remarking how cordial and responsive they are to her initiatives. When she takes students on tours of physics, the faculty members always “pop out of their offices” and introduce themselves. The faculty shows the students a passion and energy for their field that is impressive. In addition, once students are admitted, she sends the names to the Physics Department. The department is always good at following up with personal letters and brochures.

C. The Career Services Office

When the team visited with students, they mentioned enthusiastically the Career Services office and all the resources that were available there (in addition to its free root beer floats during freshman orientation week). Many if not most of the students had visited, regardless of their year in school.

The Site Visit Team met with Staci Heidtke, the Associate Director of Career Services. She works with over twenty departments, and she described her relationship with the Physics Department as very positive. Her office hosts career fairs every fall and spring, and she encourages students to attend other career fairs such as the one held in Minnesota the week of the site team’s visit.

Ms. Heidtke describes herself as building relationships with physics students. She asserted that the physics students trust their faculty members, so when the physics professors tell them to listen to her and utilize her office, they do. She has built a strong working relationship in general with the Physics Department. It starts every fall when she is invited to speak for about five minutes at the “All Department Meeting” that physics uses to kick-off the new school year. At this meeting she informs students of all class years that she is dedicated to meeting with them and working with them. She pushes internships and REUs as things that make the students more marketable.

About three years ago, Ms. Heidtke started working with the physics capstone course. Five or six times a semester she spends an hour with the students. She teaches them how to write a cover letter and a resume. She teaches them about networking and interviewing and how to start a job search. She works with faculty to learn about the distinctive features that are important in a physics resume. Often she works on the early drafts with the students and then sends the resume to a physics professor for final proofing. Ms. Heidtke teaches the students how to market themselves. Her office maintains interview rooms each with a computer that leads a student through a mock interview (“The Perfect Interview”) and then allows them to view a recording of that interview—now a standard assignment in the capstone course.

In speaking with the Physics Department, it is very clear that the work done by Heidtke is greatly appreciated and the difference she is making is readily discernible. The department recently realized that the senior year was too late to learn about the things taught by Career Services and so divided the capstone course and moved the job and internship search material to earlier in the undergraduate’s years. The current plan is to move it all the way into the freshman year. The thinking is that this will help get students ready to look for internships as soon as possible and thereby start developing a resume for job placement right after graduation.

V. The Alumni

The UWEC Physics Department is currently reviving its alumni newsletter, and has recently established an alumni Facebook page. In addition, the department is planning to send out an alumni survey for the purpose of re-connecting with graduates and gathering feedback about the program. Unfortunately, the Site Visit Team was not able to meet with any graduates of the program during the visit. Student comments indicated that occasionally alumni would return for a short visit, but there didn’t seem to be a tradition of the department initiating routine interactions between current students and alumni.

VI. Conclusions

A. Observations on Preparation for STEM Careers

The physics department at UWEC is exemplary. It has succeeded in placing students with the bachelor’s degree in physics in STEM careers at an exceptional rate. While it is the outstanding work of the department as a whole that achieves this distinction, we believe that a number of individual factors contribute significantly to this success.

- The faculty members are uniformly praised by students and administration as good teachers and very hard workers who are always available to help students. They care about ALL students, regardless of career ambitions and academic potential, and the students know and appreciate it. The student lounge, “cookie time,” seminars, and yearly “all department meeting” build camaraderie and rapport among students and faculty.

- There is a strong emphasis within the department on developing the skills necessary for the workplace. This is exhibited in several ways, such as the training of students in resume building and preparation, through the assignments in the electronics courses, through the intensive interactions between a physics faculty and the future physics teachers, and in the development of a LabVIEW sequence.
- The dual-degree engineering option has been a big draw and has dramatically impacted enrollment. Being trained and educated as an engineer is likely a primary reason that students have high job placement immediately after graduation (which occurs simultaneously between the physics major at UWEC and the cooperating engineering school).
- The department has a very good relationship with the Career Center; students are introduced to the Career Center and its services multiple times during their time at UWEC.
- The department values faculty research projects that involve students and all students are required to do some kind of research before graduation.

B. Recommendations for the Department

The site visit team came to UWEC, neither to review the department nor to evaluate it. We came to learn from the department because of its measurable success in placing students with bachelor's degrees into STEM careers. We have learned a great deal. Nonetheless, there are a few comments that we can make.

- The department is an inspiring place to be—the Site Visit Team was truly impressed by the dedication and creativity of the faculty, and the supportive environment for the students. From the “All Majors” meeting that happens each fall to the capstone class to the elective and rigorous lab courses to the value placed on physics teaching as a career, the department is clearly committed to helping students succeed and be ready for the transition from student to professional. In addition, the department’s relationship with the university administration and other departments, such as the Career Center and Admissions Office, is a model for other departments and we encourage continuation of these efforts.
- As previously mentioned, it may be the case that the degree program options attract males more readily than females and students from other groups that are underrepresented in physics. Thus, one recommendation is that as the department continues to expand, it considers adding more diverse degree emphases, such as those featuring an astronomy, biophysics, and/or medical physics, which might attract more physicists from traditionally under-represented groups. In addition, some departments have benefited from holding a regular gathering for the females in the Physics Department, sometimes partnering with other women’s groups on campus.
- The students seemed to know about opportunities available on campus and through their national SPS membership, but they seemed somewhat unaware of regional physics meeting opportunities. The department and its students could benefit from attending regional events such as SPS zone meetings, which offer students the opportunity to meet and network with physics students in their area. Regional meetings like these are often great places for students to

hone their presentation skills and hear and share about internship, graduate school, and job opportunities from other departments and companies in the region.

- The Site Visit Team noted that although the department requires students to do research to graduate, no credit is offered to students or given to faculty for the research. The Site Visit Team is concerned that this approach may be unsustainable with departmental growth and it creates the risk of fatigued faculty. In addition, a lack of incentive for high performance could lead to diminished quality of student work.
- And finally, we encourage the department to continue its efforts to re-connect with alumni and to establish a formal system for keeping track of alumni. Such a group might act as potential colloquium speakers, student mentors, or mock interviewers, and having a formal system would make the process of re-connecting with alumni less dependent upon individual relationships and less subject to transitions among the faculty.

C. Closing Thoughts

The American Institute of Physics is grateful to the University of Wisconsin Eau Claire for welcoming the Career Pathways Project Site Visit Team into the Physics Department and arranging the various meetings on which this report is based. The Physics Department has a strong record of preparing undergraduate students for STEM careers, and we appreciate the opportunity to explore some of the factors that contribute to this success. The findings from this and other site visits will provide the foundation for a set of resources that the Career Pathways Project is developing to help schools better prepare undergraduate students to enter the STEM workforce. We commend the work of the UWEC Physics Department and appreciate how their example contributed to this project.

**Appendix
Site Visit Itinerary**

AIP Career Pathways visit to the University of Wisconsin, Eau Claire

February 23-24, 2012

Site visit team

Brian Beecken, Physics Department Chair, Bethel University

Kendra Redmond, Society of Physics Students (lead)

Gary White, Society of Physics Students Director and Associate Director of the Education Division at the American Institute of Physics

Thursday, February 23

4:15-4:30 – Arrive at Phillips Hall, meet with Lyle Ford

4:30-5:30 – Meet with students

6:00 – Dinner with Lyle Ford

Friday, February 24

8:30-9:00 Kim Pierson, professor leading physics capstone courses

9:00-9:30 Marty Wood, Dean of the College of Arts and Sciences

9:30-10:00 Patricia Kleine, Provost

10:00-10:45 Staci Heidtke, Associate Director, Career Services

10:45-11:30 – Creanna Cote, STEM Admissions Counselor

11:30-12:00 – Erik Hendrickson, SPS mentor

12:00-1:00 – Lunch with faculty

1:00-1:30 – Jim Rybicki, John Stupak, Jin Huang, Lauren Likkell, Nathan Miller, Matt Jewell

1:30-2:00 – Matt Evans, author of department newsletter

2:00-2:30 – George Stecher, Scott Whitfield, Elisha Polomski, Tom Lockhart

2:30-3:00 – Doug Dunham, Co-director of the Materials Science Program

3:00-5:00 – Work time for team