Faculty of Natural Sciences and Mathematics
2008-2009 Annual Report

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Introduction

For the Faculty of Natural Sciences and Mathematics, the 2008-2009 academic year was dominated by the move into the College's new Regents Hall of Natural and Mathematical Science. The move was the culmination of over ten years of intense, interdepartmental planning. Despite a few bumps in the road, everything went well and we are now happily ensconced in this wonderful new building. Living and working in Regents Hall provides inspiration to the faculty as they work toward improving an already outstanding program in science and mathematics.

Faculty

There were a number of notable faculty achievements in 2008-2009.

Tenure & Promotion Jill Dietz (MSCS) and Mary Walczak (Chemistry) were promoted to Professor. Dietz's promotion recognized her outstanding teaching, her achievements in undergraduate research, and an excellent record of success as a scholar. Walczak's promotion recognized her excellent service as chair of her department, her scholarly achievements in both traditional scholarship and the scholarship of teaching and learning, and her service to the College in a variety of ways.

Brian Borovsky (Physics), Shelly Dickenson (Psychology), Kristina Garrett (MSCS), Greg Muth (Chemistry) were all tenured and promoted to the rank of Associate Professor. All were extremely successful in the classroom and have established solid records of success in scholarship. In particular, all are actively involved with research projects that involve undergraduates.

Tenure-track Hires The FNSM was successful in all three of its tenure-track searches. Laura Listenberger, bio-chemistry, was join us as a joint appointment in Biology and Chemistry. The Department of Mathematics, Statistics, and Computer Science was fortunate to hire two new tenure-track positions. Adam Berliner, combinatorics, and Katie Ziegler-Graham, statistics. Ziegler-Graham joins us after two years as a post-doctoral fellow in the the National Science Foundation-support Center for Interdisciplinary Research.

Hiring a more diverse faculty is a priority for both the FNSM and the College. Although none of these hires contributed directly toward that goal, each search exemplified the principles that lead to the goal of diversifying the faculty. The search committees worked diligently to ensure a large and diverse applicant pool, the selections of on-campus interviews were made with judiciously, and the final selections were made with all the competing needs of the college in mind. One offer was made to an applicant from a traditionally underrepresented group, but due to a variety of circumstances, he was not able to accept our offer.

Retirements 2008-2009 was the last year for three of our most distinguished faculty members: Gene Bakko, Lynn Steen (MSCS) (Biology), and Martha Wallace (MSCS). Bakko contributions included the development and management of the College's Natural Lands and the creation of the both the Biology in South India and the Environmental Science and Australia programs. Steen is a nationally (and internationally) recognized leader in the mathematics community. Wallace developed the College's outstanding program in mathematics education. All will be missed.

Other Achievements Anne Walter and Mike Swift received Fulbright awards to travel to India. Jason Engbrecht directed the national champion Rube Goldberg team, Shelly Dickinson was given the Mink Award for outstanding undergraduate teaching in Psychology (the third St. Olaf faculty member to be so honored). Paul Zorn was elected president of the Mathematical Association of America. Bob Jacobel was selected as the second Janet Anderson Midstates Consortium lecturer.

This year also marked the first time there was a uniform method of faculty self-reports. Almost all faculty submitted a self-report and each received a individualize reply from me. Overall, it was a rewarding and worthwhile experience. It provided the individual faculty an opportunity to reflect on their accomplishments for the year. It provided me with an overview of activity in the entire Faculty of Natural Science and Mathematics.

Curriculum

2008-2009 was a relatively stable year for the curriculum. Notable achievements include the following.

The Science Conversation Under the leadership of Brian Borovsky (Physics) and Shelly Dickinson (Psychology) the pilot offering of the first Science Conversation course — ID225 *From Certainty to Novelty: The Classical, the Quantum, and Beyond* — was offered. The first full sequence of three courses will be offered next yea with a contingent of 24 students already signed up.

Pyschology Major The Department of Psychology significantly revamped its major. The changes included eliminating the required courses in biology and sociology/anthropology and the addition of a new required course, Psych 130 *History and Methods of Psychology.* The motivation was to bring the St. Olaf major in line with national norms and also to reduce the number of required courses from 12.25 to 11.00.

Biology The Department of Biology introduced two new courses: Bio 275 *The Biology of Reproduction* and 0.25 credit reading course in Mathematical Biology. As part of the Term in the Middle East, Dave Van Wylen taught a course entitled *Water and the Middle East.*

In 2008-2009, Intended Learning Outcomes (ILOs) were defined for all majors and programs. Within the FNSM, all the departments identified a single ILO to study.

Physics looked at how students use computing to help understand physics concepts. The vast majority of their students demonstrated the appropriate level of skills.

Psychology used the ACAT standardized test to measure students' learning in the areas of Abnormal, Developmental, Pysiological, and Statistics. Their students scored above the national average on these test.

MSCS, with the help of the College's Office of Evaluation and Assessment, asked all of its majors to comment on the entire set of ILO's. The results were generally quite positive, with the possible exception of students' appreciation of the use of technology. Statistics also investigated an ILO regarding students' understanding of p-values. The results are pending.

Biology used two assessment tools: the ETS Major Field Test and an open-ended survey. The results indicated that their ILOs are being achieved.

Chemistry focused on two ILOs: demonstration of safety concepts and general chemistry knowledge. For the safety ILO, they used a Moodle quiz to ask about the students knowledge of basic procedures. The results of this questionnaire will be reviewed by the department's safety committee. For the second ILO, the department used standardized, nationally normed exams. The students scored about the national average.

Student/Faculty Research

Our faculty continue to remain professionally active in a variety of ways. Individual faculty research programs are flourishing, especially among the younger faculty. Overall, the most common model is a collaborative research program involving students. Sustaining our vibrant undergraduate research program is perhaps the highest priority for the FNSM. At this point in time, there is only good news to report: The number of students involved in undergraduate research is holding steady, there are opportunities for undergraduate research in every department and program, and faculty are enthusiastically active in seeking funding to support this very important part of our program.

The positives are:

- There are 45 summer researchers and a sizable number of research projects that took place during the academic year.
- The Center for Interdisciplinary Research continues to support 20-25 students engaged in collaborative projects with other faculty and students on campus.
- The majority of faculty publications in Biology, Chemistry, and Physics are co-authored by students. The proportion is somewhat smaller in the other departments.
- Several faculty applied for and got supplemental funds for undergraduates from NSF to augment their research grants.
- There is growing interaction with the College's McNair Scholars program. A number of McNair scholars are doing research in the FNSM.
- We used over $50,000 to support student travel to conferences and other related events. This travel involved almost one hundred students and dozens of faculty.
- There were a number of interdisciplinary collaborations: Mathematics and Computer Science, Statistics and Biology, Biology and Chemistry, Physics and Computer Science. We are working hard to generate even more of these opportunities.

The challenge continues to be finding a way to build a sustainable structure for undergraduate research. There are several issues to be resolved.

- We must find a way to "wean" ourselves off of outside support for summer research stipends for students. As the HHMI episode taught us, eventually all outside funding goes away. I am pleased that the College is looking hard at this question.
- We must find a way to properly reward and recognize faculty effort in undergraduate research. This involves both the financial component (e.g., summer stipends) and considerations at tenure and promotion time.

Grant Activity

Despite the focus on moving into Regents Hall, 2008/2009 was a very good year for grant proposal submissions. Some of the notable proposals are:

- Antartic research (NSF; Jacobel, $705,809, funded)
- Isotope Ratio Mass Spectometer (NSF; Shade, Umbanhowar, Beussman, and Schmidt, $621,547, recommended for funding)
- Mathematical biology (NSF,McKelvey and Walter; $992,781; pending),
- Continuation of the Center for Interdisciplinary Research (NSF; Legler, Richey, and Roback; $841,377; declined)
- Addiction research in adolescent mice (The Foundation for Alcohol Research; Dickinson, $50,000; funded)
- International Research in Combinatorics (NSF; Garrett and Hanson; $101,6420, pending)
- Neurobiology of Leeches (NSF; Crisp; $45,376, recommended for funding)
- Research at Undergraduate Institution: Causes and Consequences of Stoichiometry, (NSF; Cole and Schade; $412,319, pending)
- Fulbright in India, (Fulbright Foundation, Walter and Swift)
- S-STEM in Chemistry (NSF; Walczak; $500,000). This complements the S-STEMs in Mathematics and Biology, providing over $1.5million in support for students in STEM majors.

Overall, 22 proposals totally almost $5,000,000 in requests were submitted this year.

Regents Hall

The move into Regents Hall started in late summer and was essentially complete by the Dedication on October 4, 2008. Dave Van Wylen did an admirable leading the FNSM to the point of completion. I was fortunate to follow his good work as we completed the move and started our first year. The move was not without its complications, but overall it proceeded with efficiency and a non-trivial amount of good cheer. Since moving into Regents Hall, the faculty have been extremely pleased with the effect of this facility on their teaching, research, and general well-being. The facility is living up to its promise as a sustainable, student-focused, state of the art science and mathematics facility.

Next Year

There are a number of significant event coming up during the 2009/2010 academic year. These include

- Tenure track hires in social psychology, organic chemistry, and mathematics education.
- Program reviews in Psychology and Biology. These reviews intersect, most notably with Neuroscience.
- New chairs in Psychology (Donna Mcmillan succeeding Dana Gross), Chemistry (Greg Muth followed by Beth Abdella succeeding Mary Walczak), and Biology (Charles Umbanhowar succeeding Anne Walter).

There a number of challenges facing the FNSM over the next few years, many of which are inter-related. In no particular order these are:

Enrollment pressures As expected, the opening of Regents Hall has increased the already high profile of science and mathematics at St. Olaf. As a result, we are seeing an increase in student interest our courses. The pressures are at all levels. Introductory courses are already at capacity and major courses are also as full as ever. The number of majors also appears to be on the increase. The table below shows major trends: the first row is the number of major graduated this year; the other two rows are declared majors for the rising seniors and juniors.

Class	Bio	Chem	Math	Physics	Psych	**Total**
2009	102	42	54	15	52	265
2010	95	68	75	12	48	298
2011	102	45	55	24	54	280

The pattern is clear: there are more declared majors in each of the rising junior and senior classes than we graduated this year. Coupled with the preliminary information on intended majors, this could mean there will be significant enrollment pressures in FNSM courses for the next several years.

Undergraduate research As mentioned above, this is a primary focus of FNSM. The challenge is to build a sustainable, interdisciplinary, first-class undergraduate research program. Without the HHMI and the CIR funding, this challenge becomes even greater.

We must also continue working on finding ways to enable faculty to maintain a viable, peer-recognized research program while at the same time including undergraduates in the process. This is a challenging, but not impossible task.

Student and faculty diversity We have made headway in both these areas. Our students are becoming more diverse no matter what we do. Fortunately, thanks to the S-STEM programs and our close relationship to the McNair Scholars program, we are able to actively support a students from traditionally underrepresented groups. On the faculty side, we have had some success. Stephanie Schmidt had a wonderful first year as a CFD post-doc and will be staying with us for at least three more years (thanks to a Schade et al. grant). Sharon Lane-Getaz had a very good first year in her tenure-track position in statistics and education. The MSCS department made offers to both an hispanic tenure-track candidate and an African-American CFD candidate. Unfortunately, both these fell through. The department was successful in hiring an African-American mathematician in a term position.

Overall, the FNSM made a progress in this area. Aside from the outcome of any particular search, the process is much more oriented toward ensuring a maximally diverse applicant pool.

Staff support There is an increasing need for additional support staff in Regents Hall. For the short term, we will make do with the current staff. However, given the amount and complexity of equipment used, there will soon reach the point where a full-time equipment technician will be needed.

The overarching theme of all these is sustainability. The combination of undergraduate research, scholarly work, teaching large numbers of students, grant writing activity, and interdisciplinary collaborations is pushing the faculty very hard. The members of the FNSM quite self-motivated and are buoyed by a number of notable successes Still, we must eventually find a way a way to manage the workloads of the faculty.