Department/Program: Biochemistry **Chair/Director:** Christine White-Ziegler

Retreat Date: May 29, 2008

Departmental/program faculty in attendance:
Lale Burk
David Bickar
Cristina Suarez
Betsy Jamieson
Amy Burnside
Steven Williams
Carolyn Wetzel
Stan Scordilis
Christine White-Ziegler
Adam Hall

Outside guest(s)/speaker(s) in attendance: None

Goals for the retreat:
Summarize/discuss questions posed by Provost
Discussion of a Molecular Biology major in the Biochemistry Program
Discussion of Physical Chemistry courses in the Biochemistry and Chemistry majors
Formulate more specific goals and guidelines for our Honors program

Outcomes/Plans to achieve outcomes:
There was significant support among the Biochemistry faculty for a molecular biology major. Further discussions during the fall semester will define the consensus of the group and work towards defining the specific requirements of this major.

In discussions of the physical chemistry courses currently offered, there was considerable support for the content offered in CHM 335 where biologically relevant examples are used in class and lab. This is the course most of the Biochemistry majors take. Discussions in Chemistry have evolved around offering a single physical chemistry course for both chemistry and biochemistry majors. Conversations will be scheduled this fall between Biochemistry and Chemistry to determine if a single physical chemistry course can fit the needs of both chemistry and biochemistry major and what would be the content of such a course.

More specific Honors guidelines were discussed in our retreat that will be finalized this fall and implemented the 2009-10 academic year.

How do your plans advance departmental goals as outlined in mid-term or decennial reports?

Potential development of a molecular biology major, greater physical proximity of all Biochemistry faculty in Ford Hall, and the continued growth of the Center for Molecular Biology and Center for Proteomics will further increase the student community for our majors, an area we want to further develop as outlined in our decennial review. We anticipate that there would also be an expansion of faculty and staff involved in the program, a recommendation set forth by our external reviewers. With this potential expansion, we delineated the expectations we would have for current and future Biochemistry program faculty and staff members as recommended by our external reviewers.

How does the departmental/program plan to integrate the list of intellectual capacities into the major? For instance, are specific capacities such as writing, speaking or quantitative skills developed in particular courses, or a series of courses?

We currently have a strong tradition of incorporating writing, quantitative, and oral presentation skills throughout the major. All of the laboratories in the major require students to obtain, analyze, and present quantitative data and subsequently describe and critically evaluate the data. Students are guided in how to write clearly, concisely, and objectively in presenting this information. This training begins in the introductory courses in Chemistry and Biological Sciences and continues into the upper level courses. In the upper level courses in Biochemistry, students write papers based upon their research of the primary literature that is customarily accompanied by an oral presentation to the class to allow information sharing within the classroom. There are multiple opportunities to hone these skills throughout the Biochemistry major curriculum so that students are well prepared upon graduation.

Of the specific curricular goals identified by the faculty which would be furthered within the major? (see page 8 of the Smith catalog for further examples)

I. **Develop the ability to think critically and analytically and to convey knowledge and understanding**
II. **Develop historical and comparative perspectives**
III. **Become an informed global citizen**

The Biochemistry major addresses all three of these goals. The foundation of science is built upon the first goal- learning to complete, analyze, and communicate research to others, whether completed by oneself or analyzing the work of others. Examples given previously demonstrate that these skills are developed in both lecture and laboratory courses where students are evaluating either others' research or their own.

Towards the second goal, Biochemistry is intrinsically interdisciplinary and demonstrates to student the necessity for using multiple approaches to explore and answer questions. Foundational papers within the field of Biochemistry are covered to give students the perspective of the progress of the field over time.

Biochemistry also informs our students about current technologies, methodologies, and treatments that allow them to understand and evaluate current health care and environmental issues.

Has the department integrated the development of student research abilities in the structure of the major? For instance, is there an information literacy program in place for students who major in the department? Is there a research methods course recommended for your majors (either in your department or another one)? If so, when in the student's career does she take this course?

Information literacy is currently taught through individual courses. Students in the required Biochemistry 1 lecture and laboratory courses meet directly with the science librarian to get an overview of resources available and how to access them at the Young Science library. In other courses, such as Immunology and Gene and Genomes, the use of various databases required for the course is taught in the classroom. Other courses have students bring drafts of their papers to the Jacobsen Center for review to learn of the resources offered.

We do not currently have a specific research methods course in the Biochemistry major. Currently, research methods in the field of Biochemistry are discussed in individual lecture classes or taught hands-on in the laboratory courses. The addition of the Center for Proteomics (CFP) has enriched our major, allowing our students to learn and use cutting edge mass spectrometry techniques that is facilitated by the CFP Instrumentation and Techniques Instructor Mona Kulp who teaches about and demonstrates these methodologies in various biochemistry and chemistry courses. We discussed the addition of a research techniques course similar to those that have been found to be successful in other departments and programs, but feel this would require an addition to our laboratory instructor staff.

Are the pathways through the major clear for prospective majors? Is the department satisfied with the level of advanced work accomplished by its majors? (It may be useful to review the transcripts of graduating majors, or to examine the course taken patterns of several recent groups of senior majors.)

There is currently a single pathway through the Biochemistry major comprised of a set of core requirements and a single elective course. While highly structured, we feel this major offers the depth in chemistry, biology, and biochemistry required in the field and fits the suggested curriculum set forth by the American Society for Biochemistry and Molecular Biology.

We spent a considerable amount of time at our retreat discussing the development of a Molecular Biology major that would directed by the Biochemistry program faculty. We anticipate that this major would only slightly differ from the Biochemistry major, increasing the molecular biology requirements and decreasing slightly the biochemistry emphasis. This idea was formulated due to several driving forces. Based on the number of students in both Biochemistry and Biology who choose to do research in molecular biology labs, we conclude there would be significant students interest in such a major. Also, our experiences with prospective students and the current trend of other liberal art colleges to offer such degrees suggest that the addition of such a major might be helpful to recruitment. Lastly, the physical split of the Biological Sciences department has localized the majority of molecular biologists in Ford Hall along with all of the chemists. Offering a Molecular Biology major could potentially foster a more cohesive home for Biochemistry and Molecular Biology majors within this new setting. There was significant support for development of this major among the Biochemistry faculty and we plan to discuss the feasibility of this during the fall semester.

Independent research is highly encouraged within the Biochemistry major. Currently, approximately 50% of our majors complete a Special Studies and/or Honors project. In addition, an average of 16 students each summer complete independent research projects with Biochemistry faculty. Others are completing internships at other institutions. Thus, we are satisfied that the majority of Biochemistry majors are obtaining the independent research experience they need for their future goals. Given the already high number of requirements in the major and that faculty in Biochemistry are all mentoring several students each semester in their labs, we do not envision making independent research a requirement of the major.

We did spend a significant amount of time discussing how we could make the Honors process more transparent and structured for our students. We discussed and drafted a set of deadline dates for various portions of the thesis to facilitate the writing process and incorporate greater involvement of the second reader along the whole course of the thesis.

What are the culminating or capstone experiences for students in your major?

Several courses in our major are considered capstone experiences. The second biochemistry course (BCH352) serves as a capstone course required for all of our majors. This course integrates and builds upon many of the topics covered in previous classes that lead to this course. Students are able to integrate and visualize how all of the various pieces they have learned contribute to the workings of a living cell.

Our Biochemistry seminar course (BCH 380) and several of the other electives (e.g. Pharmacology and Drug Design, Bio-organic Chemistry, Immunology) require an integration of chemical, biological, and biochemical concepts for full understanding of these courses. In these courses, not only is their integration of concepts, but the expectation that students be able to read, analyze, and write about the primary literature in an area not covered directly in lecture, thus honing these skills. Students are also

expected to present the information concisely and clearly to their classmates, making these course much more self-directed learning.

Additional topic of retreat: Physical Chemistry course for biochemistry and molecular biology majors

The Chemistry department is currently discussing the option of offering a single physical chemistry course that could fulfill the needs of both the chemistry and biochemistry majors. While this would offer potential benefits, such as putting together these majors in a common classroom setting and alleviating staffing issues, there is considerable debate about whether such a course could adequately fulfill the needs of both the chemistry and biochemistry majors. Among the Biochemistry faculty, there is high support for the current course CHM 335 taken by most biochemistry majors where biologically relevant examples/techniques are used in lecture and lab. The Biochemistry faculty plan to compile a list of topics to be covered in a physical chemistry course that represent both their own opinions of an optimal course along with requirements of various graduate school programs. Subsequently, this fall, the Biochemistry faculty will meet with Chemistry to discuss what might be the best option, retaining both courses or consolidating into one course.