The completion of a thesis based on original research is crucial in the completion of an advanced degree in chemistry. The first year course, "Introduction to Research" (C500), provides an opportunity for the student to learn about the diverse range of ongoing research in the Chemistry Department, and to participate in advanced research in the laboratory of a faculty member on a two-semester trial basis. This allows the student to both evaluate their abilities and interests, and to provide him/her with first-hand knowledge about at least one research group. This course also provides the student an early opportunity to survey the literature pertinent to their research project. These processes of evaluation and orientation represent the primary objectives of C500, both from the point of view of the student and from that of the faculty and thesis committee.

C500 is completed after two semesters, whether or not a research project has finished. At the end of the two semesters, students submit a report on their work, and based on this report and their own observations, the research adviser and graduate committee assign a C500 grade. It is imperative that the student submit their report before or at the time of the deadline. Otherwise, these project reports will be given less consideration for an award nomination. To the student's question, "Will I be able to attain a PhD?" this grade provides a concise answer: A, yes; B, maybe; C, unlikely.

Participation in C500 implies no permanent commitment on the part of either the student or the supervising faculty member beyond the first year. In other words, this course is considered a “pseudo lab rotation”, but with no commitment to rotate if the student desires to continue in their original Ph.D. project. Students are strongly encouraged to take advantage of this flexibility when they feel that it would be better to change research groups at the end of C500. While a reluctance to "throw away" the research efforts of the first year is only natural, it should be recognized (1) that a major benefit derived from C500 by most students is a beginning, at least, on "learning to do research," and that this experience will move with them to any new research area; (2) that first-year results usually play a very minor role in most completed PhD theses, if they are included at all; and (3) that moving to a research area in which students are developing strong interest could significantly enhance the quality and quantity of their personal research efforts.
PROCEDURES

Enrollment. New students entering the graduate program in chemistry normally enroll in C500 for three credit hours in their first semester and three credit hours in the spring term, submitting their final report at the end of their second semester of graduate study. Students must enroll for a total of 6 C500 credit hours for their first year. Exceptions are made on an individual basis, commonly for students in the MD/PhD program, for new students arriving at the beginning of the summer session, and for students who feel unable to make a prompt choice of research adviser.

Preliminary Operations. Students are encouraged to read about the active research projects in faculty laboratories by visiting faculty web pages, reading papers, and meeting with senior students. The C500 course features an additional mechanism by which faculty and incoming graduate students can become acquainted. Beginning the second week of classes (September 3, 2013) a faculty seminar series will held Monday-Thursday, in C033 from 5:45 pm – 6:45 pm. Each faculty member will be invited to present a 20-minute research seminar (including questions) to the incoming class. These brief seminars will give a general overview of the type of research being done in the laboratory. The series will conclude by September 19, 2013.

Students will receive daily reminders of which faculty are presenting each evening, plus links to the faculty web pages. Students with majors or minors coinciding with the field of the faculty speakers are required to attend the seminars that evening, though ALL students are encouraged to attend ALL seminars to become informed of the variety of research projects in the department.

During and after the seminar series, students are encouraged to arrange to meet with faculty in whom the students may be interested in doing a C500 research project. Students can obtain a C500 faculty signature sheet from the Graduate Office. Students should meet with at least three faculty in case the student decides to switch groups after or before completion of their C500 project, AS WELL as to become acquainted with potential committee members.

On Friday, October 11, 2013, the C500 Faculty Interview Sheets need to be submitted to the Graduate Office with the students’ order of preference for a C500 advisor. The Director of Graduate Studies, according to the preference of each individual will make a tentative assignment of each student to a C500 advisor, pending approval by the Department Chair. Graduate students will then be assigned to a lab to begin their C500 course project. The final C500 report will be due Friday, April 18, 2014. After the spring 2014 semester is completed, students
will receive an email message from the graduate office, asking whether they wish to continue to do research with the C500 advisor, or if they plan to switch to a different advisor.

Students entering in the summer, 2013, will work as personnel under the direction of a research mentor. Beginning early does not represent commitment from the student to join that research group (or from the faculty to take the student as a group member). These students will enroll in the C500 course and follow the same protocol as the rest of the entering class.

**Assignment of Students to Advisers.** Assignments are managed by the Graduate Standards Committee, which can limit the number of students assigned to each faculty member, and which must approve all research assignments. The Department Chair then has final approval over the C500 assignments. The range of interests represented in each incoming class is usually quite broad, providing a reasonable match to the range of interests within the faculty. It often happens that most students can be assigned to their "first choice" of research adviser. Problems arise only when a given adviser is selected by more students than can be reasonably accommodated. When this occurs, no final decision is reached without conferring with all the students involved. Experience has shown that satisfactory arrangements can usually be found. Therefore, it is imperative that students meet with faculty outside their first choice given this small probability.

In the area of chemical biology, a second option exists. Students may elect to participate in a "rotation" system that involves working with two to three different professors for short periods of time. The details of the rotation option will be outlined by the chemical biology faculty member on the Graduate Standards Committee during pre-semester counseling. Chemical biology students can participate in the standard, one-professor system, however. The choice is up to the student. The C500 Final Report for chemical biology majors is also due Friday, April 18, 2014.

**C500 Final Report.** Activities during the first and second semesters are devoted entirely to research work and the preparation of a final report. The final report should be a term paper worthy of six semester hours of credit. It must reflect sustained effort, care, and thoroughness both in the preparation of the report itself and in the related studies and research. Minimally, it should include:

1. A title that represents the topic of the work.
2. An introduction clearly stating the objective of the work.
3. A discussion of important background information. This should not be an extensive review, but it should explain the "starting point" for the work. Facts that the reader will need to know in order to follow and understand the research report should be anticipated and presented here. Any points which involve discussion of results obtained in the course of the project should be avoided in this section.

4. A description of experimental techniques and procedures (this section can be placed at the end of the report). Presentation of results (other than routine characterization of synthetic products) should be avoided in this section.

5. A results and discussion section. This should be the longest section of the report. It is impossible to provide an outline that will be generally applicable. Each project will have unique features that call for specific modes of organization. A few points that may be useful, however, are:

   a. presentation of all results before any discussion is usually difficult both for the author and for the reader. It usually is best to present each point of discussion as soon as the necessary results have been reported. This approach will help to sustain the reader's interest and will frequently lead naturally to the presentation of the next set of results.

   b. A system of headings and subheadings will be invaluable to the reader.

   c. If there are fewer results than originally hoped for, the student should explain why. The C500 report is different from a conventional research report in this regard, but the making of excuses (as gracefully as possible) and an accounting for time are appropriate in a report which must be submitted by a particular deadline rather than when a project has been truly completed.

6. Include the appropriate set of references at the end of the report. All references provided by the student must be references THEY HAVE READ.

Students are further encouraged to discuss questions regarding the preparation of their report with their research advisers. A time of approximately two weeks prior to the April 18 deadline for the completed reports. One spiral bound copy and one electronic copy in pdf form should be turned in to the Graduate Office and one copy to the C500 research adviser. The graduate committee then prepares a critical evaluation of the student's work and prospects are assigned by the graduate committee. Incompletes are not permitted in the second semester. As stated above, turning in a report on a timely manner is strictly enforced. Late reports or extensions will result in unfavorable circumstances for the C500 nomination. While it is true that a research adviser's casual observation of a student might provide
much of the important information on which a C500 grade is eventually based, the C500 report itself has great importance for at least three reasons.

1. For the student, contemplation of the eventual necessity of putting sensible works on paper should be a powerful motivating and organizing factor. Knowledge of the criteria employed in evaluating a report (described below) can help to guide a student's efforts by improving his or her understanding of how to translate the philosophical goals of C500 into practical activities.

2. For the potential thesis adviser, the C500 report provides the kinds of information unobtainable through casual observations. Can the student write effectively? Can the student finish things (even if only a thought, or a report – not necessarily an entire research project)?

3. For other members of the faculty, especially the graduate committee, who must somehow make an estimate of the student's potential for doctoral work, the C500 report provides a product which is, under the circumstances, the best indicator of a student's potential for completing a thesis. While this kind of evaluation must be carried out with great care and with an eye to the substantial uncertainties involved, the C500 report does represent the student's individual efforts over a substantial period of time on a project of his or her choice.

The criteria employed in the grading of the C500 reports differ to some extent between various faculty members and sub-disciplines, but students should not fear that undue importance is being placed on the report itself (the document). To elaborate on this point, it is useful to list briefly three basic areas which can be considered to have equal importance in the evaluation of C500 projects:

I. The report itself
   A. Organization
      1. Is the outline of the project clear?
      2. Is the report adequately subdivided?
   B. Form and appearance
      1. Are references clear and correct?
      2. Are headings and subheadings adequate?
      3. Does the report present a good appearance?
   C. Grammar, spelling and word choice
   D. Clarity of expression

II. The effort apparently devoted to C500
   A. The scope and adequacy to technical developments
      1. The quantity and quality of results
      2. The potential demonstrated for future effort
III. The estimated potential for doctoral research (Is the work above the undergraduate level?)

A. Effective use of the literature
   1. Has the student become aware of other work relevant to the project?
   2. Have the findings of others been used in order to guide and strengthen the project?
   3. Does the student read the previous work to improve on current technology and does he or she apply previous findings in their project.

B. Understanding of the project
   1. Has the student clearly indicated the significance of the work?
   2. Are the objectives, experiments, and conclusions well described and supported and has the student demonstrated an understanding of the background and project goals?

C. Correctness of science
   1. Are there any scientific errors?
   2. Are there any significant oversimplifications?

The C500 Award

At the Chemistry Honors Banquet each April, an award is presented to the graduate student who has submitted the most outstanding C500 report in the preceding academic year. Criteria for selection of the outstanding report include the quality and quantity of the research, the originality of approach, the quality of the final report, and if such document was submitted on time. The name of each recipient of the award is engraved on a special plaque, which is displayed in the Chemistry Department. The C500 is one of our department’s most prestigious awards and recognizes graduate student(s) early in their Ph.D. career.