



Department of Chemistry

Graduate Student Handbook

2011–2012



*Graduate Student Advisory Committee
Department of Chemistry
Dartmouth College
Hanover, New Hampshire 03755*

<http://www.dartmouth.edu/~chem/docs/handbook2011.pdf>

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Welcome!

Welcome to the graduate program in the Chemistry Department! As faculty members, we look forward to working with you as you continue your education as chemists. You will find the graduate education experience an interesting and exciting transition from student to independent scientist. You will begin by enrolling in courses and by taking examinations very much as you did as an undergraduate; at the end, you will present a thesis describing some of your own research which contributes to the body of new knowledge in chemistry.

Actually, the process is not the simple progression that the foregoing statement might imply. While you are taking courses, you will also be serving as an apprentice teacher in undergraduate courses, and some of you will be discovering new knowledge in your first weeks in a research laboratory. Above all, a productive chemist never loses the attitude of an inquiring student.

The process of education is something to which we faculty members devote our professional careers, and we look forward to working with you in every way we can to make the process a success for us all. While the goals of having your graduate years be satisfying and productive are clear, the methods of realizing those goals are elusive and need to be reexamined continuously. This Handbook is meant to introduce you to those parts of the process which can be described on paper, and thus to make it easier for you to add those most important dimensions of personal growth that can never be written down.

This brochure has been prepared by the *Graduate Student Advisory Committee (GSAC)* which is a subset of the Chemistry faculty carrying the main responsibility for seeing to it that the graduate program operates smoothly and effectively. The members of GSAC are responsible for making sure that degree requirements are met and for giving you advice and counsel regarding the conduct of your own education. All members of GSAC, particularly the Chair, are available to you at any time for advice or questions, and they welcome your suggestions on any matters whatsoever. One member of GSAC will serve as advisor to each student until a research supervisor has been selected. Advice and assistance, of course, are not limited to this formal route through GSAC. You will find the entire faculty, your fellow graduate students, and all of the supporting staff in the department available to answer inquiries.

Logistics

The Department Office is in the chemistry building, 102 Burke Laboratory, at the top of the stairs from the main street entrance.

Deborah Carr, the Department Administrator, and Administrative Assistant Kay Yost, who serves as the department's secretary for graduate affairs, can answer most miscellaneous questions about the department, the College, and Hanover. Deb will set up your electronic access to Burke Laboratory and manage your stipend. Kay will assign you a mailbox and introduce you to our administrative procedures. The main office is also the source of common stationery supplies such as writing pads, pencils, and pens.

On the ground floor of Burke is the Burke Stockroom, which serves primarily chemistry but also other departments in the Fairchild Science Center. Your research supervisor will explain to you how you place orders through the stockroom or over the web, or check out stocked research supplies. The stockroom staff is available to answer your questions and help you place orders.

At the other end of the hall from the Stockroom, at the base of the main stairway, is the Electronics Shop and the departmental magnetic resonance (NMR/ESR) facility. This room houses the department's shared NMR spectrometers that many of you will use for routine NMR.

The department's two primary large lecture rooms are 006 and 007 Steele Hall, on the ground floor. Steele also houses a medium-sized classroom, 315 Steele, on the top floor. This floor also holds many of the department's undergraduate instructional labs. Burke has two seminar rooms, 220 and 309, that are used for small classes, research group meetings, and other purposes. These small rooms and 315 Steele are scheduled through the Department Office.

Dartmouth has long had a computing network linking personal computers to the Internet, either via Ethernet or the campus Wi-Fi networks. Computers are available in all research groups, libraries, and offices. You will have free access to the Dartmouth electronic mail system and to other features, such as library access, available over the Dartmouth Network. While Dartmouth once used Apple Macintosh personal computers in far greater number than Windows machines, either can be used over the network, and the mix of platforms across the campus today is very heterogeneous.

You should also be aware of the Graduate Studies Office located in Wentworth Hall. The Dean of Graduate Studies and the Dean's assistants can help you with all sorts of problems that transcend departmental jurisdiction. For example, they can arrange for long or short term loans should the need arise. You should also read the Graduate Handbook that office provides and keep it and this Handbook available for reference throughout the year. (Both are updated annually.)

Stipends, Vacations, and Outside Employment

Academic year stipends normally begin September 15, with the first paycheck available on October 1, and at monthly intervals thereafter. The check can be sent to your campus mailing address, or you may arrange through the Graduate Study Office in Wentworth Hall to have your check deposited directly into your account at an area bank. It is a good idea to open an account at one of them.

It is the intent of the department to provide a stipend during twenty terms of graduate work. Usually, this will mean five consecutive years. Support beyond sixteen terms will be provided only if the department is convinced, on the basis of a review and recommendation by the student's Research Advisory Committee, that the student is making progress which will allow completion of the thesis within approximately an additional year. Support is only provided beyond twenty terms if the student's research supervisor has research funds available for that purpose. Note that if you arrived at the start of the Summer term, rather than the Fall, and if you were enrolled as a student that term, it will count as the first of your twenty terms of departmental support.

The stipend comprises a full tuition scholarship, all fees except health insurance (for which you will receive a credit covering about 85% of the current cost), and an amount to assist you with living costs. The sources of these funds vary from student to student and from year to year. Graduate student stipends at Dartmouth are subject to state and federal income taxes to the extent required by law. It is departmental policy to insure that all students receive comparable disposable incomes. Anyone with significant non-Dartmouth income should consult the Graduate Study Office for current tax regulations. Every student who enrolls in the graduate program accepts the responsibility to cooperate in efforts to acquire funds for her or his stipend through application for fellowships or participation in federal work-study programs.

Graduate study is no more a clock-punching activity than research is for a faculty member. You will probably find evenings and weekends in the laboratory some of your most productive periods, and many of us find that quiet interludes in the building during some of the regular undergraduate holidays provide the best research time of the entire year. However, the official departmental policy is that **graduate students are entitled to a total of two weeks' vacation per year**, in addition to any time off during regular College holidays, such as Thanksgiving and Christmas vacation. (Note that the period between the last day of one academic term and the first day of the following term is not a College holiday period.) Implementation of the policy is left to each individual and the research advisor. Please note that teaching duties frequently extend into both the beginning and end of undergraduate holidays; be sure to check with your teaching supervisors before planning a holiday. Please keep your research supervisor informed of all vacation plans.

It is the view of the department that graduate study is a full-time occupation. It is worth emphasizing that outside employment is likely to reduce the time that a student can devote to graduate study to a level that will necessarily prolong the period required to satisfy the Ph.D. requirements. On the other hand, there may be circumstances where outside employment would enhance a student's professional growth. Dartmouth's policy is that graduate students must not accept outside employment without the explicit prior approval of GSAC and the Dean of Graduate Studies. Approval is granted only in extremely unusual circumstances.

**Graduate
Student
Organization**

Each department has one graduate student elected as a representative to a graduate student advisory group, which meets with the Dean of Graduate Studies. This same student normally acts within the department as a clearing house for certain kinds of interchange between the faculty and the graduate students.

Actually, the community of chemists is sufficiently small that formal organization is seldom called into play, but on occasion faculty committees want a relatively formal level of input from graduate students, and in such cases the graduate representative is often asked to help make the appropriate arrangements. Groups of graduate students, for example, are always asked to interview prospective candidates for faculty employment in the department and to express their evaluation of such candidates.

Academic Matters

Your academic progress will be monitored by GSAC and your Research Advisory Committee, and continuation in the program is always contingent on your satisfactory performance in research, teaching, course work, and examinations.

If at any time the Research Advisory Committee wishes to recommend probation or separation from the program, that recommendation will be shared with you and with GSAC. While the Committee or the Dean of Graduate Studies may initiate a probationary period, separation from the program will be made only by vote of the faculty upon recommendation by GSAC.

Formal degree requirements, as printed in the Dartmouth publication known as the *ORC (Organization, Regulations and Courses)*, are given below, followed by detailed comments on various of the requirements. *ORC* course listings for the current year are also available at <http://www.dartmouth.edu/~reg/courses/index.html>.

The Master's Degree: M.S.

The general requirements for the Master's degree are given in the *ORC*. These requirements, together with the specific requirements of the Department of Chemistry, normally allow completion of the degree in two years.

The specific requirements are as follows:

1. Each student must pass with a grade of P or better eight courses from the offerings in chemistry and allied areas which have been chosen in consultation with the advisor and approved by GSAC. Chemistry 256 and one term of Chemistry 257 may count. Up to four courses may be in graduate level research, but they may not include the Colloquium courses (140 and the 260 series), nor may courses numbered below 100 count in the eight-course total.
 2. The student must complete a satisfactory thesis and pass creditably an oral examination upon this thesis.
 3. In the course of this training, the student must gain experience in teaching, including completion of Chemistry 256.
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The Doctor's Degree: Ph.D. in Chemistry

A student will be admitted to candidacy for the doctorate when she or he has satisfied the following requirements:

1. Completion, by the start of the Fall term of the student's second year in the program, through an appropriate combination of Dartmouth courses or performance on diagnostic entrance examinations, of a breadth requirement in three of the four topical areas of biological, inorganic, organic, and physical chemistry.
2. Passing within the specified time a total of five cumulative examinations in chemistry at an advanced level, at least three of which must be from an area closely allied with the student's research area.
3. Presentation before the Department of a lecture unrelated to the thesis topic.
4. Submission and oral defense of an original research proposal in an area removed from the student's own thesis research.

The candidate will receive the doctorate upon:

1. Satisfactory completion of an original thesis project of high quality and substantial significance and approval of the thesis embodying the results of this research.
2. Successful defense of this thesis in an oral examination.

A candidate for the doctorate will take various courses in chemistry and allied fields that are pertinent to the area of study. He or she will also participate actively in undergraduate teaching, including completion of Chemistry 256. It is anticipated that a

graduate student will normally complete all of the requirements for the doctorate in approximately four years. It is not necessary to earn a master's degree as a prerequisite to the doctorate.

***The Doctor's
Degree: Ph.D.
in Chemistry-
Materials***

The department offers a Ph.D. in Chemistry-Materials that is more focused in materials science. The degree requirements for this course of study are outlined below.

A student will be admitted to candidacy for the doctorate after satisfying the following requirements:

1. Completion, by the start of the Fall term of the student's second year in the program, through an appropriate combination of Dartmouth courses or performance on diagnostic entrance examinations, of a breadth requirement in three of the four topical areas of biological, inorganic, organic, and physical chemistry.
2. Successful completion, by the end of the student's third year in the program, of four core courses satisfying the breadth requirement in Materials Chemistry, and a minimum of three elective courses selected from the Chemistry-Materials elective course list.
3. Annual presentation of a Research in Progress lecture to the Materials Chemistry Group, and submission of an annual research progress report to the student's Research Advisory Committee.
4. Submission and oral defense of an original research proposal in an area removed from the student's own thesis research.

The candidate will receive the doctorate upon:

1. Satisfactory completion of an original thesis project of high quality and substantial significance, and approval of the thesis embodying the results of this research.
2. Successful defense of this thesis in an oral examination.

A candidate for the doctorate will take additional courses in chemistry and allied fields as required for their area of study. He or she will also participate actively in undergraduate teaching, including completion of Chemistry 256. Students are required to attend the research discussion meetings of the Center for Nanomaterials Research at Dartmouth as well as seminars designated as Materials Seminars by the Center. It is anticipated that a graduate student will normally complete all of the requirements for the doctorate in approximately five years. It is not necessary to earn a master's degree as a prerequisite to the doctorate.

Honor Principle

Dartmouth operates on a system of academic honor. The following statement from the Dartmouth College Student Handbook applies fully to all aspects of graduate study, including such matters as problem assignments and rules for use of library and computing materials as well as examinations.

Fundamental to the principle of independent learning is the requirement of honesty and integrity in the performance of academic assignments, both in the classroom and outside. Accordingly, Dartmouth operates on the principle of academic honor without proctoring of tests and examinations. A student who submits work which is not his or her own forfeits the opportunity to continue at Dartmouth.

The Honor Principle depends on the willingness of students, individually and collectively, to maintain and perpetuate standards of academic honesty. Each student accepts the responsibility not only to be honorable in his or her own academic affairs but also to support the principle as it applies to others.

A student who becomes aware of a violation of this Principle is bound by honor to take some action. He or she may report the violation, speak personally to the student, exercise some form of social sanction, or do whatever is appropriate under the circumstances. If he or she stands by and does nothing, he or she threatens both the spirit and the operation of the principle of academic honor.

The Honor Principle applies not only to individual student actions, but it also has implications for faculty and Teaching Assistant interactions with students. The guidelines below represent the faculty's view of a Teaching Assistant's role in supporting the Honor Principle at Dartmouth. Faculty and TAs in each course should discuss these guidelines at the outset of each course to ensure that there is no confusion about the roles, duties, and responsibilities of the teaching staff regarding this important aspect of academic life.

Teaching Assistants play an important role in the Department's teaching efforts. TAs often work closely with the faculty in the evaluation of material submitted for a grade. Generally, such material is assumed to be covered by the broad principles of Academic Honor embodied in the Academic Honor Principle as stated in, for instance, the *ORC*. The material is assumed to be entirely the work of the individual submitting it unless collaborations (as is common in collecting lab data) and/or other sources specified as acceptable references by the instructor are acknowledged. The Department views this Principle as a serious compact between students and faculty, and both sides of the compact implicitly agree to accept various responsibilities that go along with it. One such responsibility is the assumption that we all play by the rules. Consequently, exams are not closely monitored. Another is the assumption that unreported knowledge of a suspected violation of the Honor Principle is itself a violation. Consequently, it is important that guidelines for action are stated clearly in case such a suspicion arises.

It is incumbent on the teaching staff of any course to discuss among themselves and with their students the various graded portions of the course and the role played by the Honor Principle in each of them. Examples include laboratory notebooks, term papers, and homework as well as exams. Any limits on student collaboration must be made clear to all involved: students and teaching staff.

Should a suspected violation of the Honor Principle turn up in the course of routine grading, there are several steps that must be taken. ***These steps are not optional; they are integral to the Honor Principle itself.*** Faculty guidelines include consultation with colleagues to verify or refute the suspicion, optional consultation with the student or students involved, and, based on these steps, forwarding evidence supporting the suspicion to the College-wide Committee on Standards. A Teaching Assistant uncovering a suspected violation in the course of routine grading must immediately bring the suspicion to the attention of the faculty member in charge of the course. It is inappropriate for a Teaching Assistant to confront or otherwise question a student directly, and it is further inappropriate for the TA to penalize the student or students in any way. Teaching Assistants are, of course, encouraged to respond to student questions regarding the Honor Principle's application to any assignment and to be alert to situations that have the potential to lead to an Honor Principle violation. In this Department, the most common such situation involves student collaboration in labs, and the instructors of the course must be clear among themselves at what point student collaboration ceases and individual work begins.

Information Technology Policy

In addition to the Honor Principle, use of computer resources is governed by the Dartmouth College Information Technology Policy, available on the Dartmouth web site at <http://www.dartmouth.edu/comp/about/policies/general/itpolicy/>. This policy begins:

Dartmouth College (including all undergraduate and graduate programs) is dedicated to the missions of teaching, education, research, and public service. In support of these missions, Dartmouth provides access to electronic information resources, including networks, software, and equipment, to its students, faculty, and staff.

The Dartmouth College Information Technology Policy (the “Policy”) contains Dartmouth’s philosophy and requirements governing student, faculty, and staff use of its information technology resources. Dartmouth College expects each member of the community to use Dartmouth’s information technology resources, including connections to resources external to Dartmouth that are made possible by Dartmouth’s information technology resources, responsibly, ethically, and in compliance with the Policy, relevant laws, and all contractual obligations to third parties. The use of Dartmouth’s information technology resources is a privilege. If a member of the community fails to comply with this Policy or relevant laws and contractual obligations, that member’s privilege to access and use Dartmouth’s information technology resources may be revoked. The use of Dartmouth’s information technology resources to send communications to Dartmouth or non-Dartmouth persons or entities typically identifies the sender as belonging to the Dartmouth community. Each member of the community should therefore recognize that any such communication may reflect on how Dartmouth is perceived by not only the Dartmouth community, but also the public at large. For further information, please see the section on DND, Name Directories, User Name, and Account Revocation Procedures.

By adopting the Policy, Dartmouth recognizes that all Dartmouth students, faculty, and staff are bound not only by the Policy, but also by local, state, and federal laws relating to electronic media, copyrights, privacy, and security. Other Dartmouth policies that relate to this Policy and also apply to Dartmouth College students, faculty, and staff (collectively, the “community”) include the Dartmouth College Copyright Policy, the Dartmouth College Policy and Guidelines on Copyrighted Materials, the Dartmouth College Patent Policy, the Dartmouth College student handbooks and faculty handbooks, and the Dartmouth College Exempt and Non-exempt Staff Handbooks. Each member of the Dartmouth community is expected to be familiar with the relevant foregoing policies.

Please take the time to review the entire policy at the web address listed above.

The Breadth Requirement

While the Chemistry Graduate Program appropriately focuses on original research in a narrowly defined branch of chemistry, a working knowledge of the terminology, concepts, theories, and issues of modern chemistry is a necessary component of any post-baccalaureate education. Two Program requirements directly address this need: the Research Colloquium lecture series, which exposes students to contemporary research talks across all of chemistry, and the Breadth Requirement, described here.

The Breadth Requirement addresses four broadly defined branches of chemistry: biochemical, inorganic, organic, and physical, and it has two components: a *basic knowledge* component and a *specialized knowledge* component. Admission to the program requires a student to specify the general area in which she or he intends to conduct degree-related research. For the purposes of this requirement, this area is called the student's *primary research area*.

All students are required to demonstrate basic knowledge in three of these four branches of chemistry (the primary area must be one of the three) through, as described in detail below, a combination of courses taken at Dartmouth, performance on diagnostic evaluation exams given on entrance to the program, and/or performance in courses taken before matriculation in the Program. In addition to basic familiarity in these areas, the specialized knowledge component emphasizes broad exposure at a more advanced level in the student's primary research area and entails graduate coursework in that area.

The Basic Knowledge Component

During the week before Fall term registration, all entering students will be invited to take four diagnostic exams, one in each of the areas of biochemistry, inorganic chemistry, organic chemistry, and physical chemistry. All four are multiple-choice exams provided by the American Chemical Society (ACS). Each consists of 60-70 questions, and the exams are timed for periods of typically 120 minutes. These exams are carefully aimed at the typical undergraduate course level, and they are widely used across the country. Students who do sufficiently well on one (or more) of these exams will have satisfied the basic knowledge component of the Breadth Requirement for that area (or those areas). In any areas *outside* the student's primary research area, diagnostic exam performance will be evaluated in the light of the student's performance in previous courses in each area as recorded on a transcript or transcripts from the student's previous institution or institutions (as used to apply for admission to the program). Outstanding prior performance will be considered favorably as the faculty evaluates satisfaction of the Breadth Requirement. Similarly, the one area that will be excluded from the basic knowledge component will be designated based on an evaluation of the student's ACS exam performance, background in that area, and primary research area.

At a meeting with GSAC during the week before Fall term registration, students will be asked to specify their primary research area. The diagnostic exams will be given throughout that week, but a student can choose not to take any (or all) exams if she or he prefers to enroll in the corresponding courses, as described in the next paragraph. This choice is usually only appropriate for a student who has no experience in one of the areas and is certain to do poorly on the ACS exam.

For those areas in which a student does not demonstrate basic knowledge, GSAC will choose an academic plan of courses which must be passed with a grade of P or higher (for graduate courses) or C⁺ or higher (for undergraduate courses) to complete the basic knowledge component. Students will not be permitted to withdraw from these

courses solely on the basis of poor academic performance. If the student's primary research area is among these areas, the plan will generally include undergraduate courses that will prepare the student for the specialized knowledge component described below. If the student has not demonstrated basic knowledge in areas outside the primary area, the plan will generally include at least one course in each such area.

The basic knowledge component must generally be satisfied in all three of the four possible areas by the start of the Fall term of the student's second year. As shown on the calendar of Important Deadlines and Dates on the last page of this Handbook, the diagnostic exams are offered (if needed) at the end of the Spring term of the student's first year and again before the start of the following Fall term should a student fail to satisfy this requirement through coursework.

The Specialized Knowledge Component: Ph.D. in Chemistry

All students in the Ph.D. in Chemistry program must complete with a grade of P or higher at least *two graduate level courses* in their primary research area (or in a closely allied area agreed to by GSAC or the student's Research Advisor) to complete the specialized knowledge component of the requirement. These courses need not be taken right away, and in many cases, our pattern of graduate course offerings will indicate an academic plan in which these (and often other) graduate courses will be taken during the first two years in the program.

The Specialized Knowledge Component: Ph.D. in Chemistry-Materials

All students in the Ph.D. in Chemistry-Materials program must complete with a grade of P or higher four courses from either the Chemistry-Materials option (a) or option (b) required course list and three courses from the Chemistry-Materials elective course list. Chemistry 256 must be among the four required courses.

Chemistry-Materials Required Course List. Chemistry 256 plus three from among:

Option (a): Chem 101.4, 109, 101.7, 137 (or 101.3).

Option (b): Chem 101.4, 101.7 (or Engs 24), 137 (or 101.3), Engs 131.

Chemistry-Materials Elective Course List:

Chem 101.1 (or Phys 91), 101.2, 130, 131, 151, 152; Engs 91, 100 (identical to Phys 100), 130, 132, 135, 165; or other courses approved by the student's Research Advisory Committee.

The specialized knowledge component of the Breadth Requirement must be completed by the end of the Fall term of the student's third year in the program. GSAC will adjust this schedule appropriately for students entering the program at times other than the Fall term, but in no case will a student have more than nine terms in residence to complete this requirement (unless our annual course schedule, which is beyond the student's control, dictates a one or two term extension).

GSAC periodically reviews the progress of all students and discusses progress with each student. Failure to complete either component of the Breadth Requirement in the allotted time or a pattern of failure (such as failing grades, failure to show sufficient commitment to research, or withdrawing from courses due to academic difficulty) will lead GSAC to recommend to the Department that the student leave the program.

Courses

Course work is regarded as an important component of an educational experience which focuses on the preparation of a thesis and, most importantly, on the research to which that thesis testifies. In keeping with this philosophy, course work should be selected on a very individual basis. The specialized knowledge component of the Breadth Requirement and the Teaching Requirement (described on the next page) both address course selection issues.

Initial course selections will be made in consultation with GSAC and will be based on each student's interests together with the goal of satisfying the Breadth Requirement's course component. After satisfying the basic knowledge component of the Breadth Requirement, students will select courses in consultation with their research supervisor or GSAC advisor in a way that addresses the specialized knowledge component.

It is certainly not possible to give any universally applicable advice regarding course choices, but perhaps two rather different generalizations will be useful:

The Ph.D. degree testifies to research ability, not accumulated course credits. Therefore, course selections should be made judiciously and with the design of supporting a developing research capability. Remember that there will be many more interesting courses than you will have time to take; so, select carefully.

Or, on the other hand:

The topic of your graduate thesis is not likely to be the area of your life's work. Your intellectual and professional development will depend on your flexibility and your ability to grow. The opportunity to take course work outside your central field of interest is quite unique to this stage of your career—use it wisely.

So there you have it. Pick the linear combination that applies to you.

Courses in chemistry numbered above 100 carry graduate credit and will be graded on either an HP, P, LP, NC [high pass, pass, low pass, no credit (= fail)] basis or a simple CT (credit) or NC (no credit) basis. Whether or not such courses satisfy explicit graduate program requirements varies from student to student and depends on the degree the student is seeking. Courses numbered over 100 in other departments may carry graduate credit as well, and questions about them should be addressed to the student's advisor.

Courses numbered below 100 never carry graduate credit. Many of these courses can be used to satisfy the Breadth Requirement in lieu of a satisfactory performance on the diagnostic exams. These courses are graded on an A, B, C, D, E basis, and for the purposes of satisfying the Breadth Requirement, a grade of C⁺ or higher is considered satisfactory. Grades of LP or NC may not be used to satisfy either the Breadth Requirement or the course requirement for the Master's degree. You should consult your instructor whenever you are unsure of your standing or performance in any course.

Penalties for unsatisfactory performance in graduate courses (LP or NC grades) are discussed in the Graduate Student Handbook distributed by the Graduate Studies office (available at <http://www.dartmouth.edu/~gradstdy/students>).

Teaching

Experience as a teaching assistant is a regular degree requirement for all graduate students in Chemistry and in most other departments at Dartmouth. Graduate students benefit from such experience by acquiring chemical knowledge and by developing teaching skills. Such skills are valuable whether or not you seek a career in teaching. Undergraduates benefit from the presence of graduate student teaching assistants in several ways. First, of course, there simply isn't enough faculty time available to give undergraduates the individual attention they need and deserve. Equally important, however, is the fact that graduate students, still close to their own undergraduate experience, frequently are uniquely effective in helping students learn techniques of problem solving and laboratory skills. Finally, graduate students serve as important role models for undergraduates, many of whom will eventually do honors research projects and go on to chemistry graduate school.

Graduate students serving as teaching assistants (and thus as an extension of the regular faculty) have many of the responsibilities of the faculty, and they share with the faculty a position of authority over their students. Consequently, graduate students must avoid personal relationships with undergraduate students they are either supervising or might reasonably be expected to supervise in the future. See the **Policy on Consensual Relationships and Conflict of Interest** on the Graduate Studies' web site: <http://www.dartmouth.edu/~gradstdy/students/undergradrel.html>.

The teaching requirement for the PhD is measured in terms of teaching terms, with a typical term of service requiring 15-20 hours per week of teaching-related activity in one course during a ten-week academic term. In a First Year course, for example, this might involve two four-hour laboratories each week, plus grading laboratory notebooks, answering questions, and helping grade midterm and final exams. We try to make total career teaching assignments equitable, recognizing that no two courses are really alike.

Dartmouth recognizes the value of the teaching assistant experience in graduate education, and it provides the department with stipend funds, known as Dartmouth Fellowships, or DFs, to support its teaching mission. We expect each student to complete at least four units of TA duty (three, if the student is in the MD/PhD program). Normally, students are supported on DF funds during their first two years, and four TA terms will be assigned during those years. Students will be assigned to more TA terms in subsequent years if their research advisor lacks external research grant funds to provide a research assistantship, or RA, stipend. Beyond the second year in the program, students supported on DF funds will be expected to serve as a TA during one of every two terms of DF support. Students will be informed as soon as possible of any TA terms they may be required to serve beyond the minimum of four. While students may serve as a TA for more than four terms, it is important to realize that the stipend amount is the same for a DF term or an RA term. Students who have been awarded a special fellowship provided by an external agency, such as a National Science Foundation Graduate Fellowship, will be paid at that fellowship's rate for the duration of the fellowship and will generally serve their four TA terms during their first two years.

In the fall of the first year, graduate students enroll in Chemistry 256, Graduate Instruction in Teaching. This course covers fundamental issues you will encounter as a teacher. Students may be judged upon arrival to lack proficiency in English. In such cases, they will be obliged to take a course in English as a Second Language, beginning in the fall term of their first year. A final grade for Chemistry 256 will not be assigned until adequate proficiency in English has been demonstrated, and such students may not begin their teaching assignments. If English proficiency

has not been achieved by the end of the Fall term of the first year, a student will be placed on probation; if proficiency has not been demonstrated by the end of the Winter term of the first year, the student will be separated from the program. After the first year, students are asked to state their preferences regarding assignments, and such requests are taken into account, along with faculty requests, the requirements for continuity in some courses, and the goal of giving each student a variety of experiences. A student enrolls in Chemistry 257, Supervised Undergraduate Teaching in Chemistry, in each term she or he serves as a teaching assistant. This course is graded, and a formal evaluation of each student's performance will become part of the student's file.

Advanced students with a particular interest in developing teaching experience may make special arrangements with a faculty member. Students interested in such an arrangement should discuss it with their research supervisor and with the Chair of GSAC.

**Research
Supervisor and
Research
Committee
Selection**

Students are urged to begin thinking about possible areas of research activity and an appropriate research supervisor as soon as possible. This is obviously an important decision which should be made very carefully and on the basis of all information available.

The selection of a research supervisor is one that requires a mutual agreement between the supervisor and the student as well as the approval of the department. Students may be admitted to our graduate program with a condition, stated in the department's letter offering admission, that the student will work in a specific research area or in a specific research group. If the offer letter does not specify such a condition, we require students to talk to at least three members of the department during the first eight weeks of the Fall term regarding possible research activities. Each faculty member will generally have several possible areas of research with interesting problems available for graduate students. Occasionally, students may wish to carry out all or part of their thesis research in another department. Special arrangements for such research can be made, and general guidelines are given later in this Handbook. At the start of the fall term of the student's first year in the program, GSAC will provide each entering class with a list of research groups that are able to accept new students in that year along with GSAC's best projection as to that group's source of graduate student stipend funds. The type of stipend funds available through any one group can affect the total number of terms a student will serve as a teaching assistant, as described in the previous section on Teaching. GSAC's projection generally cannot extend over an entire graduate student career in the program, and the projection provided at the start of the first year must not be taken to be a promise of support of any one particular type or amount during the student's total time in the program.

The faculty will meet as a group at the end of the fall term to review students' individual rankings of potential research supervisors, and final assignments to research groups will be made by the faculty taking into account those rankings along with other departmental concerns such as sources of financial support and any conditions made in the letter offering admission.

After a graduate student has been assigned a research supervisor, the supervisor in consultation with the student will nominate to GSAC at least three additional faculty members to serve on a Research Advisory Committee charged with the responsibility of observing progress and offering advice on the student's research work. One member of this committee, not the research supervisor, will act as chair of the committee. Since it is the duty of GSAC to ensure that these committee assignments are somewhat evenly distributed among the faculty, a student's first choices cannot be guaranteed.

Progress Reports and Research Committee Meetings

An important aspect of any research career is the periodic reporting needed to gauge progress, set new directions, and invite comment from other experts. In your graduate career here, you will learn how to do this through periodic progress reports directed to your Research Advisory Committee. Periodic meetings with this Committee will ensure the proper flow of information needed to keep them informed of your progress and to allow you full benefit of their advice and council.

The Research Progress Report

By no later than the first day of the Summer term of each year, each student shall submit a written Research Progress Report to her or his Research Advisor in advance of an annual meeting to be held in that term. Once the advisor has approved the report, but preferably no later than the end of the second week of the Summer term, copies should go to the other members of the student's Advisory Committee. In addition to the scientific content, the prose aspects of technical report writing will be considered by the Committee, since effective written communication of scientific results is an important professional skill to master. The report should contain a succinct abstract (no longer than one double-spaced typewritten page), and the body of the report is to be no longer than fifteen pages. The details of auxiliary information, such as experimental procedures, analyses of compounds, design of apparatus, etc., should appear in Appendices to the report. Not all research groups will require such Appendices; your Research Advisor should be consulted as to the exact format.

Each report should include a statement of the direction planned for research in the next six months as well as a recapitulation of the previous period's accomplishments. It is to be remembered that failures often constitute progress in a research setting. The first report should be simply a statement of the proposed research, placing it in scientific context.

Meetings with the Research Advisory Committee

During the summer of each academic year, each student will meet with his or her Research Advisory Committee for the purpose of describing what has been achieved as well as future research plans. The Research Progress Report described above will be the basis of discussion for much of this meeting.

Each student will select a time for the meeting in consultation with the members of her or his Research Advisory Committee that is free of conflicts, and the student will notify members of the Committee of the meeting time and location preferably *four weeks in advance*. (The Research Progress Report must reach the Committee members at least *one week* in advance unless a committee member requests a different schedule.)

In addition to these general topics for each meeting, each year's meeting has specific areas of concern as described below.

End of the First Year

At this first meeting, the student should provide a description of his or her research project and an initial plan of attack as well as any research progress to date. Plans for scheduling the term for the Second Year Seminar (based on anticipated course and teaching loads) should also be discussed, and any questions the student might have about this requirement should be answered as well.

End of the Second Year

The main purpose of this meeting is to provide a detailed description of research accomplished during the second year and a clear definition of research plans for the next several months. The student will also provide the committee with a summary of 1) his or her progress in meeting the various teaching and cumulative examination requirements; 2) courses they have completed; and 3) plans to enroll in future course offerings. The timing and nature of the Research Proposal requirement will be discussed, and a target date for presenting this proposal should be agreed to.

End of the Third Year

This meeting should focus entirely on the research progress to date and the research remaining to be done. Generally, all requirements for the Ph.D. degree will have been completed by this meeting except for the thesis itself.

End of the Fourth Year (and annually thereafter)

If required, the student will provide a detailed description of the additional research that must be completed to bring the research project to a point at which a thesis can be written. If, on the basis of this review, the student's Research Advisory Committee is convinced that the student's progress is such that they can complete the thesis within a reasonable period of time, they will recommend continued stipend support in the following year.

General Requirement for Meeting Documentation

It is to the advantage of all involved that the various issues and milestones discussed in each Research Advisory Committee meetings be documented to the satisfaction of everyone at the meeting. To this end, the student will provide a written brief summary of each meeting (whether a regular annual meeting or one called at another time as described below) to all members of the Research Advisory Committee. These members, in turn, will review this summary and approve or edit it as necessary. The final summary, as approved by the student and Committee, will become part of the student's permanent file in the department. Normally, this summary should be completed within two weeks following the meeting in question. Should the student fail to complete this summary, he or she will be subject to receiving a grade of NC (No Credit) for the research course elected during the term of the meeting.

Provision for Additional Meetings

Additional meetings of a Research Advisory Committee may be called by any member or by the graduate student. A Research Advisory Committee may make oral or written reports to GSAC or the department on the student's progress as it sees fit or at the request of the department. The Research Advisory Committee may also set other requirements for a student when it believes that meeting these requirements is important for the student's professional development.

**Grievance
Process**

It is the aim of GSAC and the Research Advisory Committee structure to provide each student with a supervised, fair, and consistent graduate experience. The Research Advisory Committee exists to provide each student with a variety of expert research consultants and points of view, as described in the previous section. In addition, the Committee can act as a sounding-board for any conflicts, misunderstandings, or concerns that might arise in the mind of the student or the student's research director. Discussion within the Research Advisory Committee is the first step in resolving any grievance or program-related concern that might arise, but should questions or concerns remain, the formal grievance process outlined here is available to ensure that equitable and unbiased consideration is given to any concern.

Should the Research Advisory Committee be unable, for whatever reason, to provide a resolution that is satisfactory to all concerned, the grievance will be brought to the attention of GSAC and the Chair of the Department. (Should the Chair be directly involved in the grievance in question, GSAC alone will meet.) The majority of concerns have been historically resolved through the Research Advisory Committee or through GSAC.

If a satisfactory resolution can not be reached within the department, the Dean of Graduate Studies (perhaps joined by the Associate Dean of the Sciences if appropriate) will meet with all directly involved in the grievance in an attempt to reach a mediated resolution. If the Dean (or Deans) is (or are) unable to reach a satisfactory resolution, the aggrieved party or parties can request in writing a formal hearing and ruling by the Dean of Graduate Studies and the Committee on Student Grievances as described in the Graduate Student Handbook distributed by the office of the Dean of Graduate Studies, available online at <http://www.dartmouth.edu/~gradstdy/students/>.

**Special
Arrangements
to Carry Out
Research in
Other
Departments**

A student enrolled in the Graduate Program of the Department of Chemistry may decide during the first term to carry out research in another department, and he or she is welcome to do so. Such a decision should be communicated in writing to the Chair of GSAC by the end of the Fall Term. Two situations can be distinguished:

In the first, the student may simply elect to transfer to the other department. If he or she is accepted by the new department, he or she may transfer after the Spring term of that first year, and the mutual obligations between him or her and the Chemistry Department cease as of that date.

Alternatively, he or she may choose to continue toward an advanced degree in the Chemistry Graduate Program but to do his or her dissertation under a member of another department. If accepted by that professor, the student must submit to the Department of Chemistry the title and a brief description of his or her dissertation topic, together with a program of course work. Provided that the dissertation is substantially chemical in nature, approval by the Chemistry Department may be expected. One member of the Chemistry Department will be designated as the associate research supervisor, and it would be well for the student to work out such an arrangement before submitting the request to the department.

The student is obliged to fulfill within the Chemistry Department all of the other requirements for the Chemistry degree program including the teaching experience. Generally, a chemistry graduate student who is assigned to a research group in another department will serve as a TA during two terms of the student's first year in the program, and he or she will be supported on a Dartmouth Fellowship during all of that year. The additional two terms of TA service will occur after the first year at times determined by the department's teaching needs and the student's research progress. The student will be supported on a Dartmouth Fellowship during those two terms, but except for these two teaching terms, the financial obligation of the Chemistry Department to the student will typically terminate on June 30 of his or her first year.

***Special
Arrangements
for Students in
Other
Departments
to Carry Out
Research in
Chemistry***

A student enrolled in the Graduate Program of another department may decide in his or her first year to apply to carry out thesis research in the Chemistry Department. Such an application should be made to the Chair of the Chemistry Department by the end of the Winter Term for approval by the department.

The student is obliged to fulfill, in addition to the requirements of his or her own program, an appropriate teaching requirement within the Chemistry Department. This requirement will be chosen with the individual's circumstances in mind.

Safety

There are numerous Federal and State laws and regulations that govern laboratory activities ranging from hazardous waste disposal to personal safety. The department, in conjunction with campus-wide safety efforts, has devised the following guidelines for safe operation of our facilities. In addition to these general statements, you must read and follow the Chemical Hygiene Plan, a copy of which will be issued to you shortly after your arrival.

- *Adherence to the safety rules is **not** optional, and it is important that a clear and consistent policy is followed by all members of the Department. The Chemistry Department Safety Policy is contained in the Chemical Hygiene Plan, which has been approved by vote of the faculty. That we have such a plan is not optional; it is required by law of all Chemistry Departments. All principal investigators, research workers, stockroom personnel, and teaching assistants must have access to a copy of this plan and are expected to read it and comply with it. Changes to this plan within the constraints of prevailing federal and state safety laws cannot be made without Departmental approval in the form of a faculty vote.*
- *The safety policy requires appropriate eye protection, footwear, and skin protection. The appropriate level of protection may vary according to the nature of the research conducted in any particular lab, but general protective measures must be followed as detailed in the Chemical Hygiene Plan itself.*
- *Responsibility for enforcing safety rules in undergraduate teaching labs rests with the lab instructor and the teaching assistants.*
- *Responsibility for enforcing safety rules in research labs rests with the faculty member in charge of that laboratory.*
- *Experienced workers in any teaching or research lab should also take leadership roles and help to educate other workers by example.*

Your research advisor can assist you in the selection and purchase of appropriate safety equipment for specialized needs, and she or he should also be consulted for any unusual hazardous waste disposal requirements or other hazards your research lab may have. In general, all chemical waste should be considered hazardous in that specific disposal protocols must be followed. Specific disposal and collection protocols for non-aqueous solvents vary according to the nature of the solvent.

The chemistry department works closely with Dartmouth's Environmental Health & Safety department. This department makes periodic inspections of research and teaching laboratories and issues reports of its findings to those responsible for each lab. All deficiencies found by these inspections must be corrected immediately.

Cumulative Examinations

Successful completion of a series of Cumulative Examinations constitute an important part of the Ph.D. program. These examinations are given four times a year, once in the Fall and Spring terms, and twice in Winter. Each offering is composed of four exams: one in each of the following four areas: organic chemistry, physical chemistry, inorganic chemistry, and biological chemistry. (These area descriptors should be considered to be rather broad. For instance, “inorganic chemistry” can include “materials chemistry” or “organometallic chemistry.”)

The general topic of each of the four exams, and frequently a list of key references, is announced two weeks before the date of the examination. Relevant materials will sometimes be put on reserve in Kresge library or otherwise made available. Although each student is expected to attempt only one of these four exams, it is the intention of the department that this structure of the examinations will encourage students to take a broad view of Chemistry and avoid narrow disciplinary stereotypes. Indeed it is entirely possible for a student to attempt and pass two or even three exams in any one offering. Each exam is graded separately, so that more than one passing grade can be earned on a single offering.

The departmental requirement is that *five* exams must be passed *during the first three years* of graduate work, and that *at least two passes must be earned by the end of the second year*. Of the five passed exams, *at least three must be in areas closely allied to the student's research field*. All students are expected to attempt cumulative examinations starting at the beginning of their first year. There is *no* penalty for failed exams, so that there is every reason to begin trying the exams immediately. They are intended as an educational device, and even when a student has not had time to prepare for a given exam, attempting it should provide valuable practice. Anyone intending to take a particular exam must express to the exam author his or her binding intent to do so (via a signup sheet that will be in the main department office) on or before the Monday preceding the exam day. (Typically, the exams are scheduled for the following Monday, and students with Monday evening teaching assignments or other academic conflicts will be allowed to take their exam at another time.)

Exams are graded HP (high pass), P (pass), CP (conditional pass), and F (fail). A CP on one exam garners credit only in conjunction with an HP on another; one HP and one CP are the equivalent of two P grades.

To students, the cumulative examination system may at best appear to be a series of hurdles blocking the road to the Ph.D., or at worst as a diabolical mechanism of extended torture. From the faculty viewpoint, the system is designed to develop in students the skill and the habit of self study and to provide a continuing contact with the progress of the chemistry research literature on a broad front. To underscore the educational function of the examinations, the author of each exam will be happy to review it with students after the exams have been returned.

**Other
Requirements:
Ph.D. in
Chemistry**

While there is no formal requirement of demonstrated skill in reading technical literature in a foreign language, acquisition of such a skill or a skill in another area may be expected of certain students in the Ph.D in Chemistry program, as explained below.

When it is the judgment of a graduate student's Research Advisory Committee that demonstration of competence in a particular discipline is important for that student's professional development, the Committee may require demonstration of such proficiency as part of satisfactory progress toward the Ph.D. degree. For example, a student of synthetic organic chemistry might reasonably be expected to develop a reading knowledge of chemical German, whereas a student of physical chemistry or chemical theory might reasonably be expected to demonstrate competence in some aspects of computer programming. In such cases, the research committee will notify the student no later than the end of the Spring Term of the student's second year as to the nature of the requirements, the methods by which they can be satisfied, and the time by which they should be completed.

**Other
Requirements:
Ph.D. in
Chemistry-
Materials**

The Chemistry-Materials program has several additional requirements that must be completed before a degree will be awarded. Students are required to attend the bi-weekly meetings of the Center for Nanomaterials Research group discussion. At least once per year, a research-in-progress talk must be presented during these discussions by every enrolled graduate student. Prior to receiving the Ph.D. degree, students must present their research at a national professional society meeting (poster or talk) and have at least one research manuscript accepted for publication in a professional, refereed journal.

Research Proposal

The doctorate degree should testify to a demonstrated ability to carry on independent research. An important component of that ability is the development of the chemical insight and originality required to identify and isolate a valid research project. To help develop this skill and to encourage this habit of thought, each student is required to submit an original research proposal in an area not closely related to his or her thesis research. The topic chosen should be approved in advance by the student's research advisor. The research advisor may give occasional advice, but beyond this the work should represent an independent effort by the student.

The proposal involves a short written description (3-5 pages) of a substantive unsolved problem, including a proposed method of attack on the problem. The proposal must be presented and defended before the Research Advisory Committee which will evaluate its merits and deficiencies. (Note, however, that sometimes the page limit is waived for revised and final versions that may thus be longer than the initial 3-5 pages.) The Department office keeps a collection of recent research proposals, and once yours has been accepted, you should file a copy in the collection. This collection can be perused in advance to give you a feeling for the scope and range of these proposals.

A target date for the presentation will be agreed upon at the meeting with the Research Advisory Committee at the end of the second year. This target date must be *no later than May 1 of the third year*. *Failure to complete the research proposal requirement by June 30 of the third year will normally result in cessation of the stipend as of that date*. Upon satisfactory completion of the requirement, the stipend will resume.

The requirement will be evaluated on the depth of the student's understanding of a significant original research idea. Should the Committee find the initial presentation to be lacking, written comments as to the deficient areas will be given to the student with the understanding that a second presentation should address those areas in depth. If a second presentation shows no significant improvement, the requirement will have been failed, but if there is improvement, the requirement will have been passed, or a third presentation can be called for, as the Committee sees fit. The Committee's recommendation after each presentation will be forwarded to GSAC.

Seminars

A continuing exposure to a wide range of materials presented in the departmental seminar programs, as well as the opportunity of developing and presenting several seminars, is an important part of graduate education.

The weekly Departmental Chemistry Colloquium is normally held every Thursday morning at 10:30 during the Fall, Winter, and Spring terms. It brings visiting scientists to the department on a regular basis, with topics ranging over the whole field of Chemistry. **Attendance at the Colloquium is required of all students in the Ph.D. in Chemistry program.** It is designated as a formal course, Chemistry 140, which should appear on every course registration card.

An adjunct meeting of Chemistry 140 is reserved for Wednesday afternoons at 4:00 PM. This time period is used primarily for student presentations, but outside or local faculty speakers may use this time as the need arises. **Attendance is required of all Ph.D. in Chemistry students for all student presentations such as the Second Year Seminar described below, Ph.D. thesis defense presentations, etc.**

Each graduate student is required to present a 50–60 minute seminar in the 4:00 Wednesday time slot *by the end of the Winter term of the second year* in residence, on a date agreed upon by the student's Research Committee. This seminar should be on a topic outside the main thesis subject, and it should be at a level suitable for the diverse audience of the full Department. It is expected that preparation for this seminar should take no more than two weeks. An announcement of the seminar should be posted at least one week in advance, and the announcement must contain a brief abstract of the talk (one-half page) including any pertinent leading references. A copy of the announcement should be given to each Committee member. This seminar presentation must be of professional quality and must be approved as acceptable by vote of the student's Research Advisory Committee. The result of this vote will be transmitted to the student and to GSAC by the student's research supervisor. The seminar will be evaluated along the lines of the research proposal's evaluation, and a first presentation, if deemed unsuitable, will be followed by written comments from the Committee to aid preparation of a second presentation. A grade of P (Pass) for the seminar satisfies the requirement, a grade of CP (Conditional Pass) indicates that portions of the seminar were satisfactory, but that a second, shorter seminar must be presented on some aspect of the same or related topic, and a grade of F (Fail) indicates that the seminar was unsatisfactory and that a second seminar must be presented on a topic different from the first. If the first presentation is not deemed satisfactory (i.e., a grade of P is not obtained), a satisfactory presentation must be made by the end of the Spring term of the second year in residence.

Finally, each student will present a full length seminar as part of the Ph.D. thesis presentation and defense. This will be an open seminar, and it will normally be followed by the closed oral defense of the thesis before the Committee.

In addition to Chemistry 140, one or more of the courses numbered in the 260 series, Graduate Research Colloquium in Chemistry, should be elected by students in those research areas covered by these courses that are appropriate and approved by the research director. (Some of these courses may not be offered each term; consult your research director.) These courses provide a valuable setting in which students gain practice in seminar presentation techniques, meet to discuss common contemporary research topics, and share their research progress with their peers.

Seminar Presentation Hints

The Second Year Seminar is an important aspect of our Ph.D. program. The seminar is an opportunity for you to learn about a new topic and to convey your impressions of it to an audience; this is something you will do again and again throughout your professional career, whether in industry or academe. Possession of new knowledge has little utility unless you are able to communicate it effectively to your peers. Dissemination goes side-by-side with discovery in all of research.

It is easy to stand in front of a group of people and talk for 50 minutes; the hard part is to tell them something clearly and coherently during that time. This section gives you some guidance as to ways to improve the flow of new information. The bottom line is careful preparation and practice. All of the tricks of the trade and even years of experience cannot substitute for the improvement a talk always gains by at least one dry run.

Opinions differ, of course, as to what makes one speaker better and more informative than others, but the following are some general suggestions that may improve presentations:

- Expect to be nervous. And take comfort that a case of “butterflies” is a normal part of giving seminars, speeches, and lectures, even for the faculty! The nervousness will go away once you are into your talk, especially if you have the confidence that good preparation and practice will ensure.
- Assume your audience knows nothing about your topic unless you have good reason to know otherwise. A succinct introduction and an outline of your talk lets the listener know where you are and what to expect.
- Take your time in speaking. Look at the audience and gauge their level of puzzlement. Stand still as you talk, as if you were talking to one person and not to a room-full.
- Use visual aids with care and planning. The blackboard is a tempting open space when erased. Plan its use in advance—and do plan to use it. The blackboard forces you into a slower pace and allows you to show a step by step relationship in a way computer presentations can't. If you're going to put an outline on the blackboard, do so to one side, saving the middle for later use. WRITE BIG. Don't erase what you've just written. Anticipate that you may well need blackboard space to respond to questions at the end of your talk. Computer presentations can be magic or disaster. It is so easy to scan figures or tables from a text into a computer that one forgets that the Journal size was meant for one person to look at from a distance of 12", not for a roomful to look at from 12'. Remember that there are enlarging copying machines in the department. Fill the screen with a single figure or at most two figures. A computer is a great help if you use large type fonts and always remember to keep the text per screen to an absolute minimum. More than about 50 words per screen is usually too many. (There are about 340 words in this paragraph!) Color, if used carefully, can be a great visual aid. But don't use the whole spectrum of colors just because they are only a mouse-click away. Graphs of data, even qualitative trends shown graphically, are always better for a talk than tables of numbers. If an article has a table of lots of numbers and you care about only a very few of them, make your own table instead of copying from the article. Should you choose to use transparencies, practice putting them onto overhead projectors—you don't want your thoughts distracted as you try three or four orientations during the real talk. Put a small dot in the upper right hand corner as an aid to orientation.
- Show interest in your talk. If you go to the trouble of making a slide or transparency, display it and linger over it for a while. Resist the “flash-card” syndrome of

rapid-fire display. When pointing to some feature on the screen, use a pointer, point to the thing of interest, and keep the pointer *dead steady* on that item as you talk about it. You may be looking at the item of interest, but the audience needs that pointer for its visual cue. Laser pointers aren't light sabers, and wooden pointers aren't marching band batons, post-hole diggers, or javelins. Use them to point, then hold them steady or put them down. Make use of everything you put on a transparency or slide. Don't assume the audience will read and absorb what you wrote without your help.

- Don't make up something just to "look good." If you don't know an answer to a question, or you don't fully understand some aspect of your talk, admit it freely! After all, the speaker can learn from the audience just as the audience learns from the speaker.

- In planning what to say about your topic, try to keep the Big Picture in mind. Especially for a Second Year Seminar, you will be presenting a topic of some generality. How does it fit in with other techniques/theories/methods? What led someone to consider your topic in the first place? What is its future? Why were you attracted to it? These are questions your audience will ask itself, and the answers are worth discussion.

- On the other hand, don't be so general as to be vague. Often, if discussing a new technique, it is invaluable to guide your audience through one or two examples from the literature in some detail and depth. A theoretical basis, if applicable and to the depth you understand it, should be given, but intuitive physical pictures often last far longer in a general audience's memory than do numerous equations. Similarly, synthetic schemes or mechanisms, biochemical cycles and processes, and the like should be discussed in generic form before applied to specific examples.

- Finally, remember that none of these rules are rigid. Seminar presentation can't be condensed to a flowchart of actions. How you choose to follow these general guidelines gives a certain personality to your talk. This choice is honed with experience and practice.

In choosing a topic for your Second Year Seminar, you will naturally seek advice and guidance from your research advisor, Committee, fellow students, and so on. Once your topic has been chosen, get all the help you can in assembling the relevant literature, culling from this the major references, and selecting topics for discussion. Avoid last-minute panic by getting a good head start, but don't let your life be consumed by preparation for the Seminar. You have other equally important things to do!

Thesis

The thesis represents the final documentation of your achievement as a graduate student. Certain mechanical requirements of format and style are set by the Graduate Studies Office, and a copy of these may be obtained from that office located in Wentworth Hall or at <http://www.dartmouth.edu/~gradstdy/students/thesis/guidelines.html>. You can also see what a thesis is all about by looking at typical examples in the library or in the collection of theses directed by your research supervisor.

If there is any single injunction that might be appropriate, it is the recommendation that you keep in mind the eventual *need* for a thesis. Take appropriate steps along the way to prepare yourself for the grand moment when thesis writing time comes. Some students can write easily and well; some design their experiments so that all relevant contingencies have been explored and documented; some carry through and record literature searches which leave no questions unanswered. If you do all of these, you can safely forget about thesis writing until that time when your laboratory work is finished. If you suspect weaknesses in one or more of these areas, then you should give serious thought to the matter well ahead of time. The best preparation is to write up units of your research as sort of mini-theses as you go along. You will be well advised to design your research reports to serve this function, and you may also wish to supplement these reports with additional summaries, reviews, etc. Even though many of these will never be used in the thesis because of changes in research goals, some of them will turn out to be the basis for whole chapters in the thesis. And *all* of them will have provided the practice which will greatly help production of the real thing.

It is your responsibility to ensure that the thesis is written in acceptable scientific format using grammatically correct English. While your research advisor and committee members may be willing to give advice on the overall organization of the thesis, they should not be considered as the principal proofreaders, and the thesis should not be submitted to them until you think that it is in satisfactory format. Each member of the Research Advisory Committee must certify in writing that the format and overall quality of presentation of the thesis are satisfactory before dates for the seminar presentation and the final scientific defense of the thesis results can be set. A form is available in the departmental office or on the department's web site on which you can collect the appropriate signatures and acknowledge that you believe your thesis is in the correct format and understand that acceptance of your thesis in this form by your Ph.D. examining committee does not, at this stage, constitute or imply your Ph.D. examining committee's final approval of it. The date for the defense may not be sooner than two weeks after approval by the Research Advisory Committee. Theses which are not of acceptable format or which contain an unacceptable level of spelling or grammatical errors may be returned to you for further correction.

Final defense of the Ph.D. thesis will have two parts. The first will be an open departmental seminar followed by an oral defense before your Ph.D. Examination Committee (which must include three full-time Dartmouth faculty members of which a minimum of two must be from chemistry as well as an external member with a faculty-equivalent research appointment outside of Dartmouth College). The main office has a form to list proposed committee members that must be approved by the Dean of Graduate Studies. The second part is satisfactory completion, and approval by the Ph.D. Examination Committee, of the thesis embodying the research. These two parts of the final examination will normally occur on the same day, but the seminar may be scheduled some days earlier if such an arrangement is mutually convenient. Acceptance of the Ph.D. thesis requires unanimous approval by the Ph.D. Examination Committee of both the oral defense and written thesis.

**Important
Deadlines and
Dates**

The chart below lists several important deadlines and dates for the various requirements of the program. This chart is intended to be a quick reference point. For details and specifics, refer to the appropriate section in this Handbook. Almost every box below should have *Make progress on research* added to it as well!

	Summer Term	Fall Term	Winter Term	Spring Term
First Year	<i>Study for Diagnostic Exams</i>	<i>Diagnostic Exams before start of term</i> <i>Rank research group choices by 8th week</i> <i>Cumes offered</i>	<i>Cumes offered</i>	<i>Diagnostic Exams offered (if needed) following end of term</i> <i>Cumes offered</i>
Second Year	<i>Progress Report due by end of 2nd week</i> <i>Research Advisory Committee meeting</i>	<i>Diagnostic Exams offered (if needed) to complete Basic Knowledge requirement</i> <i>Cumes offered</i>	<i>2nd year Seminar by end of term</i> <i>Cumes offered</i>	<i>Cumes offered</i> <i>Two cumes completed</i>
Third Year	<i>Progress Report due by end of 2nd week</i> <i>Research Advisory Committee meeting</i>	<i>Cumes offered</i> <i>Complete Graduate Level Course Requirement by end of this term</i>	<i>Cumes offered</i>	<i>May 1 Research Proposal deadline</i> <i>Cumes offered</i> <i>Five cumes completed</i>
Fourth Year	<i>Progress Report due by end of 2nd week</i> <i>Research Advisory Committee meeting</i>			
Fifth Year	<i>Progress Report due by end of 2nd week</i> <i>Research Advisory Committee meeting</i>			<i>Stipend after twentieth term in residence contingent on external research funds of the student's research director.</i>