

Department of Geology & Geophysics
Yale University

TWO TO FOUR PROGRAM REPORT TO GRADUATE SCHOOL OF ARTS & SCIENCES

CHAIRMAN'S OFFICE AND THE OFFICE OF THE DIRECTOR OF GRADUATE STUDIES

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The Department of Geology & Geophysics supports the Graduate School's initiative to re-examine the state and fate of departmental programs because it corresponds well with a similar albeit earlier and much broader departmental self-study and program renovation. This effort was launched organically during the 2002/2003 academic year and the resulting thoroughly revised program implemented in the Fall of 2003. While the Graduate School's 2-4 program was subsequent to our department's self-study and program revision, there are many common features. While this is not surprising, given aspects of the genericity of the nature of a subset of the issues that graduate programs face, it is also the case that each department has needs, history, disciplinary constructs and issues of technical acuity that do not render them to a "one size fits all" program of evaluation. This is particularly acute for Department of Geology & Geophysics, the faculty of which span perhaps the broadest range of disciplines of any science department at Yale, from evolutionary biology, geology and geochemistry to the physics of the earth's deep interior to its atmospheres and oceans. Therefore, it is particularly important that our department underwent this evaluation organically and without external pressure. A very brief history illuminates the process of the department self-study.

It is well known that the Department of Geology & Geophysics experienced a substantial change and expansion beginning in about 2000 with the addition of 11 new faculty in about 3 years and this change continues in the assistant professor ranks. The new faculty immediately brought to the fore issues for which they were passionate, in particular concerns about the graduate program based on their experiences at other universities and in a variety of departments that are not limited to the Earth and planetary sciences. Discussions were held in numerous faculty meetings as the evolution of grad-

uate training in the pre-evaluation stage played out. In consequence, a committee was appointed to design and oversee a review of the program that was spearheaded by David Bercovici (during his first year as DGS, 2002-2003) before the present DGS arrived at Yale. The committee's work was in full swing in the Fall of 2002, and a major revision of the program submitted and approved by the department in Spring of 2003; in the process all of the core way-points of the suggested *Procedures and Implementation* (at <http://www.yale.edu/graduateschool/academics/2-4.html>) were embraced. The entire Departmental Graduate Program Handbook for Students and Faculty was subsequently rewritten in summer of 2003 (latest version attached as part of our report). It is unnecessary here to re-numerate the procedures listed by the Graduate School as part of the 2-4 program that we went through internally but it is important to note that the changes in the handbook itself were substantial, tantamount to a complete revamping of the procedures of student evaluation and examination. Since implementation of the new program there are ongoing re-evaluations and adjustments of the program based principally on our open dialogue with the students and faculty. The Graduate Schools launching of the 2-4 program during the last year gave the department an excellent opportunity to gather further feedback from students and faculty, and these have been readily addressed with only moderate adjustments to the new program.

It is also noteworthy that our self evaluation focused on years 1-4 and addressed all of the issues delineated on the 2-4 website. The principal changes were (a) in the nature and number of courses and when they were taken (b) the modality, extent, form and length of the regular progress evaluations for graduate students (c) the entire structure of the qualifying exam and (d) the entire structure of the third year review. Were we to summarize this in one sentence we would say that much of the change is to evaluate students in the context of research progress by replacing written and oral examinations over coursework material with oral defense and examinations based on two written "Discourses" that present work on separate research projects. The details of the program are outlined at length in our Graduate Handbook; in general structure in sections 2.1, 2.2 and 2.3 and more with more specificity in 2.7 and 2.8.

It is important to emphasize that the department has one of the oldest standing graduate student clubs in North America, the Dana Club, and through this there is in existence a ready and open conduit for expression and feedback between the students and the faculty. We use the forum of regular meetings between the Dana Club and the Chair and the DGS to solicit feedback about the progress of our new graduate program. We endeavor to enhance the program with continual changes and we communicate these amongst all members of the department through the Handbook.

In the recent past and present we are in an ideal situation to make the next stage of refinements because we have students defending their theses in this academic year who were passed to candidacy in the old system and they provide a comparison and contrast for the students and the faculty. Because of their evolving maturity as scholars these senior students and recent graduates are in a good position to provide frank and honest feedback. They have done so and on major issues we are bound by the democratic process to implement those both in the context of discussion and in the context of faculty vote. We welcome all feedback, but also recognize that any complex organizational structure will not be uniformly satisfactory for all of its members. We trust and hope that our substantially revised graduate program provides the rostrum for an improved system of vetting and education for scholars of the Earth and planetary sciences.

Department of Geology & Geophysics
Yale University

**GRADUATE PROGRAM HANDBOOK FOR
STUDENTS AND FACULTY**

OFFICE OF THE DIRECTOR OF GRADUATE STUDIES

John S. Wettlaufer, Director of Graduate Studies
Peter Schrader, Graduate Registrar

Last Revised: December 2, 2007

For students entering after the 2002/2003 Academic Year

Contents

1	INTRODUCTION	4
1.1	General Information	4
1.2	Offices Relevant to the G&G Graduate Program	5
1.3	Committees Relevant to the G&G Graduate Program	7
2	REQUIREMENTS FOR THE PhD DEGREE	9
2.1	Outline of Requirements	9
2.1.1	Requirements for Admission to PhD Candidacy	9
2.1.2	Post PhD-Candidacy Requirements	9
2.2	Abbreviated Schedule for the PhD Program	10
2.3	Complete Schedule for the PhD Program	11
2.4	Residence Requirement	14
2.5	Advisory Committees	14
2.6	Standing	14
2.7	Course Work	15
2.7.1	Areas of Concentration and Designing a Program of Study	15
2.7.2	Courses and Grades	15
2.7.3	Independent Reading	16
2.8	Research Milestones	16
2.8.1	Research Projects and Preparation of the Discourses	16
2.8.2	Preliminary Presentations	18
2.8.3	Submission of the Discourses	18
2.8.4	The Qualifying Presentation	20
2.8.5	Third-Year Dissertation Review	21
2.8.6	Submission and Defense of the PhD Dissertation	22
2.9	Miscellaneous Requirements and Expectations	24
2.9.1	Foreign Language Competence	24
2.9.2	Attendance and Presentation at Scientific Meetings	24
2.9.3	Field Experience	25
3	REQUIREMENTS FOR THE MSc DEGREE	26
3.1	Residence Requirements	26
3.2	Course Requirements and Grades	26
3.3	Research Essay or Thesis	26
4	FINANCIAL SUPPORT	27
4.1	Research Grants	27
4.2	Financial Aid	27
4.2.1	University Fellowships	27
4.2.2	Outside Fellowships	28
4.2.3	Research Assistantships	28
4.2.4	Project Assistantships	28
4.3	Paychecks and Income Taxes	28
4.4	Funds for Symposia, Seminars, Colloquia	28

5	STUDENT TEACHING APPOINTMENTS	29
5.1	Teaching Requirements	29
5.1.1	University Fellowship Teaching Requirement (UFTR)	29
5.1.2	Academic Teaching Requirement (ATR)	29
5.2	Types of Appointments	29
5.2.1	Teaching Fellow 1	30
5.2.2	Teaching Fellow 2	30
5.2.3	Teaching Fellow 3	30
5.2.4	Curatorial Assistant	30
5.3	Teaching Fellow Compensation	30
5.3.1	Compensation During Fullfillment of Teaching Requirements	30
6	USE OF DEPARTMENTAL FACILITIES	31
6.1	Space and Access	31
6.1.1	Room Assignments	31
6.1.2	Laboratory Facilities	31
6.1.3	Keys	31
6.2	Communications, Transportation and Supplies	31
6.2.1	Computers and Email	31
6.2.2	Telephones	32
6.2.3	Fax	32
6.2.4	Mail	32
6.2.5	Postage	32
6.2.6	Office Supplies	32
6.2.7	Copiers	33
6.2.8	Credit Card Charges	33
6.2.9	Vehicles	33
6.3	Problems and Assistance	33
6.3.1	Security	33
6.3.2	Building Maintenance	33
6.3.3	Pets	33
A	CURRENT LIST OF GRADUATE STUDENTS	34

1 INTRODUCTION

This handbook provides a summary of the graduate program in the Department of Geology and Geophysics (G&G) with information for both faculty and graduate students.

1.1 General Information

Calendars

The Graduate School Academic Calendar can be found at

www.yale.edu/graduateschool/academics/calendar.html.

Dates and deadlines for G&G-specific requirements are discussed in this document and outlined in both §2.2 and §2.3.

The Geology & Geophysics calendar of events can be found at

www.yale.edu/geology/calendarevents.

This includes the dates of all regularly scheduled Faculty and Departmental meetings and general departmental events.

Information about major annual scientific conferences (including deadlines and dates) is discussed in §2.9.2.

G&G Undergraduate and Graduate Courses

The course listing for G&G undergraduate and graduate courses can be found at

www.yale.edu/geology/graduate/courses.html.

Graduate courses generally follow the same semester schedule as undergraduate courses. Fall semester usually starts in the first week of September (or end of August) and ends in the middle of December. Spring semester starts in the middle of January and ends in May. Semesters include 13 weeks of classes, a 1-week reading period, and 1.5-week examination period. Note that some courses have class meetings during reading period and are designated "Meets RP" in the Yale College Program of Study Bulletin.

Graduate Student Residence during the Academic Year

Graduate students enrolled for the academic year are expected to be in residence for 9 months, from registration in September until a week before commencement in May. Students are expected to continue working on their research during the summer months in order to ensure timely completion of the degree. Students engaged in summer fieldwork may leave the campus after their spring final examinations are completed.

Summer Registration

There is no summer registration process; however, if you intend to use the Yale facilities over the summer you should go to the FAS Registrar Office (246 Church St., 3rd Floor) to update your ID. You are eligible to do this if you were registered during the previous academic year or spring term.

Afternoon Coffee and Tea Break

The Department has an afternoon coffee break in the Departmental Common Room (KGL101), every weekday between 3:30 and 4:00 PM. All students, faculty, staff, and visitors are welcome to attend.

“Sacred Wednesday” and the Weekly Departmental Colloquium

By Department custom, no departmental courses, laboratories, or seminars are held on Wednesday afternoons. This arrangement is intended to provide a time for faculty meetings, committee meetings, and other departmental business.

The Department Colloquium is scheduled at 4:00 to 5:00 p.m. every Wednesday of the semester, and is followed by questions, refreshments, and informal discussion. The Colloquium lecture is held in the departmental lecture hall on the first floor (KGL123). All graduate students, undergraduate majors, and faculty are expected to attend. The Colloquium Committee will typically organize a small group for dinner with the Colloquium speaker after the talk. The Department subsidizes the dinner expenses for up to \$50.00 per person or \$250.00, whichever is less. The receipt and the names of those attending must be submitted to the Business Office for reimbursement.

Scheduling Seminars or Special Talks

Classroom space in the Department is overseen by the Chair’s Senior Administrative Assistant, Ernestine Jones (KGL301). Rooms 119, 123, 208, 226, or the Department Common Room (101) are available for special talks or informal seminars, but the space must be reserved in advance. Please allow two weeks advance notice so that the event can be announced in the weekly Departmental Schedule. Also, please plan enough time to arrange for any unusual requests, such as for special audio-visual (A/V) equipment or an A/V assistant.

1.2 Offices Relevant to the G&G Graduate Program

The G&G Department has a number of offices relevant to the graduate program: the Chairman’s Office, the Office of Graduate and Undergraduate Studies, the Business Offices, and the Departmental Secretary’s Office. This section provides a brief overview of the function of each office, together with a list of who is in charge and where you can contact them.

Department Chair’s Office KGL301, 432-3161

PROF. DAVID BERCOVICI, Chair,
KGL305, 432-3168,
ERNESTINE JONES, Senior Administrative Assistant,
KGL301, 432-3161,
ernestine.jones@yale.edu

Graduate and Undergraduate Studies Office KGL203, 432-3124

PROF. JOHN WETTLAUFER, Director of Graduate Studies,
KGL109, 432-0892,
dgs@geology.yale.edu
PROF. JAY AGUE, Director of Undergraduate Studies,
KGL216, 432-3171,
dus@geology.yale.edu
PETER SCHRADER, Registrar,
KGL203, 432-3124,
peter.schrader@yale.edu

Business Office KGL303, 432-3164

DIANE DICKINSON, Business Manager,
KGL301, 432-3164,
diane.dickinson@yale.edu

PAM BUONOCORE, Financial Assistant,
KGL303, 432-3165,
pamela.buonocore@yale.edu MARGARET LOWERY, Administrative Assistant,
KGL304, 432-5703,
pamela.buonocore@yale.edu

Department Secretary's Office KGL202, 432-3114

AIDA RODRIGUEZ, Department Secretary,
KGL302, 432-3114,
aida.rodriquez@yale.edu

The Chairman's Office oversees the Department as a whole. It is also responsible for scheduling the use of classroom space in KGL by outside departments and organizations, and for publishing a weekly Departmental Calendar. The Business Office handles financial matters. The disbursement of stipends and wages for graduate students is handled by the Department Registrar. The Department Secretary has responsibility for general clerical tasks in the Department, including preparation of teaching materials, maintaining office supplies, copying, shipping, mail, and phone reception.

The Director of Graduate Studies (DGS) is the principal liaison between the graduate students, the Department, and the Graduate School. The DGS also oversees departmental graduate examinations, graduate admissions, student evaluations, and overall graduate program development. G&G students are encouraged to contact the DGS Office on any matters relating to the graduate program. This office also maintains files of posted information from the University, the government, and other educational institutions and external agencies about teaching, research, funding, and employment opportunities.

There are offices elsewhere in the University that can be of assistance to G&G graduate students:

Yale Graduate School

- Richard Sleight, Associate Dean for the Sciences,
133 Hall of Graduate Studies, 432-2744,
grad.sci.deans@yale.edu
- Thomas Burns, Assistant Dean for the Sciences,
133 Hall of Graduate Studies, 432-2744,
grad.sci.deans@yale.edu.
- Stephen Goot, Deputy Registrar, Faculty of Arts and Sciences,
140 Hall of Graduate Studies, 432-2743,
stephen.goot@yale.edu
- Jennifer Brinley, Associate Director, Financial Aid,
127 Hall of Graduate Studies, 432-7980,
jennifer.brinley@yale.edu
- Lisa Brandes, Director, McDougal Graduate Student Center,
123 Hall of Graduate Studies, 432-2583,
lisa.brandes@yale.edu

Office of Foreign Students and Scholars

www.oiss.yale.edu

Ann Kuhlman, Director,
246 Church Street, 432-2305,
ann.kuhlman@yale.edu

Yale Graduate Housing Office

Helen Hadley Hall, 420 Temple Street
www.yale.edu/hronline/gho/html/GHOcore.html
Graduate Apartment Office, 432-8270
Graduate Dormitory Office, 432-2167

1.3 Committees Relevant to the G&G Graduate Program

Listed below are those committees that oversee various aspects and activities of the G&G graduate program. Faculty members of these committees are appointed during the summer by the Department Chair for a three-year assignment.

Program Review and Examination Committee (PREcomm)

Wettlaufer (Chair, DGS), Affek, Briggs [Fall], Vrba [Spring], Evans, Park

PREcomm oversees the functioning of the pre-candidacy portion of the G&G graduate program, which includes course work, research, and examinations for graduate students in their first two years. PREcomm meets in the second week of each semester to review the schedules approved by each student's Advisory Committee to ensure that they are consistent with the requirements and guidelines of the G&G graduate program. PREcomm is also responsible for monitoring the quality and effectiveness of all processes leading to Admission to PhD Candidacy.

Admissions Committee(Adcomm)

Wettlaufer (Chair, DGS), Brandon, Gauthier, Karato, Wang, Grad Student (TBA)

Adcomm is responsible for graduate recruiting and processing and evaluating applications for the G&G graduate program. This committee meets in the Fall to plan recruiting, and as often as necessary in Winter to evaluate graduate applications and to prepare a recommended list for admission, which is presented at a Faculty Admissions meeting in February.

Committee on Teaching Fellows (TFcomm)

Wettlaufer (Chair, DGS), Ague (DUS); Michelle Casey, Devin McPhillips, Melissa Spannuth, Una Farrell, Peter Schrader (Registrar)

TFcomm is responsible for: (1) estimating the number of teaching fellows (TF) needed for each course, (2) determining an appropriate appointment level (e.g., TF1, TF2, etc.) relative to the work involved, and (3) selecting specific students to fill the available positions. Most of TFcomm's business is done in the spring term when it prepares the recommended list of TF assignments for the next academic year. The number of available positions is ultimately controlled by the Graduate School, which bases its decision on available funds, prior course enrollments, and the amount and type of assistance needed. For selecting students, TFcomm is guided by the written preferences of the instructor and of any interested students, and by the requirement that students supported on University Fellowships (as opposed to research grants) must teach once during each academic year. Instructors must be careful that the work required of a TF does not exceed the rank of the position (see section §5 on Student Teaching Appointments for further details). The DGS is authorized to make a limited number of changes in teaching assignments to account for changes in enrollment or the revised plans of the instructor or student involved. Please try to make any requests for changes as soon as possible in order to avoid problems with the teaching assistant's wages.

Faculty Student Committee on Departmental Affairs (FScomm)

Wettlaufer (DGS), Ague (DUS), Bercovici (ex officio), plus Dana Club President and Treasurer.

FScomm's function is to organize joint faculty-graduate student ventures and to serve as the principal forum for discussion of new ideas, concerns, and grievances. All students and faculty are welcome to attend the meetings of this committee. FScomm meetings are scheduled as needed and are open to all G&G faculty and graduate students.

Colloquium Committee (COcomm)

Pagani (Faculty advisor); Students: TBA

COcomm meets as often as necessary. It runs the Wednesday colloquia, queries faculty and students for names of potential speakers, invites speakers, arranges the colloquium schedule, and finds hosts to organize individual speaker's visiting schedules.

Curriculum Committee (CUcomm)

Wettlaufer (DGS), Ague (DUS), Bercovici (Chair), Peter Schrader (Registrar)

CUcomm meets once a year to review course offerings and the overall structure and organization of the undergraduate and graduate curricula.

The Dana Club

Officers of the Dana Club: Michelle Casey (President); Devin McPhillips (Treasurer). Melissa Spannuth (Past-President); Una Farrell (Past-Treasurer).

The Dana Club, named after J.D. Dana, Yale Professor of Natural History from 1850 to 1895, is the official organization representing G&G graduate students. Officers are elected annually, and meetings and events are organized as needed. By tradition, the Dana Club roasts the faculty in an annual skit usually held in the Spring.

Advisory Committees

Each graduate student has an Advisor and Advisory Committee. The function and responsibilities of the Advisory Committee are explained in a subsequent section. The current list of students and their committees is given in Appendix A.

2 REQUIREMENTS FOR THE PhD DEGREE

Students are admitted into the G&G graduate program with the expectation that they will pursue a PhD degree. Some students may finish with a Master's degree, either by recommendation of the faculty or by their own decision.

The G&G PhD program usually requires about 5 to 6 years to complete. The first two years are focused on preparing a foundation in areas of specialization and on building scientific research skills; the remaining years are largely dedicated to completing a major body of independent research. A successful transition at the end of two years is marked by the advancement of the student into candidacy. A PhD candidate is considered to have the breadth, talent, discipline, and scholarship needed to conduct independent research, and to prepare and successfully defend a Dissertation.

2.1 Outline of Requirements

2.1.1 Requirements for Admission to PhD Candidacy

Course work: Students will design a comprehensive course of study with their Advisory Committee.

Students are required by the Graduate School to obtain two Honors before the end of their second year; the G&G department requires that one of these honors be received before the end of the first year.

Research Discourses: Students will carry out two modest independent research projects, which will culminate in two documents, referred to as the **Discourses**, that are to be submitted and defended at the end of year 2. One Discourse is expected to be more developed than the other and will take the form of a full research proposal (and will be presented at the Qualifying Presentation; see below) while the other Discourse can be written as a proposal or article. To facilitate progress on the Discourses students will follow a schedule involving

- Submission of brief **Pre-proposals** for each Discourse (submitted at different times)
- Brief oral **Preliminary Presentations** on both Discourse projects (at different times).
- Submission of the First and Second Discourses.

Qualifying Presentation: Students will give a formal oral presentation of the more developed Discourse (either First or Second). During the subsequent extended questioning period they will defend both Discourses and be queried on supporting background knowledge.

The more developed Discourse which is presented in the Qualifying Presentation is referred to in this document as the Major Discourse, even though it can be either the First or Second Discourse in terms of timing (i.e., when it is initiated). The other Discourse is referred to as the Minor Discourse. *In reading this document it is important to keep clear that the term "First and Second Discourses" denotes only the chronological order of development, while "Major and Minor Discourses" denotes degree of development.* The Major Discourse satisfies the Graduate School requirement of the *Dissertation Prospectus*. The Qualifying Presentation and the subsequent defense and extended question period satisfies the Graduate School requirement for the *Qualifying Examination*. It is expected, although not required, that the Major Discourse will be continued for the PhD Dissertation research.

2.1.2 Post PhD-Candidacy Requirements

Third Year Review: Before the end of the student's third year, he/she is required to give a presentation to his/her Advisory Committee and the DGS on the progress of their dissertation research.

Dissertation Progress Reports: The graduate school requires these reports yearly for students in their 3rd and following years.

Dissertation: The student completes graduate school and receives the PhD after successful submission and defense of the Dissertation.

2.2 Abbreviated Schedule for the PhD Program

Provided below is a short overview of the schedule for the PhD program, including key deadlines and dates. Progress is denoted by terms, or semesters, in residence, with two terms per year; specific dates assume a normal start date of September in Term 1. In the following section (§2.3) is a more complete schedule.

Term 1

- Primary course work
- Initiate research projects for the Discourses.

Term 2

- Primary course work
- Discourse research projects.
- Pre-proposal for First Discourse, submitted to DGS office by end of April (after Advisory Committee approval).

Term 3

- Primary course work
- Pre-proposal for Second Discourse, submitted to DGS office by end of 2nd week (after Advisory Committee approval).
- Preliminary Presentation of First Discourse; in last two weeks of October (abstract of presentation due at DGS office October 1, after Advisor approval).

Term 4

- Completion of primary course work
- Preliminary Presentation of Second Discourse; late January, early February (abstract of presentation due at DGS office January 15, after Advisor approval).
- Both Discourses due at DGS office by end of March (after Advisory Committee approval).
- Qualifying Presentation of Major Discourse (scheduled at DGS office during last 2-3 weeks of April)
- Faculty decision to advance student into candidacy during last Faculty Meeting in May

Terms 5 and 6

- PhD research
- Third Year Review before end of Term 6.

Terms 7 and beyond

- Preparation of the Dissertation

- Dissertation Defense
- Dissertation Submission; Grad School Deadlines are October 4 to graduate in December; or March 14 to graduate in May.

2.3 Complete Schedule for the PhD Program

Provided below is a complete overview of the schedule for the PhD program, involving tasks for both students and advisory committees. Progress is again denoted by terms in residence. Many of the details regarding various tasks are explained in subsequent sections.

Term 1

1. First week of term: Meeting between student and members of the Advisory Committee
 - Advisory Committee assists in selection of a course and research schedule
 - Student and Advisory Committee determine the student's areas of concentration (See §2.7.1)
 - Student, Advisor and Advisory Committee discuss possible Discourse research projects, including expectations and deadlines (see below).
2. Second week of term: Meeting between student and Advisor
 - Advisor approves course and research schedule
 - Rest of the Advisory Committee approves and signs the final schedule
 - Advisor forwards schedule to the DGS who will present it to PREcomm for review. If revisions are necessary the DGS will contact the student.

Term 2

1. First week of term: Meeting between student and members of the Advisory Committee
 - Advisory Committee assists in selection of a course and research schedule
 - Assess progress to date with courses
 - Assess progress on First Discourse
2. Second week of term: Meeting between student and Advisor
 - Advisor approves course and research schedule
 - Rest of the Advisory Committee approves and signs the final schedule
 - Advisor forwards schedule to the DGS who will present it to PREcomm for review. If revisions are necessary the DGS will contact the student.
3. End of term
 - Student submits brief pre-proposal (2-3 pages) for First Discourse to Advisory Committee for review and approval in April.
 - Pre-proposal forwarded to DGS by end of April for discussion at Student Evaluation Faculty Meeting
 - Student Evaluation Faculty meeting

Term 3

1. First week of Term: Meeting between student and members of Advisory Committee
 - Advisory Committee assists in selection of a course schedule
 - Advisory Committee assesses research progress

2. Second week of term: Meeting between student and Advisor
 - Student submits a brief (2-3 page) pre-proposal for the Second Discourse to his/her Advisor and Advisory Committee for review and approval.
 - Advisor approves course and research schedule
 - The rest of the Advisory Committee approves and signs the final schedule
 - Advisor forwards schedule and pre-proposal for Second Discourse to the DGS who will present them to PREcomm for review. If revisions are necessary the DGS will contact the student.
3. Midterm: Preliminary Presentations of First Discourse (see §2.8.2)
 - Preliminary oral presentation of First Discourse scheduled for last 2 weeks of October.
 - Abstract (1-2 pages) of oral presentation due to the DGS, with Advisor approval, by October 1 for distribution.

Term 4

1. First week of Term: Meeting between student and members of Advisory Committee
 - Advisory Committee assists in selection of courses
 - Committee assesses progress on First and Second Discourses
2. Second week of term: Meeting between student and Advisor
 - Advisor approves course and research schedule
 - The rest of the Advisory Committee approves and signs the final schedule.
 - Advisor forwards schedule to the DGS who will present it to PREcomm for review. If revisions are necessary the DGS will contact the student.
3. Midterm: Preliminary Presentations of Second Discourse (see §2.8.2)
 - Preliminary oral presentation of Second Discourse scheduled for late January, early February.
 - Abstract (1-2 pages) of oral presentation due to the DGS, with Advisor approval, by January 15 for distribution.
4. Submission of completed Discourses (see §2.8.3)
 - Student submits both Discourses to DGS office by the end of March, after Advisory Committee approval.
5. Qualifying Presentation (see §2.8.4)
 - Student gives no more than 30 minute presentation on one of the Discourses, i.e., the Major Discourse; scheduled for last 2-3 weeks of April by DGS office.
 - Presentation immediately followed by brief period (no more than 10 minutes) of questions from general audience.
 - General-audience question period followed by in-depth questions from faculty on both Discourses and on any general fundamental areas pertaining to the student's chosen fields of concentration. The in-depth questioning period is expected to last 90 minutes or more, as needed.
 - Attendance: attendance required by the Advisor, Advisory Committee, DGS and PRE-comm. Other interested faculty and students are invited to attend the presentation and the subsequent brief general-question period. Only G&G and invited external faculty may attend the "in-depth" question period (see §2.8.4). Thus students and other general audience will be excused by the DGS after the brief general-question period.

- After the complete questioning period, the faculty present will discuss the student's performance and progress and make a recommendation to the DGS regarding the student's admission to candidacy for the DGS to present at the Student Evaluation Faculty Meeting
 - Note on Graduate School Requirements:
 - The Major Discourse satisfies the Dissertation Prospectus requirement
 - The Qualifying Presentation and in-depth question period satisfy the Qualifying Examination requirement
6. Student Evaluation Faculty Meeting
- Evaluation of student progress and results of evaluation of the Discourses and Qualifying Presentation.
 - Faculty votes on whether to advance the student into candidacy for the PhD degree.

Year 3

1. Meetings with Advisor and Advisory Committee:
 - Meetings are scheduled as needed.
 - The Advisor and Advisory Committee assess timeliness of progress with the Dissertation research, and encourage publication of research results as appropriate.
2. Third Year Review (see §2.8.5)
 - Before the end of the 6th term, the student must schedule a one-hour meeting in which he/she presents a progress report on Dissertation research activities to date and outlines a plan for completing his/her Dissertation to the Advisory Committee, DGS, and other interested faculty.
3. Dissertation Progress Report:
 - The graduate school requires yearly reports for students in their 3rd and following years. Students should include a list of all papers (submitted, in press or published), meeting abstracts and funding proposals, as well as a brief statement of future plans.
4. Student Evaluation Faculty Meeting:
 - Student progress is evaluated at the end of each year by the entire G&G faculty.

Years 4 and Beyond

1. Meetings with Advisor and Advisory Committee:
 - Meetings are scheduled as needed.
 - The Advisor and Advisory Committee assess timeliness of progress with the Dissertation research, and encourage publication of research results as appropriate.
2. Dissertation Progress Report:
 - The graduate school requires yearly reports for students in their 3rd and following years. Students should include a list of all papers (submitted, in press or published), meeting abstracts and funding proposals, as well as a brief statement of future plans.
3. Student Evaluation Faculty Meeting:
 - Student progress is evaluated at the end of each year by the entire G&G faculty.
4. Years 5-6: **Dissertation Defense and Submission** (§2.8.6)
 - Dissertation must be submitted to the Graduate School by October 1 for graduation in December, or March 15 for graduation in May.

2.4 Residence Requirement

A student must be in residence in the Department for at least three years to fulfill the PhD residence requirement. The student is expected to have all degree requirements finished by the end of the fifth year. To stay in residence beyond the sixth year requires special approval from the Graduate School. When submitting a Dissertation, students “in absentia” do not need to apply for an extension as long as they have met all other requirements for the PhD

A maximum of one year of transfer credit will be accepted toward the three-year residence requirement, but the transfer credit is also counted as part of the six-year residency limit. Thus, the transfer credit will reduce by one year the number of years of support provided by a University Fellowship. As a result, transfer credit is not recommended unless a student expects to finish the PhD degree one year earlier than normal. Request for transfer credit should be made to the DGS no later than the sixth week of the third term of study. Transfer credit is only granted to students who have earned Honors in at least two courses during their first two terms at Yale.

2.5 Advisory Committees

A tentative Advisor and Advisory Committee are appointed for each student upon entry into the G&G graduate program. The members are selected to match the student’s stated research interests. The Advisory Committee is charged with guiding the student in the selection of courses and research projects, and ensuring that the student develops the depth and breadth of background needed for the General Examination and for PhD research. As the student advances in the graduate program, the committee members may also become involved, either directly or indirectly, in the student’s research. The make up of the Advisory Committees, including the Advisor, can be changed at any time to meet the needs or best interests of the student. Such changes are initiated by the student in consultation with the Advisor or the DGS, and are generally accepted without faculty discussion. Students are encouraged to become acquainted with the various research programs in the Department before making any extensive modifications of their initial Advisory Committee. The Advisory Committee can be constituted from faculty outside the G&G department, and even outside of Yale; however, the Advisor and a majority of committee members must from G&G.

The Advisory Committees for first- and second year students should meet at the beginning of each term to advise and approve the student’s course schedule and research activities.

2.6 Standing

The faculty evaluate each student’s standing at Student Evaluation Faculty Meetings held in May of each year. Good standing requires satisfactory progress. A student whose performance is judged unsatisfactory will fall into poor standing, and may be asked to finish with a Master’s degree or to leave the program.

The evaluation meetings consider all aspects of a student’s record, including grades, independent study, research, the Preliminary Presentation, the Discourses, the Qualifying Presentation, and the Third-Year Review. Other factors include progress to date, future plans, performance in courses, and comments by the Advisor and other faculty familiar with the student’s work. The DGS informs all students in writing about their standing after each evaluation meeting.

2.7 Course Work

2.7.1 Areas of Concentration and Designing a Program of Study

During the first week of the first term, each student should meet with his/her Advisory Committee to choose four nominal areas of concentration, and to plan a tentative program of courses and research for the first year. Examples of some concentration areas are: atmospheric dynamics, climatology, geochemistry, geodynamics, geomicrobiology, ice physics, inverse theory, isotope geochemistry, mineral physics and rock mechanics, oceanography, paleontology, paleobotany, petrology, sedimentology, seismology, structural geology, tectonics, etc. The choice of the concentration areas ultimately rests with the student and the Advisory Committee, and can be changed at any time during the first year, subject to approval by the Advisory Committee. The first three terms of study help prepare the student for the Research Discourses and Qualifying Presentation through a combination of courses, seminars, and independent reading. The student's courses should be planned to build expertise in the chosen concentration areas and to address any relevant weaknesses in his/her general academic background.

In the second week of the term, all first- and second-year students must submit a final course schedule to their Advisor. This final course schedule is approved and signed by the students's Advisory Committee. The Advisor signs the schedule and then forwards it to the DGS Office.

PREcomm meets during the second week of each term to review and approve the courses, research activities and areas of concentration for first- and second-year students. After approval by PREcomm, any subsequent changes must be reviewed and signed by the Advisor, and then submitted to the DGS. The DGS may solicit the recommendation of PREcomm before approval, especially if the changes are substantial.

2.7.2 Courses and Grades

Course load.

Students are expected to carry a full course load during the first three terms of study. A typical load is 2-3 graded courses (up through 600-level; see below) per term, not including any research course credits (GG690 and GG691); this may vary with the level and requirements of the courses chosen and with other commitments, such as teaching fellowships. Courses may be attended on an informal basis with the permission of the instructor, but "audits" have no formal bearing on the progress towards completion of the PhD.

Grades.

Graduate grades in courses up to and through the 600 level are recorded as Honors, High Pass, Pass or Fail. Higher level courses, such as seminars (700 level), tutorials (800, 810, 820, 830), and Dissertation research (900, 910, 920, 930) are graded Satisfactory or Unsatisfactory. The Graduate School requires Honors in at least two courses by the end of the second year. The Department expects at least one Honors in the first year to remain in good standing. Grades in any 500- or 600- level G&G course will count toward the Honors requirement. Honors in courses outside the Department can also be credited towards the Honors requirement as long as the course is a graded (500- or 600-level) course or an appropriate advanced level undergraduate course. (Note that some departments allow higher-numbered courses to be graded; consult the DGS if this becomes an issue for you.) The DGS can provide further information about undergraduate courses acceptable for the Honors requirement.

Incompletes.

If a student and instructor have agreed that an extension is appropriate, the student must submit a request for the Temporary Incomplete (TI) with the intended completion date, signed by the instructor and the DGS. The instructor will indicate the mark of TI on the grade sheet, which is to be submitted to the Office of the Registrar by the appropriate grade submission deadline. Only one TI for courses taken in a single term is permitted. Temporary Incompletes received in an academic year must be converted to final grades by October 1 of the following academic year. If a grade is not received by the Registrar by this date, a TI will be converted to a permanent Incomplete (I) on the student's record.

Evaluation.

Quality of performance is a major factor in the evaluation of first- and second-year students. The Department expects students to attain a High Pass or better in their areas of concentration and to demonstrate a high level of competence in any term papers, research projects, or tutorials. A grade of Pass will result in a warning issued by the Department to the student. Two Passes or a single Fail are grounds for either (1) putting the student on academic probation, requiring a course of remedial actions to be designed by the Advisory Committee and DGS; or (2) finding the student in poor standing and releasing him/her from the program.

2.7.3 Independent Reading

Entering students should note that graduate study involves an increased focus on primary scientific sources. Thus, graduate students are expected to do self-directed reading in their areas of concentration. This reading is above and beyond reading assigned for courses. Students should consult their Advisor and Advisory Committee in assembling an appropriate reading list.

2.8 Research Milestones

Graduate school differs from undergraduate study in one very significant way: gaining unique expertise by carrying out a body of original and independent research. Being a successful scientist often has less to do with performing well on class exams, and more to do with asking important but as-yet unanswered questions, designing a method to address these questions (be it experimental, observational or theoretical), carrying out the research in a rigorous manner, and writing up your findings in a publishable document. Publication is also paramount because science only truly works when research is tested and examined by rigorous peer-review; without passing the scrutiny and criticisms of your colleagues and competitors alike, your research efforts cannot be considered valid.

2.8.1 Research Projects and Preparation of the Discourses

In order to prepare students for building their research skills, an important part of the first two years is carrying out two small independent research projects, beginning in the first year. These projects culminate with the submission of two documents (either in proposal or article format), called the Discourses, at the end of the 2nd year. One of these Discourses can (and typically will) grow into the PhD Dissertation. These are described in more detail below.

The First Discourse Project

- In the student's first year, he/she is required to work with his/her Advisor and Advisory Committee to identify the first independent research project leading to the First Discourse. The student is required to submit a brief (2-3 page) pre-proposal for the First Discourse by the end of the

second term. However, this pre-proposal should represent a significant amount of reading of relevant literature and preliminary work. Thus the student is expected to identify and initiate the project as soon as possible; waiting until the second term is not advisable. The pre-proposal is first vetted by the student's Advisory Committee, then submitted to the DGS by the end of April, after which it is presented by the DGS at the end of the 2nd term during the Student Evaluation Faculty Meeting. Any resulting comments on the pre-proposal will be returned to the student and Advisor by the DGS office.

- Students can receive graded-course credit for the First Discourse Project; a two-term course series focused on independent research (G&G 690) is available for this purpose. An advisable plan is to enroll in the independent research course in Spring term of the first year and to officially finish at the end of Fall term in the second year. In this way, students will have the summer to carry out part of their research project. Note that GG690 (and GG691, see below) are not considered part of the normal 2-3 graded-class course load which is expected to be comprised of formal lecture courses.
- In the middle of the 3rd term, students will give their Preliminary Presentations of the First Discourse Project (see §2.8.2).

The Second Discourse Project

- During the first year and certainly by the beginning of their 2nd year, students will need to design, in consultation with Advisory Committee, the second research project leading to the Second Discourse. Students will formally submit a brief (2-3 page) pre-proposal for the Second Discourse to his/her Advisor by the end of the 2nd week of the 3rd term. The pre-proposal will be reviewed by the Advisory Committee, who will then forward it on to the DGS for presentation to PREcomm, along with the student's course schedule, for approval.
- The purpose of the Second Discourse is to give students greater breadth in their education and expertise, while providing further research skills. To that end, the Second Discourse Project must be significantly different from and independent of the First Discourse Project, although it can also be within the student's areas of expertise. The extent to which the second project is adequately independent of the first is determined by the Advisory Committee, but is also subject to review by the DGS and PREcomm during the 2nd week review of student course and research schedules. *It is therefore strongly advised that the student carry out the Second Discourse project with a faculty member different than their primary advisor, ideally someone else on their advisory committee.*
- As an example of how close the two Discourse projects might be, a student studying a problem in atmosphere or climate dynamics for his/her first project might choose a second project in physical oceanography or ice physics. Likewise, a student studying mineral physics in his/her first project might choose research in seismology or geodynamics for a second project. Note that there is no limit on how different the projects might be; e.g., a student working primarily in isotope geochemistry or igneous petrology would be well served by a second project in mantle geodynamics or mineral physics. Or students primarily studying paleobotany would receive significant breadth from doing a second project in geomicrobiology.
- If desired, students can receive an extra one-semester course credit for work on their Second Discourse Project through GG691. Students will typically enroll in GG690 for their 2nd and 3rd terms, and GG691 for the 4th term.
- In the early to middle of the 4th term, students will give their Preliminary Presentations of the 2nd Discourse Projects (see §2.8.2).

2.8.2 Preliminary Presentations

- In the middle of the 3rd term, students will give Preliminary Presentations of their First Discourse Projects; and in the early/middle of the 4th term, they will give similarly-lengthed Preliminary Presentations of their Second Discourse Projects.
 - The students will first submit abstracts of their presentations (1-2 pages) to the Advisor who will review them and then (after any necessary changes) submit them to the DGS for dissemination to the department faculty. The abstracts will be due to the DGS office by October 1 for the First Discourse Preliminary Presentation, and January 15 for the Second Discourse presentation.
 - The presentations themselves are expected to be 15 minutes long, followed by 10-15 minutes of questions by the audience. All faculty are invited to attend these intimate presentations.
 - The presentations will typically be scheduled in groups of two (two presentations within approximately one hour) at various times during the last two weeks of October, and again in the two weeks at the end of January or early February. The DGS office will make a list of time slots (depending on availability of rooms) that students can then reserve.
- Preliminary Presentations must emphasize research already completed and problems to be addressed with further research. Only discussing plans for future research is ill-advised since it is expected that students will have done significant amount of preliminary work as a “proof of concept” exercise.
- Although neither Preliminary Presentation is formally graded, performance on them is always considered by the department when assessing a student’s academic standing.

2.8.3 Submission of the Discourses

- In the 4th term the student will submit both Discourses as completed documents. The Discourses are due at the DGS office by the end of March after approval by the Advisory Committee.
- One Discourse is expected to be more substantial (i.e., longer and/or more developed) than the other Discourse; in this context they are referred to as the Major and Minor Discourses, respectively. The Major Discourse should propose a Dissertation-sized research project spanning a period of 2-3 years. Therefore, this Discourse will be required to follow a proposal-style format (see next item below). The Major Discourse can be based on either the First or Second Discourse Projects. The student will present the Major Discourse at his/her Qualifying Presentation (see §2.8.4) and this Discourse will serve as their Dissertation Prospectus.
- The Major Discourse should be structured in the style of a National Science Foundation (NSF) proposal and should be of high enough quality to submit to NSF for funding. Students are welcome to ask their Advisors or other faculty member for a sample copy of an NSF proposal. However, since these are not always readily available, we provide below a basic outline of expectations for the proposal:
 1. A one-page project summary that succinctly explains the significance and intellectual merit of the proposal, the implications of preliminary work, an outline of the proposed tasks, and a discussion of intended outcomes and broader impact. (Although NSF presently requires specific sections on intellectual merit and broader impact, the student need not adhere rigidly to this structure.)

2. An introductory section explaining in detail the scientific problem to be addressed, a survey of its historical foundations, and discussion of previous work. The student should use this section to both clearly state his/her working hypothesis and to demonstrate a thorough knowledge of the relevant literature. Students should be aware that they will be asked questions during the oral exam (see below) on the background and deeper foundations of the proposed work.
3. A section discussing preliminary work and results. This should include a discussion of methods used (theoretical, experimental, etc.) in carrying out the work, a presentation of results and a discussion of implications/significance of these preliminary findings. This section should demonstrate the student's ability to carry out and present original research, and should also be used to show why the preliminary results are a "proof of concept" and how they inspire the future work to be carried out.
4. A section on proposed work to be completed in a 3-year time line. This should first include a broader discussion of the further research necessary and why it is important to solve (or help solve) the overall scientific problem being addressed. It is often useful to list the important remaining scientific questions that will be answered. Then the student should outline the proposed tasks with sufficiently detailed explanation of methods and techniques to convince the faculty of his/her proficiency in carrying out the proposed tasks. A discussion of the anticipated technical problems that might be encountered, and a justification of the chosen method(s) are expected.
5. A concluding section discussing the significance and ramifications of the planned research. This section should also include a discussion of the broader impact of the research, i.e., why and how it will have relevance to areas outside the immediate field of research and Earth science in general.
6. The final section should contain a complete bibliography of work cited.

The total length of the Major Discourse should not exceed 15 pages (no less than 12 point font, single spaced, with no less than 1 inch vertical and horizontal margins) including figures and tables, but not including the bibliography. It is expected that the Major Discourse will be 12-15 pages, while the Minor Discourse can be shorter (8-10 pages).

- The student can opt to make the Minor Discourse a publication-quality paper instead of a proposal. Although the guidelines for such a paper are less rigid than for a proposal, the paper must be a completed and publishable research result. The paper can be relatively short, as is typical in journals such as *Nature*, *Science*, *Geology*, *Geophysical Research Letters*, *Physical Review Letters*, or *Terra Nova*; or the paper can be longer as is the case for more developed research articles. In general, a paper must be of high quality and in the style of a major scientific journal, with a proper introduction and background, statement of hypothesis, discussion of methods, presentation of results, discussion and interpretations, concluding remarks and a complete bibliography. Students are encouraged to examine and emulate the style of any top peer-reviewed journals, such as *Journal of Geophysical Research*, *Earth and Planetary Science Letters*, and *Journal of Fluid Mechanics*, in addition to those mentioned above.
- The Advisor and the rest of the Advisory Committee are responsible for reading and assessing both Discourses. Other G&G faculty may request copies of the Discourses from the DGS office. Assessment of the Discourses will be presented after the Qualifying Presentation (see below).

2.8.4 The Qualifying Presentation

The Graduate School has two formal requirements for admission to PhD candidacy: (1) each student must pass a Qualifying Examination that is oral and/or written; and (2) each student must present a Dissertation Prospectus to be approved by the faculty.

In G&G, both requirements are completed with submission of the Research Discourses and a successful oral Qualifying Presentation, including the subsequent question period. More precisely, the Major Discourse represents the formal “Dissertation Prospectus”, while the Qualifying Presentation and the subsequent extensive question period represents the formal “Qualifying Exam”.

After the initial two years of course work and rigorous research training, the two Discourses and the Qualifying Presentation provide a critical opportunity for the faculty to assess the student’s suitability, talent, and preparation for PhD research.

In addition to completing their two Discourses, students usually spend time during the third term reviewing and consolidating their knowledge of topics that might be covered in the question period following the Qualifying Presentation. This integration of course work, independent research, and reading marks the culmination of formal instruction in the PhD program.

The essential ground-rules for the Qualifying Presentation are as follows:

- The Qualifying Presentation is to be scheduled through the DGS office for the last 2-3 weeks of April of the 4th term. The presentation plus question period should take no more than 2 hours, but can if necessary go longer. *Thus 3 hour slots will be scheduled by the DGS office for each Qualifying Presentation in order to allow time for a sufficient examination period, subsequent discussion and recommendations by the advisory committee, and transition between different presentations.*
- All faculty, students and staff are invited to the oral presentation itself. However, only the Advisory Committee, PREcomm and DGS are required to attend. Clearly, all 1st and 2nd year students stand to learn invaluable lessons by attending the presentations.
- For the oral presentation, the student should give a 30-minute, well-organized summary of the primary features of *only* their Major Discourse, including preliminary work completed and future plans. Slides, maps, specimens, etc. may be used as needed for a clear presentation.
- There is no formal presentation of the Minor Discourse during the Qualifying Presentation; however, the student will need to prepare a few key visual aids or slides relevant to this Discourse for the question period since students will be expected to defend both Discourses.
- The oral presentation is immediately followed by a brief (no more than 10 minutes) question period from the general audience.
- After general questions, the DGS will excuse all members of the audience except for G&G faculty members and external faculty members of the Advisory Committee. Other external faculty may also remain, given advanced agreement of the Advisor and the DGS, and advance notification to the student.
- After the general audience is excused, there follows an extended question period to be moderated by the DGS. Questions can be on both Discourses, as well as on any relevant topic pertaining to the foundations of either Discourse or to the students chosen areas of competence. However, lines of questioning will be primarily motivated by and arise from the Discourses and the oral presentation.

- Students should be prepared to deliver concise answers and to illustrate their answers at the board using relevant equations, schematic plots, or diagrams. Students should not shy away from providing partial answers, but they should also be careful to indicate those parts of a question that they do not know or fully understand. If the answer to a question is not immediately known, it is useful for the committee to see a student explain how they might answer the question, e.g., by describing an experiment or trying to derive the answer from first principles. When answering questions on his/her research topics, the student must express their own thoughts and defend their own work, and should not defer to their Advisor (likewise, the Advisor must not answer questions for the student lest he/she jeopardizes the student's admission to PhD candidacy). In the end, the faculty is particularly interested in seeing evidence of good preparation, rigorous thought process, and a high level of scholarship.
- At the end of the extended question period, the student will be excused from the room and the faculty present will discuss the student's performance, both on the Qualifying Presentation as well as the two Discourses. Brief assessments of the Discourses will be given by the Advisor and each member of the Advisory Committee who are required to read both documents. The entire discussion is to be moderated by the DGS and it will conclude with a recommendation as to whether or not the student passes into PhD Candidacy; the recommendation will be presented at the end-of-year Student Evaluation Faculty Meeting.
- Satisfactory performance with the two Discourses and Qualifying Presentation is required for the PhD degree. The recommendation of the faculty present at the Qualifying Presentation will be reported to the G&G faculty by the DGS at the end-of-year Student Evaluation Faculty Meeting. The faculty as a whole then decides by vote whether the student passes into PhD Candidacy.
- Students who are admitted into PhD Candidacy will be recommended to the Degree Committee at the Graduate School for a Master of Philosophy (M.Phil.) degree. This degree is considered a formal acknowledgment of advancement into PhD Candidacy. The Graduate Registrar will provide the student with the necessary paperwork to obtain an M.Phil. diploma.
- Students who are not admitted into candidacy are expected to complete 1 or 2 aspects of one of their Discourses (in particular that for which there is the most completed work); this will comprise the Masters Essay or Thesis (see §3). Given the student's preliminary work, the Masters Essay/Thesis should be readily completed before the end of the summer.
- Under special circumstances, students who are not admitted to candidacy but complete a Masters Essay/Thesis can petition the DGS to retake the Qualifying Presentation in the following Fall, and to then be reconsidered for admission to candidacy. However, this request will be well scrutinized by the DGS, Advisor, Advisory Committee and PREcomm. Given that it will demand at least one more semester of financial support from the University, such a request will require exceptional reasons to be approved.

2.8.5 Third-Year Dissertation Review

- PhD students must present a summary of their Dissertation progress at the end of their third year. The Third-Year Dissertation Review must be completed before the Student Evaluation Faculty Meeting in the student's sixth term, otherwise the student will be considered in poor standing. A student may petition in writing to the DGS for a postponement if scheduling conflicts make it impossible to complete the review on time. The petition must include a revised deadline for completion of the Dissertation Review. In all cases, the Dissertation Review must be completed by the end of the seventh term.

- At least one week prior to the Third-Year Dissertation Review, the student will submit to the DGS office a summary (no page limit) with figures, tables, and references as needed. The summary, together with an announcement of the time and place for the Dissertation Review, are circulated to the faculty by the DGS Office. The primary audience at the Dissertation Review is the student's Advisory Committee and the DGS, although other G&G faculty are welcome to attend and participate. The Advisor serves as the moderator. The review starts with a presentation by the student, no longer than about 40 minutes, followed by a question period, after which the student is asked to leave. The faculty remains to discuss the student's progress and standing and performance on the review (see next item below). The results of that discussion are then reported to the student by the Advisor and the DGS, and reviewed at the next Student Evaluation Faculty Meeting.
- A Third-Year Dissertation Review is ranked either satisfactory or unsatisfactory by the advisory committee and DGS after the Review is complete.
 - A satisfactory rating leaves the student in good standing and this will be noted at the Student Evaluation Faculty meeting.
 - If the Review is found unsatisfactory then the advisor must compose a report to the student, in consultation with the rest of the advisory committee, explaining why the student was found unsatisfactory and listing remedial actions that the student should take. The report is submitted for approval to the DGS, after which it is forwarded to the student for concurrence and signature (with discussion if necessary with the advisor and DGS). The student must then schedule a re-take of the Third Year Review as soon as possible and must achieve a rating of satisfactory. A repeat rating of unsatisfactory on the Third Year Review is grounds for finding the student in poor standing and thereby releasing him/her from the graduate program.

2.8.6 Submission and Defense of the PhD Dissertation

The final step in completing the PhD degree requires the submission and defense of a Dissertation. The Dissertation Defense involves a formal oral presentation to the Department summarizing the major results of the Dissertation research. The Dissertation is formally reviewed by a Reading Committee, usually composed of four members. The Reading Committee typically includes the members of the student's Advisory Committee, but this arrangement is not required. The Department encourages the appointment of an external reader who was not involved in the design of the Dissertation.

The following checklist outlines the various steps involved in preparation, submission, defense, and completion of the Dissertation.

1. The Department strongly encourages students to publish their research before submission of the Dissertation. In this regard, the Dissertation can be viewed as a summary of all the student's published and unpublished work related to the Dissertation topic. Papers that are in review, in press, or published can be included verbatim, and in fact, may make up the bulk of the Dissertation. Note, however, that it is not acceptable to just staple together a series of papers. Regardless of the source of the materials, the Dissertation itself must read as a coherent document. The student must provide an Introduction, Discussion, and Conclusion so that separate pieces of work are clearly integrated. A footnote should be included indicating the source of published papers, the status of submitted manuscripts, and the authorship of each paper as published or submitted. The student's Reading Committee will be responsible for interpreting and implementing these guidelines and for judging the scope and suitability of the Dissertation manuscript.

2. In preparing the initial Dissertation manuscript, the student should rely primarily on his/her advisor to iterate towards a well-written manuscript. The student may call on other members of the Advisory Committee for help, but this interaction is distinct from the work of the Reading Committee.
3. The Reader's copies of the Dissertation manuscript are submitted to the DGS Office, along with a written note from the Advisor indicating that the manuscript is in good enough shape, both in terms of intellectual content and language, to merit review by the Reading Committee. The Advisor should also indicate who is to serve on the Reading Committee, as decided by the student and Advisor. The student should check with prospective members of the Reading Committee to ensure that they can perform their duties within the allotted amount of time. The DGS Office, not the student, will distribute the manuscript to the Reading Committee, including any External Readers. The reason for this arrangement is that it allows the DGS office to help keep the review process on schedule. The Reading Committee will be asked to complete their review within four weeks after the submission date.
4. The Dissertation Defense can be scheduled after submission of the initial Dissertation manuscript, but the date should be no sooner than 4 weeks after the submission date. Defenses can only be held during the academic year and no later than the last Student Evaluation Faculty Meeting of the term, in May. All internal readers must attend. External readers are encouraged, but not required, to attend. Departmental funds are available to cover travel expenses for External Readers.
5. All students who expect to defend during spring term, should notify the DGS Office in writing by the end of January. This request is intended to avoid scheduling conflicts during the very busy months at the end of the academic year.
6. The student must provide the DGS Office with a short Dissertation abstract at least one week before the Defense date. The abstract, together with a general announcement, will be circulated and posted in the Department. The Defense is open to all who wish to attend. The Defense itself consists of a presentation, not to exceed 40 minutes, followed by a question session with the general audience. The Reading Committee, DGS, and other interested faculty will continue with further questioning and discussion of the student in a subsequent private meeting, about 1 hour long. The status of the Dissertation manuscript is discussed, with a focus on revisions needed for final acceptance. The results of the Defense are discussed at the next Faculty Meeting and a determination is made then if the Defense was satisfactory or not. Note that successful completion of the Defense is separate from acceptance of the Dissertation manuscript by the Reading Committee.
7. The student will take the Reading Committee's comments and suggestions, and prepare a revised Dissertation manuscript. The student must consult the Readers to ensure that changes are suitable.
8. Upon completion of a final Dissertation manuscript, the student submits to the Registrar of the Graduate School one unbound original copy, plus a sufficient number of softbound copies for each member of the Reading Committee. The Department requires an additional unbound copy be deposited in the Kline Geology Library. The Graduate School has specific requirements about the format and organization of a Dissertation. A list of those requirements can be obtained from the Graduate School or the DGS Office. Note that conflicts with these requirements may delay acceptance of the Dissertation. The Graduate School Registrar should be consulted about specific questions or any request for variance from the regulations.

9. An archived collection of specimens is an integral part of some Dissertations. Such collections must be properly curated before the Department will vote on recommendation of the degree. Students should consult their Advisor about specific requirements for any archived collection. It is the student's responsibility to ensure that the collection is approved by his/her Advisor and that a written statement of acceptance is provided to the DGS.

After submission, the Graduate School sends out a request for Reader's Reports. Each Reader submits an independent assessment of the quality and suitability of the final Dissertation manuscript, together with a final evaluation: Distinguished, Very Good, Good, or Fair. The Reader's Reports are reviewed in a Faculty Meeting. If the Dissertation is voted as acceptable by the faculty, a recommendation is then forwarded to the Graduate School Degree Committee for award of the PhD degree.

The Graduate School makes an official award of degrees twice a year, in December and May. Students need to be mindful of relevant deadlines if they want their degree to be awarded by a specific date. The final Dissertation manuscript must be submitted to the Graduate School by October 1 for a December degree or by March 15 for a May degree. Registered students who submit Dissertations will remain registered until the end of the term and will retain all relevant privileges (e.g., use of the library privileges, health care coverage, etc.).

In planning for relevant deadlines, students should allow enough time for the Advisor and Reading Committee to do their work. A Dissertation is like any other manuscript, in that it usually requires a number of iterations before it is ready for final submission. The Advisor is responsible for feedback on initial rough drafts. The Reading Committee will commonly request modifications as well, which in some cases may take one or two months to implement.

2.9 Miscellaneous Requirements and Expectations

2.9.1 Foreign Language Competence

The Department has no requirement for foreign languages. All students are responsible, however, for the assimilation of the foreign-language literature needed for competence in their concentration areas.

2.9.2 Attendance and Presentation at Scientific Meetings

The Department places great emphasis on having all graduate students regularly attend and present research results at major scientific conferences. Each entering student is allocated a budget of \$2000 for conference-related expenses in his/her first and second year. Post-second-year students should ask their Advisor for support of conference-related expenses, and the DGS encourages faculty to honor those requests. Students are also encouraged to solicit funds from other sources. For instance, most conferences have some type of student subsidy available on request. In exceptional cases, the Department Chair will consider specific requests for conference support from post-second year students, but availability of other external funds will be a major factor in any decision made.

Students should consult the Business Office early in their planning of any conference-related travel. The Business Office can pay for conference fees and airline tickets in advance of the meeting, which will save the student the burden of having to file for a reimbursement of expenses. Students should also keep a careful record, including receipts, for any expenses to be reimbursed. A small cash advance can be obtained for some expenses; check with the Business Office for further details.

The major annual meetings most frequently attended by G&G students are

- The GSA (Geology Society of America) meeting in late October or early November; see www.geosociety.org for exact dates and deadlines.

- The AGU (American Geophysical Union) meetings: The Fall AGU meeting is in early to mid December and is typically the larger of the two AGU meetings. The Spring AGU meeting is in mid to late May; although the Spring AGU is typically a smaller meeting, recently the AGU has been (and will be) holding its spring meetings with other societies and has been referring to these meetings as “Joint Assemblies”. See www.agu.org/meetings for information about dates and deadlines.

There are many other meetings and workshops and both the GSA and AGU websites have extensive (although not necessarily complete) information and calendars about meetings worldwide.

2.9.3 Field Experience

The Department encourages G&G students in relevant areas of research to acquire some field experience. Some students may find it important to get a formal introduction to geologic field research by attending a summer field course. The DGS Office maintains a file of field course opportunities available through other universities and colleges.

The Department has a tradition of sponsoring a two-week field trip. Previous trips have been to California, the Swiss Alps, the Apennines, the Aegean, Australia, and the Southwest of the United States. The trip is open to all G&G undergraduate majors and graduate students. Students are expected to play a major role in the selection, planning, and execution of the trip. Field trips provide an excellent opportunity for all students to get a broad introduction to the geologic side of Earth sciences.

3 REQUIREMENTS FOR THE MSc DEGREE

The Department has no official Master's program, but students are allowed to complete a Master of Science (MSc) degree under special circumstances. Sometimes this option is offered when the faculty has determined that the student should not continue in the PhD program. Other times, this option may be selected by a student, but only when he/she is otherwise in good standing in the PhD program. Note that the transition from the PhD to the MSc program usually results in loss of any University Fellowship award.

3.1 Residence Requirements

The MSc in G&G normally requires two years of residence. If a student has unusual training or professional experience, the faculty may, upon petition by the student, reduce the residency requirement to a minimum of two terms, with a corresponding reduction in the course requirements. Students should consult the DGS about their eligibility for one-year residence.

3.2 Course Requirements and Grades

Two-year residency for the MSc degree requires successful completion of courses prescribed and approved by the Advisory Committee during the student's first four terms of PhD course work. As with the PhD program, a typical course load is 2-3 courses per term, not including research course credits and seminars, but this may vary depending on the level of each course and other commitments, such as teaching fellowships. Courses may be attended on an informal basis with the permission of the instructor but "audits" are not viewed as part of the student's course load, nor do they contribute to the MSc course requirement.

The advising schedule for an MSc student is the same as outlined above for PhD students. An Advisor and Advisory Committee are responsible for assisting the student in selecting an appropriate course and research schedule, and approving that schedule. The schedule is sent to PREcomm for final approval, in the same fashion as done for first- and second-year PhD students.

Performance in course work is evaluated as Honors, High Pass, Pass or Fail, except in seminar courses and tutorials, which are graded as Satisfactory or Unsatisfactory. A minimum of one Honors grade must be achieved in a graduate-level course or an approved advanced-level undergraduate course by the end of the third term (second term for one-year residency).

Quality performance is a major factor in student evaluation. The faculty expects students to achieve a High Pass or better in their area of specialization and to demonstrate a high level of competence in related fields.

3.3 Research Essay or Thesis

All MSc candidates must complete either a Research Essay (one course credit) or a Research Thesis (two course credits) prior to the end of the final term of residency. The results of the Essay or Thesis are typically presented to the Department at an MSc Defense (analogous to a PhD Defense). The Advisory Committee will review and evaluate the Essay or Thesis and the Defense, and determine if the student has successfully completed the MSc requirements. The result is reported to the faculty, who vote on completion of the degree. If approved, a recommendation is then forwarded to the Degree Committee at the Graduate School for award of the MSc degree. A successful MSc candidate must submit an unbound copy of the Thesis or Essay to the Kline Geology Library.

4 FINANCIAL SUPPORT

4.1 Research Grants

Graduate research is funded from a variety of sources, with an emphasis on external grants. Although only faculty can be the principal investigator on most major research grants, the Department strongly encourages students to take a significant role in the preparation of grant proposals to fund their PhD research. Grant proposals are a central part of one's research career, and they represent an important first step in the initiation of a research project. A proposal outlines the scientific question to be addressed, the research plan, the feasibility of the project, and the broader impact of the work. The goal is to convince one's colleagues that the research is important and deserves high priority for funding. In this regard, the Research Discourses prepared in the first two years should be well suited to pursue external funding.

In many cases, a student and Advisor will collaborate to prepare a proposal for submission to external agencies or foundations, such as the National Science Foundation, Department of Energy, American Chemical Society, NASA, NOAA, etc. In some cases, private companies will contribute research funds. Some groups welcome research proposals from students themselves. The funds from those sources are usually smaller (\$1000 to \$2000 per year), but this may be enough to support some critical fieldwork or travel. For instance, the Sigma Xi Society has an annual proposal deadline of October 15 and March 15 with awards announced 12 weeks from the deadline dates. The Geological Society of America has an annual deadline of February with awards announced in April.

4.2 Financial Aid

The Graduate School Bulletin contains a detailed statement on the kinds of financial aid available to graduate students and the university policies governing their distribution. Additional aid may come from external grants, but students should be aware that the availability of grant funds can change from year to year. The following is a general description of the current financial aid policies as applicable to G&G. The *Graduate School Programs and Policies manual* is the authoritative source for all financial-aid policies.

4.2.1 University Fellowships

University Fellowships are granted for a twelve-month period and assume that the summer months will be devoted to full-time research or other appropriate academic activities. The University Fellowship includes tuition as well as a stipend. University Fellowships also come with a nominal teaching requirement (see §5.1.1)

Students who hold a University Fellowship are allowed to receive additional income from an outside non-service award. All external fellowships must be reported to the DGS, who will inform the Associate Dean and the DGS Office. During the academic year, students may supplement their University Fellowship through appropriate university employment, up to 10 hours per week.

Students holding external fellowships should be aware of the granting agency's policy on supplementation, as well as the Graduate School policy on combined awards stated in the Graduate School Programs and Policies manual.

Some fellowships are funded by gifts to the Department or the University. A student may be asked to provide a brief annual report to the Department Chair or the University Reporting Secretary, to be used in preparing a report to the donor.

4.2.2 Outside Fellowships

Students are strongly encouraged to apply for outside fellowships. The Graduate School maintains a library of fellowship information in the McDougal Center. The DGS Office is also available for additional advice on fellowship opportunities.

Students are particularly encouraged to apply for the NSF Fellowship Program, which usually has an application deadline in November. This program accepts applications from U.S. citizens and nationals and permanent resident aliens who apply in the year prior to starting graduate school or in their first year of graduate school. The award of an NSF Fellowship bring three years of stipend support and considerable visibility to the student as well. The DGS Office can provide further information about application requirements and procedures.

4.2.3 Research Assistantships

Unlike other forms of financial aid, the funds for Research Assistantships (or Assistants in Research - "AR") come entirely from external research grants awarded to individual faculty. The work performed not only is part of the faculty member's research project, but also is the student's Dissertation research and therefore in satisfaction of a degree requirement. AR's tend to be project-oriented and are awarded to students who will contribute to the funded research endeavor. The principal investigators for the grant will determine how an AR is awarded.

A graduate student must be in good standing to hold an AR. Most awards are for a one-year period, but can be renewed assuming that the necessary grant funds are available.

4.2.4 Project Assistantships

Project Assistants (PA) are also paid by a research project, but do not exceed 10 hours of work per week. Wages are determined by the Department in consultation with the Department's representative in Personnel, and must be equivalent to the salary university staff would receive for performing similar services. The appointment is for work on a research project that is not part of the student's degree program.

4.3 Paychecks and Income Taxes

All students must have a Social Security number within a few weeks of Graduate School registration. Instructions for securing a social security number are provided at registration. As soon as the number is assigned, the student must provide it to the University Registrar's Office and the DGS Office.

Paychecks are issued semi-monthly, on the 15th of the month (or the proceeding Friday when the 15th falls on a weekend) and on the last weekday of the month. Note that Fellowship checks are not released by the Financial Aid Office until the student is fully registered.

Checks can be deposited directly to a bank account, mailed to a specific address, or picked up in the DGS Office after 9:30A.M. on payday. All students must provide written instructions to the DGS Office in KGL, indicating how their paycheck should be handled.

Students are responsible for determining their income tax status and for filing annual tax returns. Relevant tax information is provided at registration.

4.4 Funds for Graduate Student-Organized Symposia and Fund for Seminars and Colloquia

Symposia organized by graduate students provide extraordinary opportunities for intellectual interaction. The Graduate School will offer Graduate Student Symposium Awards, which will provide up to

\$1,000 to support graduate student-organized symposia. The Graduate School will accept applications for these awards in the early fall, the applications will be judged competitively, and several awards will be made. Funding to support Departmental or program-based seminars and colloquia, where students and faculty could regularly discuss graduate student work, is also available through the Graduate School.

5 STUDENT TEACHING APPOINTMENTS

In April, the DGS Office asks all G&G instructors to submit requests for teaching assistants for the next academic year. At the same time, all graduate students required to take a teaching fellowship appointment (see §5.1) are asked about their preferences for teaching. Students who apply for a teaching assistantship must have their application signed by their Advisor.

TFcomm (see §1.3) is responsible for placing students in specific TF positions. Students and instructors will receive notice at the end of spring term about the TF assignments for the next academic year. The DGS is authorized to make a limited number of changes to account for changes in enrollment or the revised plans of an instructor or student. Please try to make any requests for changes as soon as possible in order to avoid delays or problems with TF wages for the student.

5.1 Teaching Requirements

5.1.1 University Fellowship Teaching Requirement (UFTR)

Students supported on a University Fellowship are obligated to teach one semester at the TF1 level or to hold a curatorial assistantship (CA) for one semester for every year of fellowship support (the CA appointment is described below). In this document and in the DGS Office, this requirement is referred to as the *University Fellowship Teaching Requirement* (UFTR).

5.1.2 Academic Teaching Requirement (ATR)

The G&G department requires that all graduate students, regardless of how they are financially supported, successfully complete two TFI equivalents in two separate years during the first four years of graduate education; this is referred to as the *Academic Teaching Requirement* (ATR) since it is for gaining the educational experience of teaching rather than for fulfilling an obligation to the University for the University Fellowship. However, teaching completed while satisfying a UFTR will simultaneously fulfill the ATR (as long as all criteria are met).

5.2 Types of Appointments

TF appointments are assigned at different levels depending on the amount and type of work involved. Instructors must be careful not to subject students to a workload that exceeds that specified for their appointment (see estimated hours below). A student can claim additional wages in exceptional cases where the work done significantly exceeds the amount of time specified for their appointment. Such requests should be made to the DGS by the instructor before the student exceeds the specified limit. The actual claim for additional wages needs to be documented by a report from the student of hours worked and tasks performed during the term. This arrangement is strongly discouraged because it places an unnecessary burden on the student and delays payment for their work. The DGS encourages instructors to upgrade the TF appointment, request an additional TF appointment, or reduce the workload. Instructors must also keep in mind that excessive teaching duties can seriously interfere with a student's progress with their degree.

The job descriptions below were prepared by the Graduate School and provide a guide for determining the level of appointment.

5.2.1 Teaching Fellow 1

The responsibilities of a TF1 are primarily (a) grading or (b) a combination of the following: attending class, reading, advising undergraduates, offering an occasional discussion section, helping to set up a lab, or assisting in the administrative details of a course. A TF1 does not engage in regular classroom instruction. Approximate weekly effort: 5 hours.

5.2.2 Teaching Fellow 2

A TF2 typically leads and grades one discussion or laboratory section of up to twenty students or has a combination of the responsibilities described (a) and (b) in TF1. Approximate weekly effort: 10 hours.

5.2.3 Teaching Fellow 3

Depending on departmental policy, the responsibilities of a TF3 may include leading and grading one or two lab or discussion sections. Alternatively, a TF3's responsibilities might include attending lectures, office hours and consultations, and grading. Approximate weekly effort: 15 hours.

5.2.4 Curatorial Assistant

This appointment is for curatorial work on a Peabody museum collection under the general supervision of a Museum Curator. A CA appointment can be used to fulfill the University Fellowship teaching requirement. Note that CA appointments are only available to students specializing in a discipline that maintains a collection in the Peabody Museum. The CA 1 and CA 2 appointments are equivalent in hours and compensation to TF2 and TF3 appointments, respectively.

5.3 Teaching Fellow Compensation

The compensation or stipend for teaching fellow appointments are summarized in the table below (the amounts shown are per semester for which the appointment is made). However, the amount of compensation also depends on whether the student is fulfilling a teaching requirement (UFTR or ATR); see §5.3.1.

Appointment	Total Hours	Compensation for 2006-07
Teaching Fellow 1	75	\$2,200
Teaching Fellow 2	150	\$4,400
Teaching Fellow 3	225	\$6,600

5.3.1 Compensation During Fulfillment of Teaching Requirements

Assignment of a TF1 for Teaching Requirement: If this assignment fulfills either a UFTR (see §5.1.1) or an ATR (see §5.1.2), the student does not receive any additional teaching-fellowship stipend for this teaching assignment.

Assignment of a TF2, but only one TF1 Required: One TF unit of this assignment fulfills an ATR and/or UFTR. Student will receive a TF1 stipend (see §5.3) for the additional TF unit.

Assignment as a TF1 or TF2, beyond Teaching Requirement: Student will receive the full teaching fellowship stipend (§5.3) for participating in this optional teaching opportunity.

Note: Students admitted prior to the 2002-2003 academic year will finish their graduate studies under the rules they agreed to at the time they were accepted into the Graduate School Program.

6 USE OF DEPARTMENTAL FACILITIES

6.1 Space and Access

6.1.1 Room Assignments

All entering graduate students are provided with office space, either in a single or double room in the graduate student area (west side of second floor in KGL) or in offices or laboratories near their Advisor's research area. In September the Department Registrar posts the room assignments for the year. Incoming students can get their room assignments at the DGS Office on arrival.

Rooms vacated by departing students are reassigned by the DGS Office; students wishing to change rooms should consult the DGS Office and, if necessary, sign a waiting list. Those students who have sole occupancy of a double office must be prepared to accept another office mate if requested.

6.1.2 Laboratory Facilities

Laboratory facilities are available for student use but only with the approval of the appropriate supervisor. The University requires students to undergo a training course in Laboratory Health and Safety before they start work in a laboratory. The Office of Environmental Health and Safety sends out Safety Bulletins listing HS training sessions. Bulletins will be posted outside Room 302 and can also be found on the OEHS WWW homepage (www.yale.edu/oehs) under the heading Safety Publications. All the training seminars are held at the Office of Environmental Health and Safety Training Center in Room 15 at 135 College Street, unless otherwise noted.

6.1.3 Keys

A KGL entrance key and sub-master are issued to each entering graduate student, in exchange for a \$10 refundable deposit. The submaster provides entry to all student offices, all classrooms, the Library, and most laboratories. Should the need arise for access to a room not on this key, written permission from the faculty member in charge is needed before the Business Manager can issue the key.

6.2 Communications, Transportation and Supplies

6.2.1 Computers and Email

The Department Systems Programmer, David Rossman (david.rossman@yale.edu), maintains a variety of PC's and workstations throughout the department. There are computer labs in KGL 228, 318, as well as a building-wide wireless network.

Information Technology Services (ITS) at Yale University provides email services for all faculty, staff, and students. The standardized email address is of the form `firstname.lastname@yale.edu`. Please visit www.yale.edu/acct for more information.

6.2.2 Telephones

The Geology & Geophysics Lounge (KGL257) phone and two student-wing phones are provided by the Department for the exclusive use of the graduate students. Outgoing long distance calls can be made using a personal calling card number or, if research-related, a phone authorization number (see the Business Office for details). The Departmental staff are happy to take important messages that arrive on the Department's general phone lines, but please do not abuse this service. Messages will be posted on the bulletin board outside KGL201 or in the student's mailbox.

6.2.3 Fax

The Department has a general-use fax machine located in the Department Secretary's Office (KGL202). Incoming faxes should be sent to +1-203-432-3134. Long-distance transmission of outgoing faxes requires a phone authorization number (see the Business Office for further details).

6.2.4 Mail

Each entering student is given a Departmental mailbox downstairs on the west side of the first-floor entrance area. Mail carried by the US Post Office should be addressed to the following:

[Your Name]
Yale University
Department of Geology and Geophysics
PO Box 208109
New Haven, CT 06520-8109

Courier deliveries should be addressed to the following street address:

[Your Name]
Yale University
Kline Geology Laboratory
210 Whitney Avenue
New Haven, CT 06511

6.2.5 Postage

The Department postal meter (KGL202) can be used for mailing letters and packages relevant to official Departmental teaching and research activities. The meter is not to be used for personal mail, which includes requests for reprints, job inquiries, and job applications.

6.2.6 Office Supplies

Stationery, envelopes, mailers, paper tablets, pencils, transparencies, etc. are provided at no cost to graduate students for use in teaching and research activities. Graduate students are welcome to use Departmental stationery as long as the correspondence is related to the conduct of normal Departmental teaching and research activities.

6.2.7 Copiers

There are two copiers for student use: one is presently on the KGL side of the bridge to ESC (Environmental Studies Center) on the 2nd floor (through the Grad Student Wing); the other is in the G&G Library on the third floor. Entering students are given their own password for use of these machines. The first 500 copies per year are free. Additional copies are billed three times a year, in January, June, and September (see the Business Office for the current rate).

6.2.8 Credit Card Charges

The Departmental credit card is held by the business office. Permission to use the card for professional charges must be sought through the business office after consultation with the advising faculty member. All university rules and regulations associated with credit charges apply.

6.2.9 Vehicles

The G&G Department maintains two vans for University business only. Mileage is charged using the prevailing government rate (see the Business Office). Students must hold a valid Yale University driver's license before operating a University vehicle and must take the driver training course. Contact Chair's Office to make the necessary arrangements for a license or to reserve a van. Reservations and charging instructions must be given before a van can be checked out. Mileage charges for official Departmental functions, such as a course-related field trip, are covered by the Department.

6.3 Problems and Assistance

6.3.1 Security

There have been occasional thefts in KGL. Students are advised to close and lock their office doors when they leave (even for a few minutes), carry their keys at all times, and keep pocketbooks and calculators out of sight or secured. Desktop and laptop computers are particularly attractive targets. They should be secured in some way to protect from theft. The University has no insurance coverage for loss or theft of personal belongings.

Report thefts immediately to the Business Office during working hours and to Campus Police (2-4400) during the evenings and weekends.

6.3.2 Building Maintenance

Heating and cooling problems, and other building maintenance issues (leaks, burnt-out light bulbs, smoke, noxious fumes, etc.) should be promptly reported to the Business Office during working hours and to 2-6888 after hours.

6.3.3 Pets

No dogs or other domestic pets are allowed in offices or in any part of KGL and Peabody Museum.

A CURRENT LIST OF GRADUATE STUDENTS

Year	Graduate Student	Advisors and Advisory Committees
1	Peter Douglas Srinath Krishnan Keith Laskowski Tamara Machac Ross Mitchell Sarah Vorhies Joanna Wolfe	Pagani , Affek, Canuto (Anthro), Turekian Pagani , Affek, Rye, Turekian Brandon , Ague, Evans, Pagani Wettlaufer , Natarajan (Astro), Smith, Veronis Evans , Ague, Brandon, Skinner Ague , Rye, Turekian, Wang Briggs , Gauthier, Vrba, Monteiro (E&EB)
2	Xiaoyue Du Thomas Hegna Tyler Lyson Tara Mayeau Kazuihiko Otsuka Melanie Parker Carlos Szembek Jakob Vinther	Ague , Rye, Evans, Turekian Briggs , Gauthier, Vrba, Near (E&EB) Gauthier , Briggs, Vrba, Prum (E&EB) Park , Bercovici, Korenaga, Brandon Karato , Brandon, Ague, Bercovici Sherwood , Smith, Fedorov, Wettlaufer Fedorov , Sherwood, Smith, Veronis Briggs , Evans, Vrba, Leo Buss (E&EB)
3	Michelle Casey Sitindra Dirghangi Devin McPhillips Erik Sperling Bryan Woods	Briggs , Gauthier, Hickey, Vrba Blake , Pagani, Reiners, Turekian Brandon , Reiners, Evans, Pagani Briggs , Evans, Hickey, Leo Buss Smith , Sherwood, Fedorov, Wettlaufer
4	Faysal Bibi Una Farrell Melissa Spannuth Ondrej Sramek	Vrba , Gauthier, Hickey, Briggs, A. Hill (ANTHRO) Briggs , Hickey, Berner, Evans Wettlaufer , Bercovici, Karato, Sherwood Bercovici , Karato, Wettlaufer, Korenaga, Y. Ricard (ENS-Lyon)
5	Madalyn Blondes Zhicheng Jing Tatiana Lioubetskaia Daniel Peppe Erik Thomson Brett Tipple	Reiners , Ague, Brandon, Karato, Korenaga Karato , Korenaga, Bercovici, Park Korenaga , Bercovici, Karato, Reiners, Turekian Hickey , Vrba, Evans, Briggs Wettlaufer , Bercovici, Smith, Karato, L. Wilen Pagani , Blake, Turekian, Rye, Hickey, Briggs
6	Robert Allen Brian Andres Megan Andrews Matthew Benoit Theresa Raub William Landuyt Garrett Leahy Yanping Li Jerome Neufeld Timothy Raub Eben Rose	Sherwood , Smith, Wettlaufer, Park Gauthier , Vrba, Hickey, Briggs, R. Prum (EEB) Berner/Ague , Reiners, Berlyn (F&E) Vrba , Gauthier, Hickey, Briggs Evans , Brandon, Reiners, Skinner Bercovici , Karato, Park, Korenaga, Y. Ricard Bercovici , Park, Karato, Korenaga Smith , Sherwood, Wettlaufer, Veronis Wettlaufer , Bercovici, Veronis, Karato Evans , Briggs, Vrba, Reiners Evans , Blake, Pagani, Briggs
7	Jung Hyo Chae Alana Kawakami Philip Skemer	Sherwood , Veronis, Smith, Wettlaufer, Lee (F&E) Vrba , Gauthier, Hickey, Yoder (E&EB) Karato , Brandon, Reiners, G. Hirth (WHOI)