

Department of Geology & Geophysics  
Yale University

**GRADUATE PROGRAM HANDBOOK  
STUDENTS AND FACULTY**

OFFICE OF THE DIRECTOR OF GRADUATE STUDIES

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# 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

<http://www.yale.edu/printer/bulletin/htmlfiles/grad/schedule-of-academic-dates-and-deadlines.html>

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

The Geology & Geophysics calendar of events can be found at

<http://earth.yale.edu/google-calendar>

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 Section 2.8.2.

### G&G Undergraduate and Graduate Courses

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

<http://students.yale.edu/oci/search.jsp>

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 detailed receipt from the restaurant 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 Registrar, Peter Schrader. 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** KGL201, 432-3161

PROF. JAY AGUE, Chair,  
KGL305, 432-3168,  
BECKY POCOCK, Senior Administrative Assistant,  
KGL301, 432-3161,  
[rebecca.pocock@yale.edu](mailto:rebecca.pocock@yale.edu)

### **Graduate and Undergraduate Studies Office** KGL203, 432-3124

PROF. JUN KORENAGA, Director of Graduate  
Studies, KGL 314, 432-7381,  
[dgs@geology.yale.edu](mailto:dgs@geology.yale.edu)  
PROF. MARY-LOUISE TIMMERMANS, Director of  
Undergraduate Studies, KGL 305, 432-3167,  
[dus@geology.yale.edu](mailto:dus@geology.yale.edu)  
PETER SCHRADER, Registrar,  
KGL203, 432-3124,  
[peter.schrader@yale.edu](mailto:peter.schrader@yale.edu)

### **Business Office** KGL301, 432-3164

CAROL MACLEMAN, Business Manager,  
KGL301, 432-3164,  
[carol.macleman@yale.edu](mailto:carol.macleman@yale.edu)  
PAM BUONOCORE, Assistant Business Manager,

KGL302, 432-3165,  
[pamela.buonocore@yale.edu](mailto:pamela.buonocore@yale.edu)

MARGARET GOMES, Faculty Support (Events & Travel),  
KGL304, 432-5703,  
[margaret.gomes@yale.edu](mailto:margaret.gomes@yale.edu)

AIDA RODRIGUEZ, Department Secretary,  
KGL302, 432-3114,  
[aida.rodriquez@yale.edu](mailto:aida.rodriquez@yale.edu)

The Chairman's Office oversees the Department as a whole. The Business Office handles financial matters. The disbursement of stipends and wages for graduate students is handled by the Department Registrar. He is also responsible for scheduling the use of classroom space in KGL by outside departments and organizations. 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 events and travel manager is responsible for arranging travel for all department events, for coordinating all department special events and for publishing the weekly Departmental Calendar.

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](mailto:grad.sci.deans@yale.edu)
- Robert Harper-Mangels, Assistant Dean,  
133 Hall of Graduate Studies, 432-2744,  
[robert.harper-mangels@yale.edu](mailto:robert.harper-mangels@yale.edu)
- Claudia Schiavone, Assistant University Registrar, Faculty of Arts and Sciences,  
246 Church Street, 3<sup>rd</sup> Floor, 436-1579,  
[stephen.goot@yale.edu](mailto:stephen.goot@yale.edu)
- Jennifer Brinley, Associate Director, Financial Aid,  
127 Hall of Graduate Studies, 432-7980,  
[jennifer.brinley@yale.edu](mailto:jennifer.brinley@yale.edu)
- Lisa Brandes, Director, McDougal Graduate Student Center,  
123 Hall of Graduate Studies, 432-2583,  
[lisa.brandes@yale.edu](mailto:lisa.brandes@yale.edu)

### **Office of International Students and Scholars**

<http://yale.edu/oiss>

Ann Kuhlman, Director,  
246 Church Street, 432-2305,  
[ann.kuhlman@yale.edu](mailto:ann.kuhlman@yale.edu)

### **Yale Graduate Housing Office**

Helen Hadley Hall, 420 Temple Street

<http://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)**

##### **Fall**

Jun Korenaga (Chair) Ruth Blake

Ruth Blake

Danny Rye

Trude Storelvmo

Jeffrey Park

##### **Spring**

Maureen Long (Chair

Kanani Lee

Danny Rye

Alan Rooney

Ronald Smith

PREcomm oversees the functioning of the pre-candidacy portion of the G&G graduate program, which includes course work, areas of concentration, and research 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.

#### **Graduate Admissions and Recruiting Committee**

Jun Korenaga (Chair - Fall)

Maureen Long (Chair - Spring)

Ruth Blake

Mark Brandon

Derek Briggs

Shun Karato

Ronald Smith

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)**

Jun Korenaga (DGS - Fall)

Maureen Long (Acting DGS – Spring)

Mary-Louise Timmermans (DUS)

Students (TBA)

Peter Schrader (Registrar)

The DGS will: (1) estimate the number of teaching fellows (TF) needed for each course, (2) determine an appropriate appointment level (e.g., TF10 or TF20) relative to the work involved, and (3) select specific students to fill the available positions. Most of TF-related business is done in the spring term when the recommended list of TF assignments for the next academic year is prepared. 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, the DGS 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.

### **Colloquium Committee (COcomm)**

Faculty advisors: Kanani Lee, Alan Rooney

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)**

Mary-Louise Timmermans (Chair)

Jun Korenaga (DGS - Fall)

Maureen Long (Acting DGS – Spring)

Other Members: TBA

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: Emily Stewart (President); Duncan Keller (Vice-President); Nicole Shibley (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 at the end of year 2. One Discourse – the Major Discourse – is expected to be more developed than the other and will take the form of a full research proposal (and will constitute the Dissertation Prospectus; see below) while the other Discourse – the Minor Discourse – can be written as a proposal or article. Both Discourses will be presented at the Qualifying Presentation (see below) with the Major Discourse comprising most of the talk. To facilitate progress on the Discourses students will follow a schedule involving:

- Submission of brief Pre-proposals for each Discourse (submitted at the same time).
- Brief oral Preparatory Presentation on Major Discourse project plus progress-to-date on Minor Discourse Project (e.g., statement of the problem, fundamental background knowledge, context).
- Submission of the Major and Minor Discourses (at the same time).

**Qualifying Presentation:** Students will give a 40-minute formal oral presentation on the Discourses (about 30 min on the Major and 10 min on the Minor). During the subsequent extended questioning period they will defend both Discourses and be queried on supporting background knowledge. The Major Discourse eventually 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. The Minor Discourse would ideally become a publishable article, and if appropriate can become a chapter in the Dissertation (i.e. if it is related to the overall thesis topic).

#### 2.1.2 Post PhD-Candidacy Requirements

**Third and Fourth Year Progress Meeting:** Ph.D. students will present a summary of their Dissertation progress to their full Advisory Committee during the Spring terms of their third (term 6) and fourth year (term 8). These meetings are not intended to repeat the qualifying exam, but

are rather an opportunity for the student and committee to exchange ideas, to discuss research directions, and to help focus the student's scientific and career trajectories.

**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 (Section 2.3) is a more complete schedule.

### **Term 1**

- Primary course work
- Initiate research for the Major Discourse, and the Minor Discourse.

### **Term 2**

- Primary course work. At least 1 Honor grade is achieved by Term 2.
- Proposed topics/titles and advisors along with 2-3 page pre-proposal for both Major and Minor Discourses, including brief abstract, submitted to DGS office (after approval by Advisory Committee) by end of April.

### **Term 3**

- Primary course work
- Preliminary Presentation of Discourses/Mock Exam in mid-to-late October.

### **Term 4**

- Completion of primary course work. 2 Honors are required to proceed to the oral Qualifying Exam.
- Discourses due at DGS office by end of March (after Advisory Committee approval).
- Qualifying Presentation of Major Discourse/Oral Examination (scheduled at DGS office during April); note that the interval between the mock exam and the qualifying exam should not exceed six months (excluding the period during which the student may be on leave).
- Faculty decision to advance student into candidacy during last Faculty Meeting in May.

### **Terms 5 and 6**

- PhD research
- Third Year Progress Meeting in the Spring Term (Term 6)

### **Terms 7 and beyond**

- Fourth Year Progress Meeting in the Spring Term (Term 8).

- Preparation of the Dissertation

## **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
  - 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 and signs the document containing the course schedule, areas of concentration; and the remaining Advisory Committee members approve and sign the document.
  - 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 Discourses
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
  - Proposed topics/titles/advisors with brief (2-3 page) pre-proposal including abstract for both Major and Minor Discourses approved by Advisory Committee and submitted to DGS office by end of April.
  - Advisor forwards proposed topics and pre-proposals for both Discourses to the DGS who will present them to PREComm for review. If revisions are necessary the DGS office will contact the student.
  - Student Evaluation Faculty meeting
  - Minimum requirement of Honor grade is achieved

### **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

- Advisor approves and signs course and research schedule
  - The rest of the Advisory Committee approves and signs the final schedule
3. Preliminary Presentation of Discourses & Mock Exam (Section 3.3)
- Preliminary Presentation of the Discourses/Examination is scheduled for late mid-to-late October. It is a Preparatory/Mock Examination that serves as a practice trial and preparation for the Qualifying Presentation/Oral Examination. Prior to the presentation, the student needs to update the discourse pre-proposals and send them to the DGS office, so that they can be distributed to the Advisory committee, attending PREcomm members, and the DGS beforehand. An oral presentation of the Major discourse is required, followed by comments and general questions of the kind to be expected in the Qualifying Presentation/Oral Examination. Questions and comments related to the Minor discourse should be expected and students should plan accordingly. At least one slide should be available that describes the fundamental nature of the Minor discourse, either to be presented formally or to be held in reserve for questions. The examining faculty will articulate the general research areas on which the student is expected to answer questions, and thus broadly the kinds of questions also expected in the Qualifying Presentation/Oral Examination. In preparing for this event, the student should not concentrate on giving an elaborate powerpoint display, but instead should seek to demonstrate in-depth understanding of the intellectual content of the thesis research and its broader context. After the presentation, the Advisor summarizes what transpired, sends the summary to the DGS office, and gives the student feedback. If a student remains in doubt on any points raised during this event, he/she should seek out those faculty members for additional discussion to ensure a full understanding of what is expected.

#### **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 Major Discourse and Minor Discourse
2. Second week of term: Meeting between student and Advisor
  - Advisor approves and signs 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 office will contact the student.
3. End of term
  - Submission of completed Discourses: Major and Minor Discourses due at DGS office by the end of March, after Advisory Committee approval. Student has achieved a minimum of 2 Honor grades.
  - Qualifying Presentation (Section 3.4)
    - Student gives 40-minute presentation: 30 minutes on the Major Discourse, 10 minutes on the Minor Discourse. (The Major Discourse will typically develop into the PhD thesis). Scheduled for April by DGS office.
    - The presentation is immediately followed by brief period (no more than 5 minutes) of questions from the general audience.
    - This is followed by in-depth questions on the presentation, and on any general fundamental areas pertaining to the student's chosen fields of concentration and in the general areas of the geosciences.

- Attendance required of the Advisory Committee, DGS, and the PREcomm. 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.
  - 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.
  - After this the DGS and the Advisor inform the student of the result, and that they will make the recommendation to the G&G faculty for final approval; the Advisor gives the student more extensive feedback.
  - The DGS will endeavor to keep the entire event to no more than two and a half hours.
  - Note on Graduate School Requirements: the Major Discourse satisfies the Dissertation Prospectus requirement; and the Qualifying Presentation/Oral Examination satisfies the Qualifying Examination requirement.
  - The interval between the mock exam and the qualifying exam should not exceed six months (excluding the period during which the student may be on leave).
- Student Evaluation Faculty Meeting
    - Evaluation of student progress and results of evaluation of the Major Discourse, Minor Discourse and the Qualifying Presentation/Oral Examination.
    - Faculty votes on whether to advance the student into candidacy for the PhD degree.

### **Year 3**

1. 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.
2. Third Year Progress Meeting (Section 3.5):
  - A meeting with the Student Advisor and Advisory Committee is required in the Spring term (Term 6) to assess timeliness of progress with the Dissertation research and to help focus the student’s scientific and career trajectories, and encourage publication of research results as appropriate.
3. 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. 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..
2. Fourth Year Progress Meeting (Section 3.5):
  - A meeting with the Student, Advisor and Advisory Committee is required in the Spring term (Term 8) to assess progress with the Dissertation research and to help focus the student’s scientific and career trajectories, and encourage publication of research

– Attendance required of the Advisory Committee, DGS, and the PREcomm. Other results as appropriate.

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** (Section 3.6): 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 of the Major Discourse/Mock Examination, the Advisory Committee’s report on the Minor Discourse if applicable, the Qualifying Presentation/Oral Examination, and the Three 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, paleontological and paleobotanical concepts such as anatomy of particular organismal groups, systematics, biogeography, macroevolution and taphonomy, 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 projects and the 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 office. The DGS office 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 (G&G 690 and G&G 691); 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 office can provide further information about undergraduate courses acceptable for the Honors requirement.

### **Incompletes**

If a student does not complete a course, and if he/she and the 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 Miscellaneous Requirements and Expectations**

#### **2.8.1 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.

#### **2.8.2 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 <http://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 <http://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.

### **2.8.3 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 PHD 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.

### **3.1 The Major Discourse Project**

In order to prepare students for building their research skills, an important part of the first two years is getting started on and carrying out independent research projects, beginning in the first year. One such research project culminates in the Major Discourse and can (and typically will) grow into the PhD Dissertation. (A second such research project leads to the Minor Discourse and is discussed in Section 3.2)

- In the student’s first year, he/she is required to work with his/her Advisor and Advisory Committee to identify the independent research projects leading to the Major and Minor Discourses. The student is required to submit a brief (2-3 page) Pre-proposal for the each Discourse by the end

of the second term. However, this Pre-proposal should represent a significant amount of reading of relevant literature and preparatory work. Thus the student is expected to identify and initiate the projects as soon as possible; waiting until the second term is not advisable. Pre-proposals are first vetted by the student's Advisory Committee, then submitted to the DGS office by the end of April, after which they are 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 by his/her Advisor.

- Students can receive graded-course credit for the Major 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 G&G 690 (and G&G 691, 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 3rd term, in mid-October to mid-November, students will give their Preliminary Presentations of the Major Discourse Project, which is directly followed by a Mock Examination. This event is described in Section 3.3.

### **3.1.1 Structure and submission of the Major Discourse**

- The Major Discourse is submitted to the DGS office in the 4th term by the end of March, after approval by the Advisory Committee.
- 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 below). The student will present the Major Discourse at his/her Qualifying Presentation/Oral Examination during April of the 4th term (Section 3.4) and this Discourse will serve as the Dissertation Prospectus.
- The Major Discourse should be structured in the style of a National Science Foundation (NSF) proposal and should be of sufficiently high 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.
  - The Advisor and other members of the Advisory Committee are responsible for reading and assessing the Major Discourse. Other G&G faculty may request copies of the Discourses from the DGS office. Assessment of the Discourse will be presented after the Qualifying Presentation/Oral Examination, which is discussed in Section 3.4.

### **3.2 The Minor Discourse Project**

The second, more modest independent research project will culminate in a document, referred to as the Minor Discourse, is also submitted and presented by the end of year 2. The Minor Discourse provides the student with greater breadth in research skills and experience.

- The Minor Discourse is advised by a faculty member other than the Advisor of the Advisory Committee.
- The Minor Discourse topic should be significantly different from and independent of the Major Discourse Project, although it can also be within the student's areas of expertise. The extent to which the minor project is adequately independent of the first is determined by the Advisory Committee and the PREComm. 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 major (and thesis) project might choose a minor project in physical oceanography or ice physics. Likewise, a student studying mineral physics in his/her major 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 paleontology or paleobotany would receive significant breadth from doing a second project in biogeochemistry or geomicrobiology.

- The sequence of steps for the Minor Discourse is as follows:
  - Submission of a brief Pre-proposal (2-3 pages) end of year 1, at the same time as the Major Discourse pre-proposal,
  - Minor Discourse material included in Preliminary Presentation (approximately 1 or 2 slides either in the presentation or prepared for discussion during the Mock Exam) in Fall of year 2,
  - Submission of the Minor Discourse by end of year 2 at the same time as the Major discourse and prior to the Qualifying Exam; submission is, first, to the Advisory Committee for comments and subsequently after revision to the DGS office.
  - Approximately 25% of the Qualifying presentation (10 min out of 40min) concerns the Minor Discourse material and is open for inquiry during the exam/questioning phases.
- The Minor Discourse should be written and submitted in the style of an NSF proposal (Section 3.2) or a short publication-quality paper.
- If desired, students can receive an extra one-semester course credit for work on their Minor Discourse through G&G 691. Students will typically enroll in G&G 690 for their 2nd and 3rd terms, and G&G 691 for the 4th term.

### **3.3 Preliminary Presentation of Discourses: “Mock Exam”**

In the 3rd term, in mid-October to mid-November, the student will give a Preliminary Presentation of their Discourses for 40 minutes, followed by approximately one hour of comments and questions from the faculty present. Most of the presentation concerns the Major Discourses, for which more work is expected. However, the student should prepare 1-2 slide on the Minor Discourse material, either in the presentation itself or prepared for the following discussion and questions. The presence of the Advisory Committee, two members from PREcomm (outside the Advisory Committee), and DGS is required. Other faculty members will be invited and may participate as well. The entire event serves as a practice trial and preparation for the Qualifying Presentation/Oral Examination during April of the 4th term (Section 3.4). Prior to the presentation, the student must update the discourse pre-proposals and submit them to the DGS office.

- The preliminary presentation by the student of approximately 40 minutes must emphasize research already completed and problems to be addressed with further research. It is essentially what may be termed a PhD thesis proposal. 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. In preparing for this presentation, the student should not concentrate on giving an elaborate powerpoint display, but instead should seek to demonstrate in-depth understanding of the intellectual content of the thesis research and its broader context. The contents of the research, both to date and planned up ahead, and how the entire body of work relates to broader concepts, should be presented with as much clarity as possible.
- Questions and comments from - and discussions with - the examining faculty in response to the student’s presentation, lasting some 40 minutes, will serve to articulate the general research areas on which the student is expected to answer questions, and thus broadly the kinds of questions also expected in the Qualifying Presentation/Oral Examination. The Advisory Committee particularly, and possibly additional faculty, will comment on such parts of the presented research which they do or do not consider successful, and point out areas in which the student needs to improve by gaining greater depth and breadth of knowledge and experience. The event provides an opportunity for the student to fill in knowledge gaps and chains of logic. In sum,

the examining faculty will do all they can to prepare the student for the upcoming research and for what he/she should expect in the Qualifying Presentation/Oral Examination.

- Feedback after the presentation: the Advisor will summarize what transpired, send the summary to the DGS office, and gives the student feedback. If a student remains in doubt on any points that were raised, he/she should seek out those faculty members for additional discussion to ensure a full understanding of what is expected.

### **3.4 The Qualifying Presentation of the Discourses**

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 Major Discourse 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".

Students usually spend time during the 3rd 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 Presentations are as follows:

- The Qualifying Presentations are scheduled through the DGS office to occur during April of the 4th term. The duration of this event will be kept as close as possible to a total of 2.5 hours. The scheduling by the DGS office will reserve 3 hours per Qualifying Presentations. Note that the interval between the Mock exam and the Qualifying exam should not exceed six months, excluding the period during which the student may be on leave.
- All faculty, students and staff are invited to the oral presentation itself. However, only the Advisory Committee, DGS, and two members from PREcomm (outside the Advisory Committee) are required to attend.
- For the oral presentation, the student should give a 40-minute, well-organized summary of the primary features of the Discourses (30 minutes on the Major Discourse and 10 minutes on the Minor Discourse), including preliminary work completed and future plans. Slides, maps, specimens, etc. may be used as needed for a clear presentation.
- The oral presentation is immediately followed by a brief (approximately 5 minutes) question period from the general audience.
- After general questions, the DGS will excuse all members of the audience except for the PREcomm, and other G&G faculty members and any external faculty members of the Advisory Committee.
- After the general audience is excused, there follows an extended question period which is moderated by the DGS on both discourses.
- 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 their research topics, the students 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 and the two Discourses. The discussion will conclude with a recommendation as to whether or not the student passes into PhD Candidacy; and after the event the DGS and Advisor inform the student and the Advisor gives the student general feedback.
- 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 one or two 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 (Section 4) 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 then to be reconsidered for admission to candidacy. However, this request will be well scrutinized by the DGS office, 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.

### **3.5 Third and Fourth Year Progress Meeting**

- Ph.D. students will present a summary of their Dissertation progress to their full Advisory Committee during the Spring terms of their third (term 6) and fourth year (term 8). These meetings are not intended to repeat the qualifying exam, but are rather an opportunity for the student and committee to exchange ideas, to discuss research directions, and to help focus the student's scientific and career trajectories.
- At least one week prior to each meeting, the student will submit to the DGS office a Progress Report (5 page limit) with additional pages for figures, tables, and references as needed. The Progress Report will summarize all work performed to date, future work planned, and a timetable for completion of research and thesis goals. The Progress Report, together with an announcement of the time and place for the meeting, are circulated to the Advisory Committee and DGS by the DGS office (the student provides the Report and time/place to the DGS for circulation). Only the full Advisory Committee is required to attend the Progress Review, although other G&G faculty are welcome to participate. The Advisor serves as the moderator. The review starts with a presentation by the student, no longer than about 30 minutes, followed by a question/discussion period. The length of the meeting will not exceed 1.5 hours, 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 a short, one page report is generated by the Advisor and submitted to the Advisory Committee and DGS, and reviewed at the next Student Evaluation Faculty Meeting.

- If, after the Third Year Progress Meeting, the student is broadly viewed in poor standing, the Advisor will schedule an additional Committee Evaluation with DGS and several PREcomm members present, no later than six months from the Third Year Progress Meeting, to examine the knowledge and capacity of the student to perform their research. An unsatisfactory performance during the Committee Evaluation is viewed as grounds for releasing the student from the graduate program.

### **3.6 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. Needless to say, the Dissertation has to be of substantial scientific value to warrant its consideration toward PhD; the student should consult with the Advisor as well as the Advisory committee regarding this criterion, the concrete definition of which could vary among different disciplines.
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 and the DGS must attend. External readers are

encouraged, but not required, to attend. Departmental funds are available to cover travel expenses for External Readers. It is the student's responsibility to find a time that works for the readers as well as the DGS and notify the DGS office about the scheduling.

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 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 office.

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.

## **4 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.

### **4.1 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.

### **4.2 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.

### **4.3 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 DGS office.

## **5 FINANCIAL SUPPORT**

### **5.1 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.

### **5.2 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.

#### **5.2.1 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 (Section 6.1.1)

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.

### **5.2.2 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.

### **5.2.3 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.

### **5.2.4 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.

## **5.3 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 Registrars Office (KGL 203) after 9:30A.M. on payday. All students must provide written instructions to the Registrar 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.

## **5.4 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.

## **6 STUDENT TEACHING APPOINTMENTS**

In April, the DGS Office asks all G&G instructors to submit requests for teaching fellows for the next academic year. At the same time, all graduate students required to take a teaching fellowship appointment (Section 6.1) are asked about their preferences for teaching. Students who apply for a teaching fellowship beyond the required teaching must get an approval from their Advisor.

The DGS office 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.

### **6.1 Teaching Requirements**

#### **6.1.1 University Fellowship Teaching Requirement (UFTR)**

Students supported on a University Fellowship are obligated to teach one semester at the TF10 level or to hold a curatorial assistantship (CA) for one semester for every year of fellowship support (the CA appointment is described below), up to four semesters total. In this document and in the DGS Office, this requirement is referred to as the *University Fellowship Teaching Requirement* (UFTR).

#### **6.1.2 Academic Teaching Requirement (ATR)**

The G&G department requires that all graduate students, regardless of how they are financially supported, successfully complete two TF10 equivalents, ideally in two separate years during the first two years of graduate education, or in exceptional cases one TF20; 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).

### **6.2 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 office 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 office 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.

### 6.2.1 Teaching Fellow 10

This is the most common TF assignment. The responsibilities of a TF10 vary and include (a) grading and/or (b) a combination of the following: attending class, reading, advising undergraduates, offering discussion sections, helping to set up a lab, or assisting in the administrative details of a course. Approximate weekly effort: 6-10 hours.

### 6.2.2 Teaching Fellow 20

TF20 assignments are more involved. A TF20 typically leads and grades one discussion or laboratory section of up to thirty students and/or has a combination of the responsibilities described (a) and (b) in TF10. Approximate weekly effort: 15-20 hours.

### 6.2.3 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 CA10 and CA20 appointments are equivalent in hours and compensation to TF10 and TF20 appointments, respectively.

## 6.3 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); Section 6.3.1.

Appointment	Compensation for 2016-17
Teaching Fellow 10	\$4,000
Teaching Fellow 20	\$8,000

### 6.3.1 Compensation During Fulfillment of Teaching Requirements

**Assignment of a TF10 for Teaching Requirement:** If this assignment fulfills either a UFTR (Section 6.1.1) or an ATR (Section 6.1.2), the student does not receive any additional compensation above their regular stipend for this teaching assignment.

**Assignment of a TF20, but only one TF1 Required:** Students are advised not to take on TF20 in such a case as the TF system cannot currently split payments for such assignments.

**Assignment as a TF10 or TF20, beyond Teaching Requirement:** Student will receive the full teaching compensation above their regular stipend (Section 6.3) for participating in this optional teaching opportunity.

## **7 USE OF DEPARTMENTAL FACILITIES**

### **7.1 Space and Access**

#### **7.1.1 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 Registrar 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.

#### **7.1.2 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 homepage (<http://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.

#### **7.1.3 Keys**

An office key is issued to each entering graduate student. KGL front doors are unlocked Monday through Friday, 8 am to 5 pm. Students can use their ID card for key card access to the building outside of these hours.

### **7.2 Communications, Transportation and Supplies**

#### **7.2.1 Computers and Email**

The Department Systems Programmer, David Rossman ([david.rossman@yale.edu](mailto:david.rossman@yale.edu)), maintains a variety of PC's and workstations throughout the department. There is a computer lab in KGL 228 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 <http://www.yale.edu/acct> for more information.

#### **7.2.2 Telephones**

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.

### **7.2.3 Fax**

The Department has a general-use fax machine located in the Department Secretary's Office (KGL303). 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).

### **7.2.4 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

### **7.2.5 Postage**

Letters relevant to official Departmental teaching and research activities can be left in the mail basket in KGL303 and postage will be provided. This is not to be used for personal mail, which includes requests for reprints, job inquiries, and job applications.

### **7.2.6 Office Supplies**

Stationary, 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.

### **7.2.7 Copiers**

There are three copiers for student use: one is on the first floor (across the hall from KGL 112), another on the KGL side of the bridge to ESC (Environmental Studies Center) on the 2nd floor (through the Grad Student Wing); the other is on the third floor (across the hall from KGL 312). Entering students are given their own password for use of these machines. The first \$50 per year is free. Additional copies are billed three times a year, in December, May, and September (see the Business Office for the current rate).

### **7.2.8 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.

### **7.2.9 Vehicles**

Vehicles may be rented by the G&G Department for use during field trips. Students must hold a valid drivers license before they may operate a vehicle for University business and must take the University driver training course.

## **7.3 Problems and Assistance**

### **7.3.1 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. Yale also offers student organization and personal property insurance: <http://ogc.yale.edu/erm/other-programs/insurance-provided-registered-student-organizations>

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

### **7.3.2 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.

### **7.3.3 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

### Graduate Student Advisors and Committees 2017 - 2018

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#### 1<sup>st</sup> Year

Yun Chang	Timmermans, Fedorov, Smith, Wettlaufer
Ulla Heede	<u>Storelvmo</u> , Wettlaufer, Fedorov, Timmermans, Smith
Joachim Katchinoff	<u>Planavsky</u> , Hull, Rooney, Blake
Yu Liang	<u>Fedorov</u> , Timmermans, Smith, Fedorov
Jack Shaw	<u>Hull</u> , Briggs, Planavsky Gauthier
Zhongtian Zhang	<u>Bercovici</u> , Karato, Korenaga, Wettlaufer

#### 2<sup>nd</sup> Year

Daniel Gaskell	<u>Hull</u> , Briggs, Bhullar, Gauthier
Zheng Gong	<u>Evans</u> , Brandon, Planavsky, Korenaga
Boriana Kalderon Asael	<u>Planavsky</u> , Brandon, Hull, Rooney
Ryan Li	<u>Boos</u> , Smith, Wettlaufer, Fedorov
Puskar Mondal	<u>Long</u> , Park, Karato, Korenaga
Andrea Servali	<u>Long</u> , Park, Karato, Brandon, Korenaga
Daniel Smith Paredes	<u>Bhullar</u> , Gauthier, Briggs, Hull
Sophie Westacott	<u>Hull</u> , Briggs, Planavsky, Gauthier
Jasmina Wiemann	<u>Briggs</u> , Hull, Planavsky, Bhullar
Bowen Zhao	<u>Fedorov</u> , Timmermans, Smith, Boos (UC Berkeley)

#### 3<sup>rd</sup> Year

Sarah Arveson	<u>Lee</u> , Karato, Bercovici, Long
Neta Bar	<u>Brandon</u> , Planavsky, Ague, Evans
Matteo Fabbri	<u>Bhullar</u> , Gauthier, Briggs, Hull
Duncan Keller	<u>Ague</u> , Brandon, Planavsky, Rye
Nicolas Mongiardino Koch	<u>Briggs</u> , Hull, Sargis (Anthropology)
Juri Miyamae	<u>Bhullar</u> , Gauthier, Briggs, Hull
Nicole Shibley	<u>Timmermans</u> , Fedorov, Bercovici, Wettlaufer
Emily Stewart	<u>Ague</u> , Brandon, Evans, Planavsky
Peng Sun	<u>Karato</u> , Bercovici, Park, Lee

#### 4<sup>th</sup> Year

Janet Burke	<u>Hull</u> , Briggs, Gauthier, Bhullar
Devon Cole	<u>Planavsky</u> , Brandon, Rye, Evans
Neala Creasy	<u>Long</u> , Park, Lee, Karato, Bercovici
Jie Deng	Lee, Karato, Long, Ague, Korenaga
Michael Hanson	<u>Bhullar</u> , Gauthier, Briggs, Hull
Zachary McGraw	<u>Storelvmo</u> , Smith, Fedorov, Wettlaufer
Yoshi Miyazaki	<u>Korenaga</u> , Bercovici, Wettlaufer, Laughlin (Astronomy)
Terry Tang	<u>Evans</u> , Brandon, Planavsky, Rye
Christopher Whalen	<u>Briggs</u> , Hull, Gauthier, Bhullar

### **5<sup>th</sup> Year**

Yana Bebieva  
Eric Bellefroid  
Elizabeth Clark  
Kierstin Daviau  
Chhavi Jain  
Christopher Kruse

Timmermans, Smith, Fedorov, Boos (UC Berkeley)  
Planavsky, Blake, Evans  
Briggs, Vrba, Gauthier, Hull  
Lee, Karato, Bercovici, Fischer (Astronomy)  
Korenaga, Bercovici, Karato, Basu (Astronomy)  
Smith, Storelvmo, Fedorov, Boos (UC Berkeley)

### **6<sup>th</sup> Year**

Ross Anderson  
David Auerbach  
Robin Canavan  
Katelyn Gray  
Shineng Hu  
Zhen Liu  
Anwar Mohiuddin  
Varun Murthy  
Holger Petermann  
James Super  
Azusa Takeishi  
Mengnan Zhao  
Yiqi Zheng

Briggs, Evans, Planavsky, Nick Tosca (Oxford)  
Brandon, Evans, Smith, Planavsky, Hren (UConn)  
Hull, Briggs, Rye, Affek (Hebrew U. of Jerusalem)  
Blake, Gauthier, Planavsky  
Fedorov, Timmermans, Smith, Boos (UC Berkeley)  
Park, Long, Karato, Bercovici  
Karato, Bercovici, Long, Lee  
Boos, Smith, Timmermans, Storelvmo  
Gauthier, Vrba, Briggs, C. Skinner, Bhullar  
Hull, Planavsky, Ague, Thomas  
Storelvmo, Smith, Unger, Boos (UC Berkeley)  
Timmermans, Fedorov, Wettlaufer, Boos (UC Berkeley)  
Storelvmo, Smith, X. Lee (FES)