

graduate handbook **2015-2016**



IU GEOLOGICAL SCIENCES

TABLE OF CONTENTS

Graduate Committee	2
General Information for all Graduates	4
Master of Science Thesis Overview	6
Master of Science Report Option Overview	7
Master of Science Geological Science-Atmospheric Sciences	8
Doctor of Philosophy Degree Overview	9
Doctor of Philosophy Geological Science-Atmospheric Sciences	13
Doctor of Philosophy Degree with No Prior Masters Degree	13
Figure 1: Degree Timelines	14
Appendices	15

GRADUATE COMMITTEE

The Graduate Committee is responsible for administration of admissions, academics, and other advisory issues for graduate students in the department. The committee acts on applications for associate instructorships, fellowships, and summer research support and monitors academic progress of students. The committee consists of faculty members chosen to represent a range of disciplines and research fields in the department. The committee is assisted in its work by the Graduate Services Coordinator.

2015-16 GRADUATE COMMITTEE MEMBERS

Dr. Simon Brassell- Director of Graduate Studies (simon@indiana.edu)

Dr. Gary Pavlis, Director of Graduate Admissions (pavlis@indiana.edu)

Graduate Services Coordinator (geolgrad@indiana.edu)

LINKS PROVIDED IN THIS HANDBOOK

Graduate School Bulletin: <http://bulletins.iu.edu/iu/gradschool/2014-2015/index.shtml>



University Graduate School: <http://www.indiana.edu/~grdschl/index.shtml>



IU Graduation Ceremony: <http://universityevents.iu.edu/>



Graduate Student Annual Review Forms: <http://www.indiana.edu/~grdschl/forms/index.shtml>



Graduate Student Theses Deadlines: <http://www.indiana.edu/~grdschl/theses-dissertations/deadlines.shtml>



Major/Minor Forms: <http://bulletins.iu.edu/iu/gradschool/2014-2015/requirements/phd/major-minor.shtml>



Geological Sciences Graduate Student Handbook: <http://geology.indiana.edu/education/handbook.html>



GENERAL INFORMATION FOR ALL GRADUATE STUDENTS

Degrees Offered

The following graduate degrees are offered in the Department of Geological Sciences: M.S. Geology, M.S. Geology-Atmospheric Sciences, Ph.D. Geology, Ph.D. Geology-Atmospheric Sciences.

Residency

All graduate students must complete at least 30 hours of graduate credits in residence at the IU Bloomington campus. Ph.D. students must be in residence at the Bloomington campus for at least two consecutive semesters during the degree program.

IUB College Information

The websites for the College and the Graduate School (<http://www.indiana.edu/~grdschl/index.shtml>) provide links on the College Graduate Office page to submit requests (Extensions of Incomplete, Family and Medical Leave), to apply for funding (College Travel Awards, College of Arts and Sciences Dissertation Year Research Fellowships), and to appoint your Doctoral Advisory Committee.

Selection of Advisors and Research Committee

The Graduate Committee advises graduate students on course selection until a primary advisor is selected. Students should choose a primary advisor with graduate faculty status (Appendix 5) from the Department of Geological Sciences or the Indiana Geological Survey (IGS www.igs.indiana.edu). A co-advisor from the Department is required (Appendix 1) if the primary advisor is from the IGS.

A Research Committee will oversee the student's academic and research progress toward the degree. For all degrees, a majority of members of the research committee must be selected from the Department of Geological Sciences. The field of expertise of both the primary advisor and the research committee should reflect the topic of research chosen by the student.

Communication with Research Committee

Students must keep members of their Research Committee informed of progress with research and fulfillment of academic requirements on a regular basis, through both meetings and e-mail. Meetings should occur at least once each semester of the academic year (Spring and Fall), although students are strongly encouraged to meet more frequently with their committee members on an informal basis.

Annual Review

An Annual Review of academic and research progress is required of all graduate students in the department. All students are to submit the completed Annual Review forms by April 15. Submission procedures will be announced. The Graduate Committee may require a student to submit forms earlier than the April 15 deadline as the need arises. Appendices 2 and 3 contain sample copies of M.S. and Ph.D. Annual Review forms. These are available on the departmental website as interactive PDF forms under the Education tab and by the following link to the Graduate Handbook Appendices:

<http://geology.indiana.edu/education/handbook.html>

To activate the fillable forms, click on "open in another program" and choose "open in Adobe PDF."

Completion of the Annual Review forms requires a meeting of the student with the research committee and signatures from committee members and student. Students must scan all pages of the review, including the signed forms, and submit as one PDF to the Graduate Service Coordinator. Students who fail to complete their annual review are subject to loss of departmental support following a review by the Graduate Studies Committee and the Chair.

Annual reviews will normally consist of three components:

- An oral presentation by the student of research progress with a detailed plan for degree completion including coursework and research
- An in-depth discussion with the research committee to critically evaluate the student's progress and advise the student on future plans to advance his/her research.
- Grading of student progress by the research committee. The grading scale, form and the submission process will be determined each year by the Graduate Studies Committee.

The annual review process is the primary mechanism used by the Department to gauge student research performance and evaluate whether or not a student should continue to receive departmental support and continue in their degree program. It also assists the Graduate Studies Committee in evaluating merit for student awards. Those students whose performance is judged unsatisfactory by their research committee will be subject to departmental summer probation, which behooves them to demonstrate improved performance in their research and/or coursework. Students in this category are required to undergo a second review by an extended committee (henceforth referred to as the evaluation committee) consisting of the student's research committee and one or more representative of the Graduate Studies Committee. This review must take place in August prior to the start of the fall semester. If performance is still judged unsatisfactory the student will be placed on formal academic probation with the Graduate School for the fall semester. Students in probation are afforded a final opportunity to show progress in research based on a third review session administered by the evaluation committee before the end of the fall semester.

Sources of Funding

The Department of Geological Sciences awards AI, RA, and Fellowship support, as well as summer research funds, on a competitive basis. AI support encompasses responsibilities in preparing and/or teaching laboratory courses, among other duties. RA support is dependent on the availability of specific research funds procured by individual faculty members through externally-funded grant proposals. Fellowships and summer research support are available from assets allocated to general or specific departmental accounts.

Diplomas

Degrees are granted every month of the year. The University Graduate School requires receipt of an electronic copy of the thesis/dissertation prior to the 15th day of the month for which the degree is to be granted; if received after the 15th the degree will be granted the next month. A degree diploma is mailed to a student's home address two to three months after the degree is conferred. Diplomas are sent by third-class mail (Printed Matter) through the US Postal Service. Please be aware that items sent third-class are not forwarded to a new address. Hence, students must verify that their correct permanent home address is on file with the Registrar to ensure that the degree is mailed to the desired location. Please see the Graduate Services Coordinator if you are an international student desiring special arrangements for receipt of the diploma. The Graduate Services Coordinator can instruct you in how to have the diploma sent from the University Graduate School to the Geology Graduate Office (GY107). Our department will then send the diploma by air-mail to your international address. Duplicate diplomas may be obtained through the Registrar for an additional fee.

MASTER OF SCIENCE THESIS OVERVIEW

This degree option is recommended for most students entering the program with an undergraduate degree. The degree requirements include:

A total of 30 credit hours:

- At least 22 of the 30 hours must be graduate-level courses. 400-level courses from the Department of Geological Sciences that can be taken for graduate credit are listed in Appendix 6. 500-700-level Geology courses and lower-level courses from other departments that count toward graduate credit can be found in the University Graduate School Academic Bulletin (<http://bulletins.iu.edu/iu/gradschool/2014-2015/index.shtml>; see the section entitled Graduate Credit - General in the Academic Regulations section of the University Graduate School Academic Bulletin).
- 12 of the 22 hours must be from the Department of Geological Sciences .
- A minimum of 3 credits of G810 (research credits) are required; a maximum of 8 credits of G810 can be applied toward the degree.
- At least three 3-credit hour courses of 500-level or above must be taken from the Department of Geological Sciences.
- Selection of courses must be approved by the primary advisor in consultation with the student's research committee.

Transfer of credit: Up to 8 credit hours of graduate classes can be transferred from another institution, provided the classes meet the requirements of equivalency of graduate classes offered at IU and a grade of 'B' or higher was achieved. Pass/Fail or 'S' graded classes cannot be transferred. Requests for transfer of credit hours originate with the student and advisor. Students are required to highlight on a copy of their transcripts the specific courses they request for transfer and submit the transcript to the Graduate Office GY107. Transfers require approval by the University Graduate School and courses must have been completed within 5 calendar years prior to awarding the Masters degree.

Minimum Grade Point Average: All Masters students must maintain a 3.0 (B) grade point average. Students with a GPA less than 3.0 can be placed on academic probation until the student's GPA increases to above 3.0. While on academic probation, the student cannot be supported as an AI, RA, or Fellow. If the GPA does not reach 3.0 after two semesters of probation, the student will be dismissed from the graduate program.

Primary Advisor: An advisor (and co-advisor if necessary; see page 4) should be chosen during the first semester and no later than March 1 of the first year in the degree program.

Research Committee: A three-person research committee must be formed for each Masters student, consisting of the primary advisor and two other members. Two of the members of this committee must be graduate faculty of the Department (see page 4). The composition of the research committee and signatures from each of the members must be filed with the Departmental Graduate Office by March 1 of the first year of the degree program. Any change in committee membership must be communicated immediately to the Graduate Office.

Completion of Written Thesis: The thesis should be prepared in a form that is essentially ready to submit for publication in an appropriate journal(s). Publication and public presentation of research results is strongly encouraged but not required. The format of the thesis must conform to the University's official policy on the production of theses (Appendix 4).

Timeframe: Master's degrees must be completed within five years of enrollment, or six years for Dual Masters degrees. Students who exceed this time frame must revalidate their coursework.

M.S. Requirements: Students in the M.S. degree program who apply successfully for admission into the Ph.D. program in our Department must complete all formal requirements for the degree no later than one semester after entering the Ph.D. program.

Example credit hour distribution for a Masters student

Geological Sciences classes:		Credit Hours
G406	Introduction to Geochemistry	3.0
G423	Methods in Applied Geophysics	4.0
G524	Carbonate Facies and Environments	3.0
G554	Fundamentals of Plate Tectonics	3.0
G587	Organic Geochemistry	3.0
G601	Clay Mineralogy	3.0
G600	Advanced Techniques	1.0
Geology Total		20.0
Other graduate classes:		
C503	Spectroscopic Methods for Structural Determination	3.0
Research Hours:		
G810	Research	7.0
Total		30.0

Application for Advanced Degree Form: This form is on the Graduate School website (<http://www.indiana.edu/~grdschl/forms/index.shtml>), and must be completed and submitted a minimum of 60 days prior to the desired graduation date, regardless of whether you will attend the commencement ceremony.

Commencement ceremony: If you wish to attend the commencement ceremony, necessary forms must be filled out in advance. To attend the December commencement, the forms must be completed around mid-September; for the May commencement, they must be completed around mid-February. Further information can be found at the Indiana University Ceremonies website (<http://universityevents.iu.edu/>). Consult with the Department Graduate Office GY107 for further information.

M.S. Thesis Presentation: Students are encouraged to present their final M.S. research results at a regional or national meeting (e.g., AGU, GSA, AAPG, etc.). A departmental defense is not formally required but is strongly recommended and should be announced to the department with title, date, time and location.

MASTER OF SCIENCE 'REPORT OPTION' OVERVIEW

This degree option is not recommended for most students because it may limit future educational and professional goals. An exception is students who plan to continue in the Ph.D. program in our Department, building directly on research begun in the M.S. program. In such circumstances the report route can streamline that transition when appropriate but the formal decision to pursue this option should only be taken after admission to the Ph.D.

The degree requirements include:

Total of 30 credit hours:

- 27 of the 30 hours must be graduate-level courses; the remaining 3 can be G810. 400-level courses from the Department of Geological Sciences that can be taken for graduate credit are listed in Appendix 6. 500- to 700-level Geology courses, and lower-level courses from other departments that count toward graduate credit can be found in the University Graduate School Academic Bulletin (see the section entitled "Graduate Credit-General" in the Academic Regulations section of the University Graduate School Academic Bulletin).
- 20 of the 27 hours must be from the Department of Geological Sciences.
- At least three 3-credit hour courses of 500 level or above must be taken from the Department of Geological Sciences.
- Selection of courses to be taken should be discussed with the primary advisor and research committee.

Transfer of credit: As above in M.S. overview.

Minimum Grade Point Average: As above in M.S. overview.

Report: The precise format and content of the report are determined in collaboration with the student's advisor and research committee. The report must be signed by the entire research committee. It is recommended that the report be in a format suitable for publishing, but it is not required.

Primary Advisor: An advisor (and co-advisor if necessary; as above in M.S. overview) should be selected no later than March 1 of the first year in the degree.

Research Committee: As above in M.S. overview.

Timeframe: As above in M.S. overview.

Application for Advanced Degree Form: As above in M.S. overview.

Commencement Ceremony: As above in M.S. overview.

M.S. Report Option Presentation: Students are encouraged to present their final M.S. research results at a regional or national meeting (e.g., AGU, GSA, AAPG, etc.) or as a departmental defense with title, date, time and location announced to the department.

MASTER OF SCIENCE DEGREE: GEOLOGICAL SCIENCE-ATMOSPHERIC SCIENCES

Admission Requirements

Undergraduate major in geological science, Atmospheric Science, mathematics, physics, chemistry, biology, or equivalent. Applicants not meeting this requirement may be expected to complete additional coursework.

Field of Study — Atmospheric Sciences

Course Requirements

Requirements are the same as the M.S. degree (thesis or report option) with one additional requirement. At least 12 credit hours must be from the list of courses specific to Atmospheric Sciences defined by the Department of Geological Sciences

Courses that satisfy the 12 credit hour requirement:

G532 Physical Meteorology and Climatology
G531 Dynamic Meteorology
G533 Advanced Synoptic Meteorology and Climatology
G534 Air Pollution Meteorology
G555 Wind Power Meteorology
G562 Dynamic Meteorology: Boundary-Layer Meteorology
G570 Micrometeorology
G575 Climate Change Science

M.S./M.S.E.S.

Master of Science in Geological Sciences/ Master of Science in Environmental Science

This degree program is appropriate for students from a wide range of undergraduate science programs interested in a career in environmental sciences. This dual masters' program is a 51-credit hour (two year) program that gives the student greater depth and breadth than is possible in a single degree.

Admission Requirements

A student must apply to and be accepted by both the Department of Geological Sciences and SPEA.

Course Requirements

Course requirements are a minimum of 21 credits from each program distributed as follows:

- Geological Sciences core (12 cr.)
- Environmental Science core (12 cr.)
- Courses in economics, policy, and law competencies (6 cr.)
- A tool skill (3 cr.)
- Other Geological Sciences or SPEA courses recommended by advisory committee and
- 9 Credits of research divided between Geological Sciences and SPEA.

The distribution of credits across these requirements can be modified with the approval of the research committee. This committee, with a minimum of three members, will supervise the student's research program. At least one member of the committee must have a primary affiliation with the Department of Geological Sciences and at least one member must have a primary affiliation with SPEA. Two members of the advisory committee must be named as co-advisors with one advisor from each program.

DOCTOR OF PHILOSOPHY DEGREE OVERVIEW

The requirements below presume that the student begins the program having completed an M.Sc. Degree.

The requirements are:

Total of 90 credit hours

- 35 of the 90 hours must be graduate-level courses.
- 20 of the 35 hours of coursework must be in geological sciences. The remaining credit hours may include electives and coursework required to fulfill the minor.
- 12 of these 35 hours must be graduate courses from the Indiana University Department of Geological Sciences. In exceptional cases (e.g., when a student enters the Ph.D. program with a strong background in the geological sciences from another university and finds few courses in the department that will support their doctoral research program), a candidate may petition the Graduate Studies Committee in writing to waive this requirement.
- Up to 30 credit hours of graduate classes can be transferred from another institution, providing a grade of 'B' or higher was earned. Pass/Fail or 'S' graded classes cannot be transferred without a letter of clarification from the instructor that a B or higher equivalent would have been awarded. Courses to be transferred must be approved by the University Graduate School and must have been completed within the 7 calendar years prior to passing the Qualifying Exam.

Minimum Grade Point Average: All Ph.D. students must maintain a 3.0 (B) grade point average.

G901 Advanced Research: Dissertation credits as G901 can be taken when the student has fulfilled all the course requirements detailed above, and completed 90 credit hours of graduate-level coursework. A maximum of 6 semesters of G901 is permitted. G901 is currently 6 credit hours per spring and fall semester. Summer enrollment is not required unless the student intends to receive the degree during summer, which necessitates enrollment in 1 credit of G810.

Example credit hour distribution for a Ph.D. student

Classes:	Credit Hours
G513 Seismology	3.0
G583 Isotopic Systematics	3.0
G514 Geophysical Signal Analysis	3.0
G612 Inverse Methods in Geophysics	3.0
G572 Basin Analysis and Hydrocarbons	3.0
G601 Clay Mineralogy	3.0
G571 Principles of Petroleum Geology	3.0
G451 Hydrogeology	3.0
G554 Fundamentals of Plate Tectonics	3.0
G589 Geomicrobiology	3.0
Total	30.0
Minor:	
A597 Introduction to Programming I	3.0
A598 Introduction to Programming II	3.0
P573 Scientific Computing	3.0
P673 Advanced Scientific Computing	3.0
Total	12.0
Total all Graduate Courses:	42.0
Research Hours:	
G810 Research Hours	48.0
Total	90.0

Primary Advisor: an advisor (and co-advisor if necessary; see page 4) should be selected and agree to fulfill this role no later than December 1 of the first year of the degree

Advisory Committee: The advisory committee shall approve the student's program of study and counsel the student until the passing of the Qualifying Exam. The advisory committee must include at least two members from the major area and one from the minor. The name of the primary advisor and two other members of the committee must be confirmed in a signed letter to the Graduate Services Coordinator.

Research Committee: Following the qualifying exam, a research committee must be selected, consisting of the primary advisor and 3-4 other members. The research committee can include all of the members of the Advisory Committee, supplemented by other IU faculty or individuals from other institutions connected to the research. Three of the members of this committee must be graduate faculty in the Department. The composition of the research committee and signatures from each of the members must be provided on the annual review form; any change must be communicated to the Graduate Office immediately.

Selection of a Minor: Selection of a Minor is also a requirement of the degree. Minors in allied science and mathematics are normally desired to broaden the student's background. The minor can also be in an area within the geosciences distinct from the chosen major. Formal external and internal minors are approved by the University Graduate School (<http://bulletins.iu.edu/iu/gradschool/2014-2015/requirements/phd/major-minor.shtml>).

An individualized minor option with a minimum of 12 credit hours from at least two different Departments is also possible through petition to the University Graduate School. An individualized internal minor, which also requires coursework from at least two Departments, must be approved by the Graduate Committee and by the Graduate School Dean's office prior to completing the proposed course work.

Minors typically require between 6 and 12 credit hours of coursework. The precise requirements and courses needed will be determined by the Minor Advisor, who must be a faculty member in the minor department. The minor advisor normally becomes a member of the student's research committee (see below).

ADMISSION

Students are admitted to the Ph.D. program through one of three mechanisms:

- Direct admission to the Ph.D. program following completion of an undergraduate degree program. (Students who enter the Ph.D. program with a baccalaureate degree will be encouraged to complete an M.S. degree.)
- Admission after completion of an M.S. degree at another institution.
- Current Indiana University students enrolled in our M.S. program may apply for admission to the Ph.D. program early in their second year of graduate study.

The expectations of progress toward the Ph.D. degree and the timelines for review of student progress, as described below, are different for each of these groups.

EARLY REVIEW

Objectives

The early review is an extension of the department annual review process. The primary purpose of this requirement is to provide a departmental assessment of each student's level of preparation to complete the Ph.D. degree in an early stage. The aim is to (i) ensure that students are actively developing a viable research project, and (ii) identify aspects of students' academic background that need strengthening early in their course of study.

Administration and Timetable

The Graduate Studies Committee administers this review procedure. Figure 1 (page 14) is a graphical representation of the timeline for this review for the three different groups outlined above. A key aspect of this process is that students entering the program with a baccalaureate degree are required to go through this process in the fall of their second year of residence, whereas students entering the program with an M.S. degree will be reviewed in the spring semester.

Step 1: Study Plan

As illustrated by the timelines in Figure 1, students are required to complete a preliminary Ph.D. research and study plan comprised of three parts:

Research Statement. A brief (less than one page) summary of a student's research plan. The format should be comparable to the "Intellectual Merit" section of the project summary for a standard proposal to the National Science Foundation written for a non-specialist in the research area.

Personal Statement. An assessment by the student of their perception of individual strengths and weaknesses pertinent to their research goals. This should address three areas:

- (i) academic background (e.g. coursework and field experiences)
- (ii) research skills (e.g. talents in writing, mathematics, computing, laboratory work, etc.) and
- (iii) personality characteristics important to professional success (e.g. tenacity, flexibility, commitment, ability to work in a team, etc.).

Students should view this task as an opportunity for objective professional self-assessment that can help the committee identify appropriate topics for discussion during the oral exam. An honest assessment will be most beneficial in this regard because it will facilitate recognition of areas of academic background that need strengthening and thereby aid ultimate success.

Intellectual Development. A bulleted list of specific targets in academic preparation and research skills that require strengthening in order to complete your Ph.D.

Step 2: Feedback and Review of Study Plan

The graduate committee and the student's advisor will provide written feedback to the student two weeks after the deadline for submission of the study plan. This response will be in the form of a review that the student should use as a guide in preparation for the oral exam. It will focus on topics that will constitute the principal points for discussion in the oral exam, especially areas that students identify as strengths, rather than weaknesses.

Step 3: Oral Exam

The Graduate Studies Committee will schedule an oral exam for individual students. The examination committee will consist of two or members of the graduate committee, the student's advisor, and (optionally) one or more members of the student's research committee. Question topics will focus on areas of knowledge described in the individual review guide given to each student and centered on their strengths. Students should recognize, however, that the broad objective of the exam is to identify areas that need strengthening; hence, the committee may ask questions regarding any aspect of geosciences.

Step 4: Results of Exam

There are three possible outcomes of this exam:

Unconditional Pass. This pass recognizes that a student has a background without deficiencies, a viable research plan, and is suitably prepared for success in the Ph.D. program.

Deferred Decision. When the student's self evaluation or the exam reveals a need to augment their academic background there may be a requirement to complete one or more courses, or fulfill other specific conditions, as determined by the com-

mittee and advisor. The result of the exam may be deferred pending the student's fulfillment of the conditions imposed by the committee. Students in this category are required to demonstrate significant progress by their annual review or they may enter the probation process described above.

Fail. A student can fail this exam. The primary reason for failure will be a student's inability to convince the committee that he/she can successfully complete the Ph.D. program. For example:

- (i) an inability to provide coherent answers during the oral exam,
- (ii) the absence of a viable research plan,
- (iii) evidence of a lack of commitment to the profession or to the Ph.D. program.

There is no possibility for retaking the exam for students who fail. For students entering the program with an outside M.S. degree (group 2 above) the 'fail' result is reserved for those exceptional circumstances when a student is disengaged from their intended research program.

Qualifying Examination

This is a three-stage process and can be undertaken only after minimum course requirements have been fulfilled. It should be taken no later than the 6th semester in the program:

- 1) The candidate will prepare a research proposal of approximately 15 pages excluding figures and references. The proposal will be reviewed by the student's advisory committee and used as part of the exam assessment. The proposal must demonstrate that the proposed research consists of a suitable topic in terms of feasibility and importance. Preliminary results and familiarity with the field and literature are necessary before writing the proposal. Once revisions are made and the proposal is accepted by the advisory committee, the second stage can be initiated.
- 2) A written examination based on the research proposal is prepared by the advisory committee. This is a closed-book examination taken on a day chosen by the student, spanning approximately 3 hours in the morning and 3 hours in the afternoon. The examination is meant to evaluate familiarity with the chosen research area, to assess the

relation of this field of research to others in the geosciences, and to alert the student to potential weaknesses in the research proposal. The advisory committee will evaluate responses to the examination. If responses are deemed sufficient and satisfactory, the third part of the process occurs. Students who fail the examination will be asked to leave the graduate program at the end of the semester, retake the examination, or complete specified remedial classes within 6 months of the examination date.

3) The oral portion of the exam takes place within 2 weeks after the written exam. The format normally consists of an oral presentation of the research proposal to the advisory committee, and responses to committee members' questions regarding both the proposal and the examination answers. This examination takes approximately 3 hours. A room within the department must be booked for this purpose and presentation equipment reserved (see the Office Assistant in GY129). Possible outcomes of this exam are: pass (admission to formal Ph.D. Candidate status), fail with permission to retake the exam, fail without permission to retake the exam, or a conditional pass (the candidate may need to satisfy some requirements set by the committee, which may involve further classes or research).

Nomination to Candidacy

The Nomination to Candidacy form must be completed online at <http://www.indiana.edu/~grdschl/forms/index.shtml> prior to the Qualifying Examination. If a candidate passes, all committee members must sign the form on the day of the Qualifying Examination. This form is then sent to the University Graduate School for acceptance of the examinee to become a formal Ph.D. candidate. After approval of the Graduate School, the candidate must complete the form for nomination of research committee, which is on the University Graduate School's website (<http://www.indiana.edu/~grdschl/index.shtml>).

Completion of Written Dissertation

The dissertation should be prepared in a form that is essentially ready to submit for publication in appropriate journals. Publication of results is strongly encouraged. The format of the dissertation must conform to the University's official policy on the production of theses (Appendix 4).

Dissertation Defense

The defense should be timed to ensure that at least eight months will elapse between passing the Qualifying Examination and the date the degree is awarded. The Research Committee and student must come to an agreement that the dissertation is at a stage that is suitable for defense, based on drafts of the dissertation submitted to the committee.

An Announcement of Defense must be submitted to the University Graduate School a minimum of 30 days prior to the defense date. An example of the format required is included in Appendix 4. Two weeks prior to the defense a copy of the dissertation must be placed in the front office of the department for public perusal. The defense itself consists of a public presentation of the dissertation research that any interested faculty and students may attend, followed by an open session of questions and discussion, after which the student's Research Committee conducts a rigorous closed-session, oral examination of the student.

The result of the defense is determined as a pass, conditional pass, a deferred decision, or a failure without the option to retake. The conditional pass usually requires revisions of the dissertation as recommended by the research committee, and a deferred decision indicates that the opinion of the research committee was not unanimous, a circumstance that requires reports from the research committee detailing the differing opinions to the Dean of the Graduate School.

After a successful defense, the Graduate Office needs to receive (i) one signed copy of the dissertation abstract, and (ii) one signed dissertation. Students should plan to submit the final version of their dissertation electronically to the University Graduate School as soon as possible.

Timeframe

The Ph.D. dissertation must be accepted by the student's research committee and a copy must be submitted to the University Graduate School within seven years of passing the Qualifying Examination. Failure to do so will result in termination of Ph.D. candidacy. Reinstatement of candidacy is possible and involves obtaining permission of the department chairperson, fulfilling any reinstatement requirements from the Department, passing the Qualifying Examination again, and then requesting reinstatement from the Dean. Once reinstated, the degree must be completed within three years.

Ph.D. Commencement Participation Application

Paperwork must be completed in advance to attend the commencement ceremony. To attend the December commencement, forms must be completed in mid-September; for the May commencement, forms must be completed in mid-February. Further information can be found at the Indiana University Ceremonies website <http://universityevents.iu.edu/>. Further information can be obtained from the Graduate Services Office in Geology 107.

DOCTOR OF PHILOSOPHY DEGREE: GEOLOGICAL SCIENCE-ATMOSPHERIC SCIENCES

Course Requirements

Requirements are the same as the regular Ph.D. degree with one additional requirement. At least 12 credit hours from a list of courses specific to Atmospheric Sciences defined by the Department of Geological Sciences.

Courses that satisfy the 12 credit hour requirement:

G532 Physical Meteorology and Climatology
G531 Dynamic Meteorology
G533 Advanced Synoptic Meteorology and Climatology
G534 Air Pollution Meteorology
G555 Wind Power Meteorology
G562 Dynamic Meteorology: Boundary-Layer Meteorology
G570 Micrometeorology
G575 Climate Change Science

DOCTOR OF PHILOSOPHY DEGREE WITHOUT PRIOR M.SC. DEGREE IN GEOLOGICAL SCIENCES

The requirements below presume that the student begins the program having completed a Bachelors degree. The requirements include:

Total of 90 credit hours

- 35 of the 90 hours must be graduate-level courses.
- 20 of these 35 hours must be graduate courses related to the students major research area
- 12 credits must be taken in the Indiana University Department of Geological Sciences
- Credits for the minor count toward the 35 total hours of coursework
- Transfer of credit — as specified for Ph.D.

The following items have the same requirements as those specified in the Ph.D. Overview:

- A 3.0 (B) grade point average
- G901 Advanced Research
- Primary Advisor
- Research Committee
- Selection of a Minor
- Ph.D. students are subject to annual and early review procedures described above
- Qualifying Examination
- Completion of Written Dissertation
- Dissertation Defense

Geological Sciences Degree Timelines

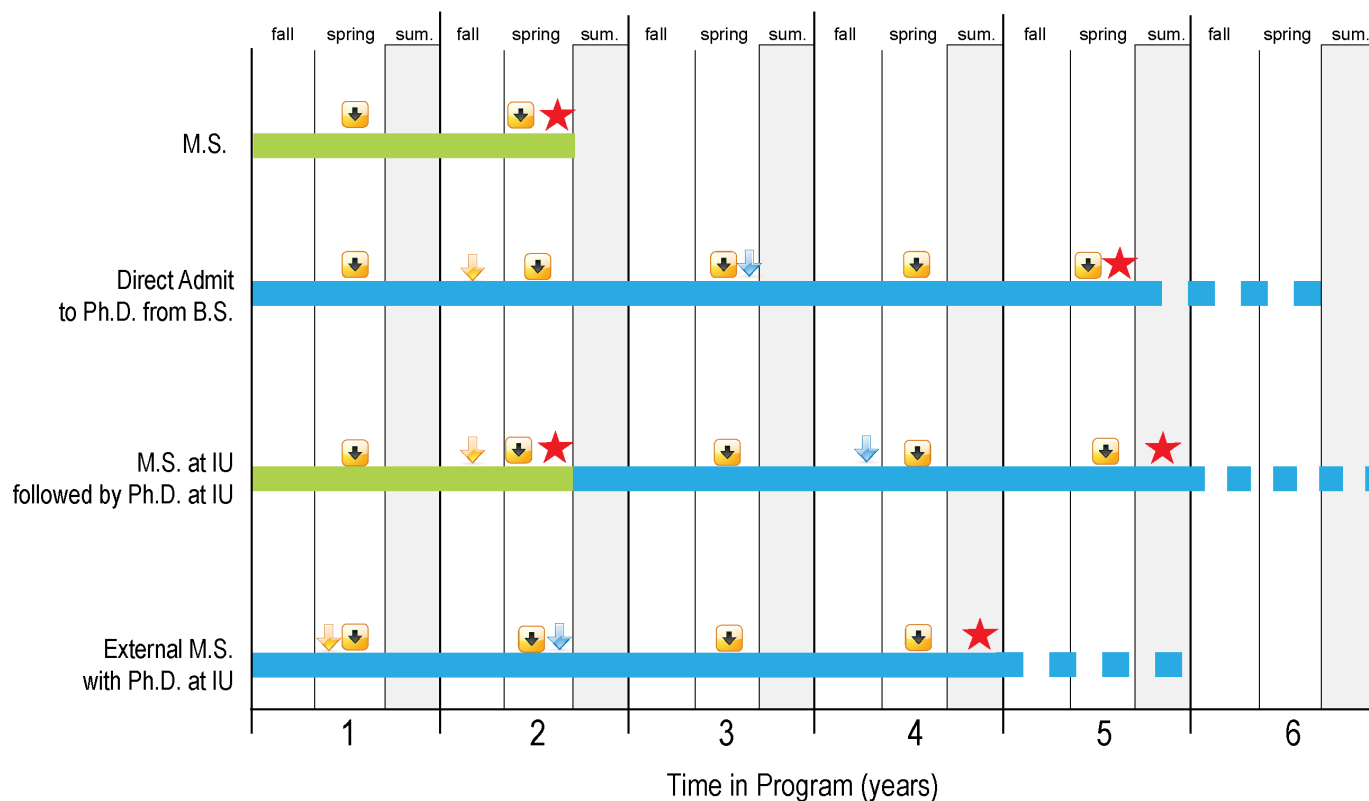


Figure 1: Illustrates a timeline for completing Ph.D. and M.S. degrees in Geological Sciences at IU.

graduate handbook appendices **2015-2016**

TABLE OF CONTENTS

Appendix 1 Faculty Directory	16
Appendix 2: Annual Report Forms for the Masters Degree	19
Appendix 3: Annual Report Forms for the Ph.D. Degree.....	23
Appendix 4: Example Forms Required by the University Graduate School	27
Appendix 5: Outside Courses Applicable to the Degrees.....	32
Appendix 6: 400-Level Courses Applied Toward Graduate Credit	35

APPENDIX 1

FACULTY DIRECTORY 2015-2016

APPENDIX 1: FACULTY, EMERITUS AND ADJUNCT FACULTY

<i>Teaching Faculty:</i> (The following people can supervise Ph.D./Masters students and serve on research committees)						
Title	Name	Specialty	Phone	Room	Email	Department
Professor	Abhijit Basu	Sedimentary and Planetary Petrology	5-6654	G521	basu	Geol Sci
Professor	David Bish	Clay Mineralogy; X-ray Diffraction	5-2039	G209	bish	Geol Sci
Professor	Simon Brassell	Biogeochemistry, Organic Geochemistry	5-3786	MSBII 404	simon	Geol Sci
Professor	James Brophy	Igneous Petrology, Geochemistry	5-6417	G309	brophy	Geol Sci
Asst. Professor	Douglas Edmonds	Sedimentary Geology	5-4512	G425	edmondsd	Geol Sci
Asst. Professor	Julie Fosdick	Sedimentary Geology	5-6109	G405	jfosdick	Geol Sci
Professor	Michael Hamburger	Geophysics, Seismology and Tectonics	5-2934	G415	hamburg	Geol Sci
Assoc. Professor	Claudia Johnson	Geobiology	5-0646	G501	claudia	Geol Sci
Professor	Kaj Johnson	Geophysics	5-3612	G401	kajjohns	Geol Sci
Asst. Professor	Chanh Kieu	Atmospheric Science	6-5704	G517	ckieu	Geol. Sci
Asst. Professor	Jackson Njau	Geanthropology	6-3170	G513	jknjau	Geol Sci
Professor	Gary Pavlis	Geophysics, Seismology and Tectonics	5-5141	G409	pavlis	Geol Sci
Professor	David Polly	Geobiology	5-7994	G524a	pdpolly	Geol Sci
Professor	Lisa Pratt	Biogeochemistry, Sedimentology/Stratigraphy	5-9203	MSBII 416	prattl	Geol Sci
Professor	Ed Ripley	Isotope Geochemistry	5-1196	G329	ripley	Geol Sci
Professor	Juergen Schieber	Sedimentary Geology	5-5322	G523	jschiebe	Geol Sci
Asst. Professor	Paul Staten	Atmospheric Science	6-5135	MSBII 302	pwstaten	Geol Sci
Asst. Professor	Laura Wasylenki	Geochemistry of Metals	5-7508	MSBII 420	lauraw	Geol Sci
Professor	Robert Wintsch	Metamorphic, Structural, Sedimentary Petrology, Tectonics and Geochronology	5-4018	G325	wintsch	Geol Sci
Professor	Chen Zhu	Hydrogeology, Mass Transport, Water-Rock-Gas-Microbe Interactions	6-1884	MSBII 424	czhu	Geol Sci
<i>Research Faculty:</i> (The following people can serve on research committees, and the Senior Scientists can supervise Ph.D./Masters students)						
Senior Lecturer	Bruce Douglas	Tectonics and Structural Geology	5-3848	G423	douglasb	Geol Sci
Senior Lecturer	Erika Elswick	Geochemistry, Sedimentology, Sedimentary Ore Deposits	5-2493	MSBII 428	eelswick	Geol Sci
Research Scientist	Ed Herrmann	Geoarchaeology	6-0587	G417	edherrma	Geol Sci
Lecturer	Cody Kirkpatrick	Atmospheric Science	5-3481	MSBII 305	codykirk	Geol Sci
Senior Scientist	Chusi Li	Petrology, Geochemistry, Mineral Deposits	5-1558	G217	cli	Geol Sci
Research Scientist	Peter Sauer	Biogeochemistry, Paleoclimatology	5-6591	MSBII 410	pesauer	Geol Sci
Senior Scientist	Arndt Schimmelmann	Organic Geochemistry, Chemical Oceanography	5-7645	G321	aschimme	Geol Sci

APPENDIX 1: FACULTY, EMERITUS AND ADJUNCT FACULTY

<i>Emeritus Faculty</i>						
	Robert Blakely	Geophysics			blakely	Geol Sci
	J. Robert Dodd	Geobiology	5-4957	G119	dodd	Geol Sci
	David L. Dilcher	Geobiology	6-0618	S209	dilcher	Geol Sci
	Jeremy Dunning	Structural Geology			dunning	
	Henk Haitjema	Hydrology	5-0731	SPEA439	haitjema	SPEA
	Donald Hattin	Stratigraphy	5-8232	G117	hattin	Geol Sci
	Erle Kauffman	Paleontology			kauffman	Geol Sci
	Brian Keith	Sedimentology, Stratigraphy	5-4213	S117	keithb	IGS
	Enrique Merino	Geochemistry and Petrology	5-5088	G117	merino	Geol Sci
	Greg Olyphant	Hydrogeology, Quaternary Geology and Geomorphology	5-1351	S423	olyphant	Geol Sci
	Lee J. Suttner	Sedimentology and Stratigraphy	5-4957	G119	suttner	Geol Sci
<i>Adjunct Faculty:</i> (The following people can supervise a Ph.D./Masters student, but require a co-advisor from the Faculty or Research Faculty. They can also serve on research committees)						
Professor	Chris Craft	Wetland Ecology	5-5971	MSBII 408	ccraft	SPEA
Research Scientist	Sally Letsinger	Hydrogeology, GIS	5-1356	S427	sletsing	IGS
Assoc. Professor	Adam Maltese	Science Education/Adjunct Faculty Geological Sciences	6-8059	Wright Ed Bldg 3054	amaltese	School of Education
Research Scientist	Maria Mastalerz	Coal Petrology, Coal Geochemistry, Coalbed Gas	5-9416	S225	mmastale	IGS
Distinguished Professor	Peter Ortoleva	Geochemistry	5-2717	CH203E	ortoleva	Chemistry
IGS Director and State Geologist	John Steinmetz	Paleontology	6-5313	S301D	jsteinm	IGS
Professor	Jeff White	Geochemistry	5-0731	MSBII 412	whitej	SPEA

¹ Only the listed phone number is needed when calling from on-campus; add 85 to the front to reach them from off-campus locations.

² Add @indiana.edu to each of these emails to contact the person.

Please note that this list changes every year – please consult the updated directory information placed in student mailboxes at the beginning of the fall semester.

APPENDIX 2

ANNUAL REPORT FORMS FOR THE MASTERS DEGREE

INSTRUCTIONS: Download this form from <http://geology.indiana.edu/education/handbook.html>
It should be completed and sent to the Graduate Services Coordinator no later than March 15th.

NAME: _____

ANNUAL REVIEW OF M.S. DEGREE PROGRESS

Students are required to organize a brief meeting with their Advisory Committee at least once a year (before April 15) to ensure that they share a common understanding of course selections, and research activities, plans and goals.

To assist in this process, students should provide copies of the form, duly completed, to all committee members at least 24 hours prior to this progress meeting. After the meeting, a PDF of the completed and signed form should be submitted to the Graduate Services Coordinator (room 107). Information on this form and in the summary statement of research progress will be used by the Committee on Graduate Studies to help rank students for academic awards and financial support.

COURSEWORK CHECKLIST

Graduate requirements:	Completed ?	Comments
1. ≥ 9 credit hours ≥ 500 level	<input type="checkbox"/>	_____
2. ≥ 12 of the 22 hours of graduate course credits in Geological Sciences	<input type="checkbox"/>	_____
3. ≤ 8 credit hours graduate transfer credit	<input type="checkbox"/>	_____
4. ≥ 30 credit hours total graduate credit	<input type="checkbox"/>	_____

Annual course load is 30 credit hours: 12 in Fall & Spring Semesters, 6 in Summer Session

RESEARCH PLANS

Program Options:

M.S. students must complete:

- ☐ Either a thesis (strongly recommended),
- ☐ Or a research report

Provisional Thesis (or Report) Title:

Brief Outline (max, 1 page) of Research Objective & Strategies:

Aims, field work, sampling, analytical methods, etc.

Summary of Immediate (3-6 months) Research Plans:

Future activities, especially during the summer months

APPENDIX 2: EXAMPLE ANNUAL REPORT FORM FOR THE M.S. DEGREE (page 2)

PROPOSED LONG-TERM RESEARCH PLANS AND TIMETABLE:

ANTICIPATED PHASES OF RESEARCH ACTIVITIES AND CONTINGENCIES

Timetable and Dates:

1. Annual Review: Date, time, and venue
2. Thesis Completion: Target dates for draft and final version. Provisional date for thesis defense.

Summary of Financial Support:

Indicate sources of support, e.g. AI (provide course #), RA (note funding agency & PI), Fellowship (give source, self, other grants (e.g. GSA, Sigma XI, etc.)

	Semester 1	Semester II	Summer
Year 1			
Year 2			

RESEARCH PROGRESS

Summary of Progress

A summary statement, preferably a one-page synopsis, which documents the following items, should be appended to this form. Several of these details would typically be compiled for inclusion in a full curriculum vitae, which may also be appended to this report.

1. Research Activities: Summarize achievement during the past year in field work, in laboratory analyses, in data collection, and written reports.
2. Proposals and Contributions to Proposals: Document grant applications submitted for research or fellowship support, including title, funding agency, date of submission, duration, purpose, and amount of funding sought/awarded, and the current status (whether pending, accepted, or declined). A copy of the proposal should be provided. Comparable information should also be given for grant applications submitted by others, for example an advisor or collaborator, to which you contributed. In such cases a copy of the proposal summary should be provided.
3. Conferences and Short Courses: Give details of meetings, short course or workshops attended, including their title(s), sponsoring organizations (e.g. GSA, AAPG), dates, location, and the source of any financial support enabling attendance.
4. Presentations: Provide a summary of any contributions to oral presentations or posters with information on the title, authorship, venue, date, and speaker (if applicable). Include a copy of the abstract, if available.
5. Publications: List all abstracts and papers, giving title, authorship, journal or book (e.g. conference proceedings or symposia), volume, pagination, and date of publication. Separately list comparable information for other manuscripts in preparation, submitted, under revision, accepted, or in press. Denote whether publications are peer-reviewed and provide copies of abstracts
6. Other Academic or Career Activities: Comment on any other relevant activities (e.g. internships) and on any awards received.

COMMITTEE REVIEW AND REMARKS

Coursework Status

Based on details documented in Coursework Summary.

1. Required Course. As determined by Advisory Committee:
2. General Requirements. Enter accumulated credit hours within each category.

≥ 500 level Geol. Sci. (≥ 9h)	<input type="checkbox"/>	Total Geol Sci. (≥ 20 h)	<input type="checkbox"/>
Transferred grad. Credit (≤8 h)	<input type="checkbox"/>	Total graduate credit (≥ 30 h)	<input type="checkbox"/>
3. Options. Specify credit hours accumulated within chosen option.

Option A:	Research (≤ 8 h)	<input type="checkbox"/>
Option B:	Research (≥ 3h)	<input type="checkbox"/>

COMMITTEE COMMENTS

1. Assessment of Degree Progress and a numerical ranking of research progress on a scale of 1-5 (1 = unsatisfactory; 2 = minimal; 3 = satisfactory; 4 = good; 5 = outstanding).
Contents based on coursework & research activities:

2. Recommendations. Specific suggestions or requirements regarding degree progress.

3. Approval. Signatures designate agreement on course selection and research programs.

	Signature	Date
Research Advisor	_____	_____
Advisory Committee member:	_____	_____
Advisory Committee member:	_____	_____

INSTRUCTIONS: Download this form from <http://geology.indiana.edu/education/handbook.html>
It should be completed and sent to the Graduate Services Coordinator no later than March 15th.

APPENDIX 3

ANNUAL REPORT FORMS FOR THE PH.D. DEGREE

INSTRUCTIONS: Download this form from <http://geology.indiana.edu/education/handbook.html>
It should be completed and sent to the Graduate Services Coordinator no later than March 15th.

NAME: _____

ANNUAL REVIEW OF Ph.D. DEGREE PROGRESS

Students are required to organize a meeting with their Advisory Committee at least once a year (by March 15) – more frequent meetings are encouraged - to ensure that they share a common understanding of course selections, and research activities, plans, and goals.

To assist in the annual review process, students should provide copies of the form, duly completed, to all committee members at least 24 hours prior to this progress meeting. After the meeting, a PDF of the completed and signed form should be submitted to the Graduate Services Coordinator in the Graduate Services Office (room 107). Information on this form and in the summary statement of research progress will be used by the Committee on Graduate Studies to help rank students for academic awards and financial support.

COURSEWORK CHECKLIST

Graduate Requirements:	Completed?
1. ≥ 12 credit hours formal graduate credits in Geological Sciences	<input type="checkbox"/>
2. ≥35 credit hours total formal graduate coursework	<input type="checkbox"/>
3. ≤30 credits of transferred graduate credit	<input type="checkbox"/>
4. ≥90 credit hours total graduate credit	<input type="checkbox"/>
5. Specified credit hours in minor (determined by minor advisor)	<input type="checkbox"/>

Annual course load is 30 credit hours: 12 in Fall and Spring Semesters, 6 in Summer Session

RESEARCH PLANS

Provisional Thesis (or report) Title:

Brief Outline of Research Objectives and Strategies:

Aims, field work, sampling, analytical methods, etc.

Summary of Immediate (3-6 months) Research Plans:

Future activities, especially during the summer months

Proposed Long-term Research Plans and Timetable:

Anticipated phases of research activities and contingencies

APPENDIX 3: EXAMPLE ANNUAL REPORT FORM FOR THE PH.D. DEGREE (page 2)

Timetable and Dates:

1. Annual Review: Date, time, and venue
2. Qualifying Examination. Proposed date and time
3. Thesis Completion: Target dates for draft and final version. Provisional date for thesis defense.

Summary of Financial Support:

Indicate sources of support, e.g. AI (provide course #), RA (note funding agency & PI), Fellowship (give source, self, other grants (e.g. GSA, Sigma XI, etc.)

	Semester 1	Semester II	Summer
Year 1			
Year 2			
Year 3			
Year 4			

RESEARCH PROGRESS

Summary of Progress

A summary statement, preferably a one-page synopsis, which documents the following items, should be appended to this form. Several of these details would typically be compiled for inclusion in a full curriculum vitae.

1. Research Activities: Summarize achievement during the past year in field work, in laboratory analyses, in data collection, and written reports.
2. Proposals and Contributions to Proposals: Document grant applications submitted for research or fellowship support, including title, funding agency, date of submission, duration, purpose, and amount of funding sought/awarded, and the current status (whether pending, accepted, or declined). A copy of the proposal should be provided. Comparable information should also be given for grant applications submitted by others, for example an advisor or collaborator, to which you contributed. In such cases a copy of the proposal summary should be provided.
3. Conferences and Short Courses: Give details of meetings, short course or workshops attended, including their title(s), sponsoring organizations (e.g. GSA, AAPG), dates, location, and the source of any financial support enabling attendance.
4. Presentations: Provide a summary of any contributions to oral presentations or posters with information on the title, authorship, venue, date, and speaker (if applicable). Include a copy of the abstract, if available.
5. Publications: List all abstracts and papers, giving title, authorship, journal or book (e.g. conference proceedings or symposia), volume, pagination, and date of publication. Separately list comparable information for other manuscripts in preparation, submitted, under revision, accepted, or in press. Denote whether publications are peer-reviewed and provide copies of abstracts
6. Other Academic or Career Activities: Comment on any other relevant activities (e.g. internships) and on any awards received.

APPENDIX 3: EXAMPLE ANNUAL REPORT FORM FOR THE PH.D. DEGREE (page 3)

COMMITTEE REVIEW AND REMARKS

Coursework Status

Based on details documented in Coursework Summary

1. Required Courses. As determined by Advisory Committee
2. General Requirements. Enter accumulated credit hours within each category.

Total Geol. Sci. (≥ 12 h)	<input type="checkbox"/>	Total Graduate Credit (≥ 90 h)	<input type="checkbox"/>
Minor	<input type="checkbox"/>	Graduate Course Credit (≥ 35 h)	<input type="checkbox"/>
Transferred Grad Credit (≤ 30 h)	<input type="checkbox"/>	Research	<input type="checkbox"/>

COMMITTEE COMMENTS

1. Assessment of Degree Progress and a numerical ranking of research progress on a scale of 1-5 (1 = unsatisfactory; 2 = minimal; 3 = satisfactory; 4 = good; 5 = outstanding).
Comments based on coursework and research activities.
2. Recommendations. Specific suggestions or requirements regarding degree program.
3. Approval. Signatures designate agreement on course selection and research progress.

	Signature	Date
Research Advisor:	_____	_____
Advisory Committee member:	_____	_____
Advisory Committee member:	_____	_____
Advisory Committee member:	_____	_____
Minor Advisor:	_____	_____
Student:	_____	_____

INSTRUCTIONS: Download this form from <http://geology.indiana.edu/education/handbook.html>
It should be completed and sent to the Graduate Services Coordinator no later than March 15th.

APPENDIX 4

FORMS REQUIRED BY THE UNIVERSITY GRADUATE SCHOOL

The University Graduate School has a comprehensive website informing students on the requirements for preparing theses and dissertations. Please review materials provided for completion of the research degree at:
<http://www.indiana.edu/~grdschl/index.shtml>

These forms are available online:

M.S. APPLICATION FOR ADVANCED DEGREE

Ph.D. NOMINATION OF RESEARCH COMMITTEE

Ph.D. NOMINATION TO CANDIDACY

Ph.D. SCHEDULE AND ANNOUNCEMENT OF FINAL EXAMINATION (on OneIU)

Ph.D. COMMENCEMENT PARTICIPATION APPLICATION (on OneIU)

A GUIDE TO THE PREPARATION OF THESES AND DISSERTATIONS (on Graduate School website)

INSTRUCTIONS: Go to the Graduate School website to complete and submit the required forms.

<http://www.indiana.edu/~grdschl/forms/index.shtml>

AND

<http://www.indiana.edu/~grdschl/theses-dissertations/deadlines.shtml>

APPENDIX 4: EXAMPLE FORM FOR THE MASTERS DEGREE

APPLICATION FOR ADVANCED DEGREE UNIVERSITY GRADUATE SCHOOL

STUDENT: _____

Month in which you wish degree to be conferred _____

Please note that if this date changes you must notify the Recorder for your name to appear in the Commencement program (please initial here) _____.

Diplomas are mailed by the Office of the Registrar approximately three months after the degree is conferred.

CAMPUS ID NUMBER: _____ DATE OF BIRTH: _____

NAME _____

Current Address _____

Permanent Address _____

Street _____

Street _____

(City, State) _____ (Zip) _____

(City, State) _____ (Zip) _____

Local Telephone number () _____

Email Address _____

Did you ever attend a regional campus for graduate credit?

Yes____ No____

If yes, where and when _____

Will you be transferring credit from another institution for this degree?

Yes____ No____

If yes, from where and how many credit hours _____

Have you ever been a Continuing Non-degree Student?

Yes____ No____

Will you be continuing work for the Ph.D. at IU?

Yes____ No____

Check appropriate boxes

Master of Arts

Department/Program _____ Major _____

() with thesis

() with research skill (specify courses) _____

() with language (specify language and how fulfilled) _____

() with essay, internship, or project

() with exam (date completed) _____

Master of Science

Department/Program _____ Major _____

() with thesis

() with research skill (specify courses) _____

() with language (specify language and how fulfilled) _____

() with essay, internship, or project

() with exam (date completed) _____

Master of Fine Arts

Department/Program _____ Major _____

() date of thesis show _____

() with thesis

Master of Arts for Teachers* Department/Program _____ Major _____

* Copy of Public Instruction Teacher's License must be subject to the Master's Recorder, Kirkwood Hall 111. Diploma will be sent to address on official University records. Please check your address at the Office of the Registrar, 408 N. Union Street, Bloomington, IN 47405

APPENDIX 4: EXAMPLE FORMS FOR THE Ph.D. DEGREE

THE UNIVERSITY GRADUATE SCHOOL NOMINATION OF RESEARCH COMMITTEE FOR THE Ph.D.

Name of Student _____ Campus I.D. _____
Department _____ Birth Date _____
Major _____ Minor(s) _____
Date of Qualifying Examination _____
Date of Enrollment in University Graduate School _____
Proposed Dissertation Title _____

Dissertation Prospectus: Please attach a one-to-two page summary of the proposed research. If the research involves human subjects, animals, biohazards, biosafety, or radiation, please also attach an approval from the appropriate committee. Note: Your signature below indicates that you have read the attached prospectus and agree to serve, if appointed, on a committee to supervise this research.

NAME	SIGNATURE	DEPARTMENT (Please type)	EMAIL
_____ (Co-Chair of Committee)	_____	_____	_____
_____ (Co-Chair of Committee)	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____ (Minor representative)	_____	_____	_____

ALL COMMITTEE MEMBERS MUST BE MEMBERS OF THE UNIVERSITY GRADUATE SCHOOL FACULTY AND AT LEAST HALF MUST BE FULL MEMBERS.

I certify that I have examined the attached prospectus and that this committee is appropriate to supervise research in this area.

Signature/Department Chairperson _____ Date _____

*To be used only by students who have passed the qualifying examinations and who have previously been admitted to candidacy.

APPENDIX 4: EXAMPLE FORMS FOR THE Ph.D. DEGREE

**THE UNIVERSITY GRADUATE SCHOOL
NOMINATION TO CANDIDACY FOR THE Ph.D. DEGREE**

Name of Student _____ Student I.D# _____

Current Mailing Address _____

Department _____ Date of Enrollment in Graduate School _____ Birth Date _____

Date of Qualifying Exam _____ (mo/day/yr) Date Candidacy Expires _____

Total Graduate Credits Earned (Including Transfer Credits*) _____

REQUIREMENT COMPLETION DATES

Academic Plan _____

Academic Sub-Plan _____

Minor _____ Date ____/____/____

Minor _____ Date ____/____/____

This certifies that the above named student has passed the Qualifying Examination and is hereby nominated to candidacy for the PhD degree.

Advisory _____
Committee _____
Signatures _____

Outside Minor _____
(Outside Minor Examination Passed)

OR _____
(Outside Minor Examination Waived)

Chair or Graduate Advisor/Major Dept _____ Date _____

Information Verified/PhD Recorder _____ Date _____
University Graduate School

Approved/Dean _____ Date _____
University Graduate School

*Do not submit this form to the University Graduate School until the transfer of credits from other institutions has been approved.

Announcing the Final Examination of

For the
Degree of Doctor of Philosophy in Geological Sciences
Thursday, December 7th, 2012, 1:00 p.m.
Room GY338, Geology Building

Dissertation: Open System Magmatism, and the emplacement of the Partridge River Intrusion,
Duluth Complex, Minnesota.

The Partridge River Intrusion (PRI) is one of several large, tholeiitic bodies that occur along the Western portion of the Duluth Complex in northern Minnesota. Mafic magmatism developed in response to intercontinental rifting at approximately 1.1 Ga. The intrusion is host to several Cu-Ni sulfide deposits that are found near the basal contact with metapelitic footwall (the Proterozoic Virginia Formation). The upper portion of the PRI is characterized by thick, unlayered, monotonous sequences of troctolite and augite troctolite. Thin (usually less than 5 meters in thickness) layers of melatroctolite and picrite occur at irregular intervals. Cu-Ni mineralization, and iron-rich units of ferrogabbro occur near the base of intrusion. The ferrogabbro units are also enriched in incompatible elements (P, Y, Ti), and are intercalated with troctolite.

Previous researchers have suggested genetic mechanisms to explain the chemical variations in the PRI that range from differentiation of a single magmatic pulse, to multiple inputs of chemically distinct magma. This study was conducted to evaluate and model the magmatic process involved during the emplacement of the PRI. Samples were selected from a drillcore located to the northwest of the major Cu-Ni sulfide body at the Babbitt deposit. The site was chosen to avoid discontinuities caused by the presence of metapelitic xenoliths of the Virginia Formation, which are common in the vicinity of the mineralization.

Ferrogabbro at the bottom of the intrusion was derived from an evolved melt of ferrodioritic composition, emplaced early in the history of the PRI. A later, more primitive troctolitic melt intruded the ferrogabbro. The main massive Cu-Ni mineralization is distinct, isotopically and compositionally, from the overlying disseminated mineralization, and was emplaced as a separate body, also early in the history of the PRI. Both the differentiated, ferrogabbroic melt and the sulfide melt which formed the massive mineralization evolved in one or more staging chambers in the shallow crust.

Outline of Studies
Major: Geology
Minor: Geochemistry

Educational Career
BS, Indiana University, 1983
MS, Indiana University, 1989

Committee in Charge
Professor Edward Ripley, Chair, Geological Sciences (855-1196)
Dr. Haydn Murray
Dr. Lisa Pratt
Dr. Robert Wintsch
Dr. James Brophy

Approved: _____
Edward Ripley, Chair

(Any member of the Graduate Faculty may attend. As a courtesy, please notify the Committee Chair in advance).

APPENDIX 5

OUTSIDE COURSES APPLICABLE TO THE DEGREES

APPENDIX 5: OUTSIDE COURSES

Outside Courses		
(Note: This is not an exhaustive list, other subjects may be taken with permission of the Graduate Committee and the Graduate School. All students are advised to consult the Director of Graduate Studies if you want a course at the 400 level or below to count for graduate credit.)		
Mathematics		
Applied Mathematics		Cr hr
M301	Linear Algebra and Applications	3.0
M303	Linear Algebra for Undergraduates	3.0
M311	Calculus III	3.0-5.0
M312	Calculus IV	3.0
M343	Introduction to Differential Equations w. Applications I	3.0
M344	Introduction to Differential Equations w. Applications II	3.0
M415	Elementary Complex Variables w. Applications	3.0
M441	Introduction to Partial Differential Equations w. Applications I	3.0
M442	Introduction to Partial Differential Equations w. Applications II	3.0
Statistics and Probability		Cr hr
K310	Statistical Techniques	3.0
M360	Elements of Probability	3.0
M365	Introduction to Probability and statistics	3.0
M366	Elements of Statistical Inference	3.0
M463	Introduction to Probability Theory I	3.0
M464	Introduction to Probability Theory II	3.0
M466	Introduction to Mathematical Statistics	3.0
M467	Advanced Statistical Techniques I	3.0
M468	Advanced Statistical Techniques II	3.0
E538	Statistics for Environmental Science	3.0

APPENDIX 5: OUTSIDE COURSES

Computer Science		
A304	Introductory C++ Programming	2.0
A306	Object oriented programming in C++	2.0
A346	User Interface Programming	3.0
C201	Introduction to Computer Science	4.0
C202	Introduction to Software Systems	4.0
C311	Programming Languages	4.0
C335	Computer Structures	4.0
C343	Data Structures	4.0
M371	Elementary Computational Methods	3.0
M471	Numerical Analysis I	3.0
M472	Numerical Analysis II	3.0
Physics		
P302	Elementary Electronics	2.0
P421	Digital Electronics and Microprocessors	3.0
P422	Analog Electronics and Semiconductor devices	3.0
P431	Electronic Laboratory I	2.0
P432	Electronic Laboratory II	2.0
Chemistry		
C315	Chemical Measurements Laboratory I	3.0
C317	Equilibria and Electrochemistry	2.0
C318	Spectrochemistry and Separations	2.0
C364	Introduction to Basic Measurements	3.0
C501	Chemical Instrumentation	3.0
SPEA		
E515	Vector-based Geographical Information Systems	3.0
E526	Applied Math for Environmental Science	3.0
E536	Environmental Chemistry	3.0
E538	Statistics for Environmental Science	3.0

400-LEVEL COURSES THAT CAN BE APPLIED TOWARD GRADUATE CREDIT

400 Level Courses that Count for Graduate Credit
Within the Department of Geological Sciences

G404, Geobiology
G406, Introduction to Geochemistry
G411, Invertebrate Paleontology
G413, Introduction to Earth Physics
G415, Geomorphology
G416, Economic Geology
G417, Optical Mineralogy
G418, Igneous and Metamorphic Petrology
G420, Regional Geology Field Trip
G423, Methods in Applied Geophysics
G427, Introduction to X-Ray Mineralogy
G429, Field Geology in the Rocky Mountains
G451, Hydrogeology