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MIT-WHOI Joint Program In Oceanography/Applied Ocean Science and Engineering

External Review Materials

December 2-4, 2014

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MIT/WHOI Joint Program in Oceanography and Applied Ocean Science and Engineering

Overview – Fall 2014

The goal of the MIT/WHOI Joint Program is to train and mentor the future leaders of ocean sciences. This ambitious goal is matched by the remarkable resources of the Joint Program: the faculty and staff of MIT, a leading research and engineering university, and the scientific staff and sea-going facilities of WHOI, a leading ocean sciences research institution. This overview describes how the Joint Program (JP) brings these resources together, notes some of the accomplishments of the last five years, and describes what we see as important challenges coming in the next five to ten years.

A little history and description of the governance of the JP

The Joint Program was established in 1968 and, as of September 2014, has awarded 963 degrees. Of these, 71% have been PhDs or ScDs. Joint Program graduates are leaders in many aspects of research and science administration both nationally and internationally and are the surest evidence of the Joint Program's success.

The Joint Program began with a very brief Memorandum of Understanding that laid down a single guiding principle: that the faculty at MIT and the scientific staff at WHOI would seek consensus on the major decisions that affect the Joint Program and JP students. This principle is followed throughout the organization of the Joint Program; every important committee includes representatives from the two institutions, and chairs of each Joint Committee are chosen alternately from the institutions.

The JP is organized around five basic science disciplines: Biological Oceanography, Chemical Oceanography, Physical Oceanography, Marine Geology and Geophysics, and Applied Ocean Science and Engineering. This reflects the organization of ocean sciences at the time the JP was founded in the 1960s, and is in parallel with the research departments at WHOI. This organization is not in parallel with academic departments at MIT; Chemical, physical and geological oceanography are mainly within Earth, Atmospheric and Planetary Sciences, Biological Oceanography is today mainly within the Biology Department and within Civil and Environmental Engineering, and Applied Ocean Science and Engineering is within Mechanical Engineering, Electrical Engineering and Computer Science, and Civil

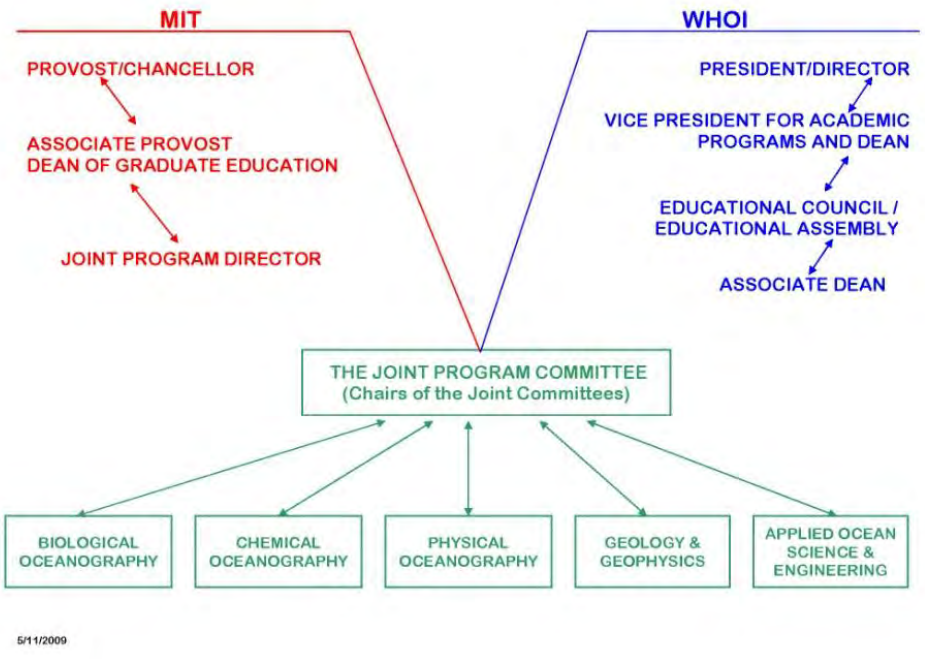
and Environmental Engineering. This division by basic sciences is not in all cases the most natural organization for the research problems pursued by JP students who may work with MIT and WHOI staff from several of these disciplines and several MIT Departments.

Students may be admitted into one or more of these disciplines, but for administrative purposes they must choose a home within one JP discipline. They must also be admitted into and have an affiliation with a department at MIT. Presently, JP students are affiliated with Earth Atmospheric and Planetary Sciences, the Biology Department or one of the Engineering Departments: Mechanical, Electrical and Computer Science or Civil and Environmental. JP students are full-fledged MIT graduate students, and are subject to the rules and enjoy the benefits common to all MIT students.

Each of these disciplines is managed and supervised by a Joint Discipline Committee (hereafter referred to as Joint Committee or JC) that is made up of three or more JP faculty members from each institution, nominated by the Head of the Department (MIT) or Department Chair (WHOI) of participating departments from the partner institutions and approved by the WHOI Dean and the MIT Joint Program Director. The five Joint Committees are for Biological Oceanography (JCBO), Chemical Oceanography (JCCO), Physical Oceanography (JCPO), Marine Geology and Geophysics (JCMGG) and Applied Ocean Science and Engineering (JCAOSE). A list of current members is attached at the end of this report (Appendix IV). These Joint Committees enjoy considerable autonomy insofar as they do not report to an academic department at either institution. They also have the lion's share of responsibility for the day-to-day functioning of the JP: they are responsible for the curriculum, for selecting instructors, for approving thesis committees, for administering general examinations and for conducting an annual review of the progress of each student in their discipline. The importance of these Joint Committees could thus hardly be overstated. It is essential that the home academic departments of the committee members, and especially of the committee chair, appreciate and reward appropriately the level of effort that committee duties require and the vital contribution that the committee members and committee chairs make to the JP. Each of the Joint Committees has prepared a brief description of the issues that they have chosen to bring to the Review Committee's attention (attached at the back of this report).

The highest level of oversight of the JP is provided by the Joint Program Committee, which is made up of the Chairs of each of the Joint Committees (an organization chart is below), WHOI Dean, WHOI Associate Dean, and the MIT Joint Program Director. The Chairs of the Joint Committees are appointed by the Director of the JP at MIT (currently Ed Boyle) and by the Vice President for Academic Programs and Dean

at WHOI (currently Jim Yoder). The MIT Director and the WHOI Dean also co-chair the Joint Program Committee.



Admissions and starting out in the JP

Students are admitted by a vote of the Joint Program Committee based upon recommendations from the five Joint Committees and supplemented by an Admissions Advisory Committee. The Admission Advisory Committee is chaired by the WHOI Associate Dean and composed of two WHOI-based JP faculty members from each discipline who first review all applications to their respective disciplines and produce a short-list of top-tier candidates. All ten members of the Admission Advisory Committee then review and rank the top-tier applicants from all of the disciplines. This broad-based review of JP applications takes time, and an effort is made to complete the process so that JP admission offers can be made by mid-February. It is significant that admission is offered on behalf of the entire Joint Program, and not just a single discipline or a major advisor. A commitment of five years of stipend and tuition support is made to admitted students, subject to making reasonable progress toward a degree. Like

admission, this commitment of financial support comes from the Joint Program, and not from one department or one potential advisor.

Many entering students have interests and academic backgrounds that fit well within a single discipline, but other applicants arrive with research interests that span two or more disciplines. Students are admitted to the discipline that they choose or that we gauge to be most appropriate for their preparation and stated research interests. This ensures that each student has a well defined administrative (and scientific) home within the JP. Students are also assigned an initial advisor at around the time of admission based on their stated interests and match with faculty interests and available graduate research assistant (GRA) support or other funding. Students can change their advisor and change their home departments with approval of the Joint Committees that are directly involved. In practice, very few students switch disciplines, but roughly 10% change their advisor at some stage of their careers, although usually not past the second year. The JP commitment of funding makes it possible for JP students to change advisors and disciplines as their research interests develop and change during their first two years in the JP. Students who may fall off grant support (GRA support) are also assured of full funding by the JP.

Degrees and degree requirements

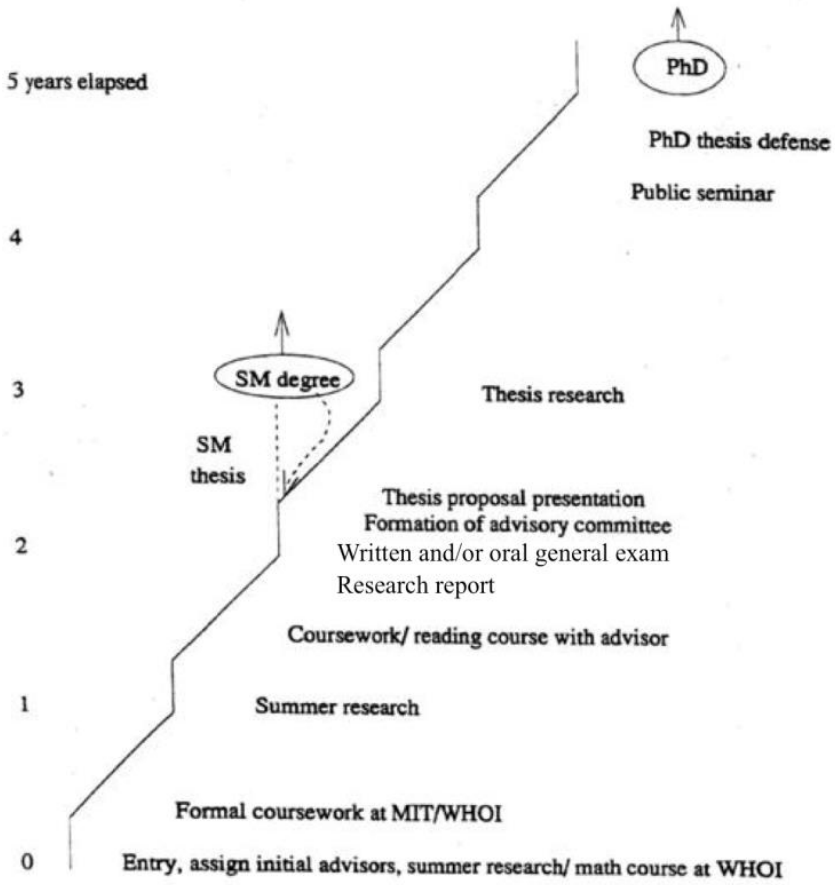
JP students are admitted into a PhD or ScD program (hereafter referred to as PhD), with the exception of Navy Masters degree students (as noted below). General degree requirements are those specified by the MIT Office of the Dean for Graduate Education (http://web.mit.edu/odge/gpp/index.html). There are no core course requirements that hold for the entire JP. Course requirements within each of the disciplines are described in the respective Handbooks (and shown in Table 1) and in all disciplines the requirements are such that there is ample opportunity for JP students to select courses that are tailored to their interests. JP students can take any course that is offered at MIT and cross-registration is available with Harvard. The curriculum of study for each individual student is determined by consultation between the student and his/her advisor and an Academic Advisory Committee (each discipline has a pre-thesis advisory committee structure with at least one designated academic advisor that is not the student's supervisor/advisor).

Table 1. Discipline Course Requirements (non-engineer disciplines)

Discipline	Required Courses
BIO	**7.47** Biological Oceanography **7.410** Applied Statistics No less than 120 units of non-research courses
CO	**12.742** Marine Chemistry **12.759** Seminar in Marine Chemistry (twice)
MGG	**12.754** Presenting Scientific Research **Data analysis** course: (e.g., 1.715, 7.40, 12.444, 12.714, 12.747, 12.864, 18.085) **Breadth Requirement**: One course from 3 of the 4 categories: Geology/Sedimentology, Geophysics/Tectonics, Climate/Paleoceanography, Petrology/Geochemistry
PO	No formal course requirements, but students are expected to know the material covered in the core courses (these are 12.800, 12.808, 12.801, 12.802 for the general physical oceanography track with substitutions allowed for interdisciplinary tracks). Expectation to pass general exam is 12 to 14 courses that include four core courses, two math courses, and six to eight elective courses.

Each of the disciplines has a general examination requirement that students must complete in order to advance to PhD candidacy. The general exam is taken by most students by about the end of their fourth semester or early in their fifth semester (a timeline is shown below). These are challenging exams, and there is no doubt that most JP students see the general exam as the most significant event of their first two years in the program. The scope of the exam is to be consistent with requirements of the student's Joint Committee and sufficiently flexible to recognize the individualized aspects of the course of study followed by each individual student (see the attached policy statement on Interdisciplinary Studies – Appendix I).

Timeline to Degree



The format of the general examination varies somewhat between the disciplines (the student Handbooks provide the details, and an overview is provided in Table 2). In brief, Biological Oceanography, Chemical Oceanography, Marine Geology and Geophysics, and Physical Oceanography general exams each require a report (or two reports in the case of Marine Geology and Geophysics) on research conducted by the student, and an exam, written and/or oral, that tests both specific and general knowledge. The form of these general exams was reviewed by each discipline (in response to the 2011 JP Strategic Plan and recommendations from the 2004 and 2009 JP External Review Committees that these general exams should have a uniform format across all JP disciplines) with

significant (Biological Oceanography) and less significant (Chemical and Physical Oceanography) modifications made to all but the MG&G general exam structure. The Applied Ocean Science and Engineering (AOSE) general exams are distinct in that they are administered by one of the three MIT Engineering Departments (Electrical, Mechanical or Civil) with which an AOSE student may be affiliated, each of which has a different format. These general exam formats have remained the same as that of the affiliated MIT department recognizing that these large departments are not likely or willing to modify requirements for the relatively small number of JP students that are within these departments.

Table 2. General Exams, non-engineer disciplines.

Discipline	Research report	Exam
BO	Research report completed by February of 2nd year	Oral presentation (~20 minutes) of thesis proposal followed by questions on proposal and then questions on general concepts in BO
CO	Research report completed by end of March of 2nd year	4hr closed book written exam on 5 questions/subjects; then oral exam w/12 minute presentation of research followed by questions on research and on written exam
MGG	Two research reports completed by fall of 3rd year	Oral presentation of each research project and questions on research projects and on general concepts of MG&G
PO	Research report completed by early May of 2nd year	One day open-book written exam; then oral exam w/20-30 minute presentation of research project followed by questions on research, written exam, and general concepts

The next step is defense (or presentation) of a thesis proposal, usually within three to six months of the general exam. This too is a very significant event, in that it defines the participants and the path for the next several years of thesis research. Students who successfully complete the general examination and thesis proposal defense or presentation advance to candidacy for the doctoral degree and form a doctoral thesis committee. The major requirement of the doctoral degree is the completion of a thesis which describes a significant, original, scholarly contribution to ocean science or oceanographic engineering, as judged by a thesis advisory committee composed of MIT and WHOI JP faculty and often additional faculty from other institutions or other MIT departments.

The Joint Discipline Committees review the academic progress of each student once per year by requiring reports from the student and advisor(s) and by discussing the progress of each student in their

discipline. These reviews are attended by the WHOI Associate Dean (at present, Meg Tivey) and by one or more of the academic programs faculty from MIT and WHOI.

As we noted above, the JP is committed to providing students with five years of full financial support, assuming reasonable progress toward a PhD degree. Few JP students complete a PhD within five years, but many do finish in less than 5.5 years. The average time to PhD in recent years is 5.5 years. Funding within a sixth year is not guaranteed, but has been provided almost routinely following a formal request by the student and approval by the relevant Joint Committee. However, we discourage funding of JP students who are beginning a seventh full year in the program, and we insure that students (and their advisors) who are in peril of a funding cutoff know what may be coming. Of course, we also consider the possible extenuating circumstances, e.g., health or unavoidable technical/logistical problems that may cause the delay of degree completion. The retention rate of those entering the program from 2005 to 2009 to obtain a PhD is 76% (see Table 3).

Table 3. Retention of students entering into PhD program from 2005 through 2009*

Discipline	Doctoral Degree	Engineer Degree	Masters Degree	No Degree	Currently Enrolled	Percent Retention
Biological Oceanography	12	0	7	2	2	61
Chemical Oceanography	20	0	1	2	2	88
Marine Geology & Geophysics	14	0	4	0	2	80
Applied Ocean Science & Engineering**	18	1	4	1	2	77
Physical Oceanography	12	0	4	1	1	72
Total	76	1	20	6	9	76

*Assumes those currently enrolled will successfully complete PhD
** Excludes 11 Navy students who entered for and received Masters degrees

A US Navy Masters degree program was started in 1970. Naval officers are admitted into this program with the expectation that they will complete an SM, including thesis, in two years and three months. To date, all of these Navy SM students are in AOSE, though beginning in 2015 it will be possible for Navy SM students to enter into Physical Oceanography. Many of the graduates have gone on to have distinguished naval careers, and they have been strong advocates of the Joint Program and of

oceanography generally within the Navy. The retention rate of those entering the program from 2005 to 2009 to obtain a SM is 100%. The total number of Navy graduates to date is 82.

Teaching and advising effectiveness

Participation in JP teaching and advising is not mandatory for MIT and WHOI staff members. The staff who choose to participate as JP faculty take on these tasks willingly and with genuine enthusiasm for the opportunity to interact with JP students. Enthusiasm is a good starting point, but not every capable scientist will be a naturally gifted classroom teacher, and not every pairing of an entering graduate student with an advisor will result in the kind of harmonious, long-term, fruitful collaboration that is so important for a PhD student.

We monitor the effectiveness of teaching and advising on a regular basis and by several means. First, by the annual reviews at which students are encouraged to express their opinions; of course we also encourage private communication between students and JP faculty and with the WHOI Academic Programs Office and appropriate offices at MIT. Classroom teaching is also monitored by means of anonymous course evaluations that are conducted at the end of every semester. The summaries of these evaluations are public records, and are duly noted by the WHOI Academic Program Office (APO) and MIT senior staff. Quality of teaching is also a topic during exit interviews that are held with each JP student as s/he exits the program. When problems with teaching quality have become evident, we make sure that the affected faculty member(s) will take some appropriate action toward improvement. One option now available for new instructors, and/or those with issues related to teaching quality, is to participate in training at the MIT Teaching and Learning Laboratory (TLL, see http://tll.mit.edu/). In serious enough cases where training is not successful, we can suggest that the faculty member be rotated out of a teaching assignment. The course evaluations following the most recent fall and spring semesters (2014) were generally favorable, and without serious problems (available in the APO at WHOI).

Monitoring advising effectiveness is a much less objective process, since it involves an interaction between only two parties. The most candid feedback that we routinely get comes through exit interviews with departing JP students. The most variable quality of JP advisors appears to be the level of attention and research guidance. Some advisors are inclined toward fairly close, almost day-to-day supervision, while many other advisors take a much more hands-off approach that works well only with

mature and independent students. The expectations for both students and advisors are summarized on the web site under "Responsibilities" (http://mit.whoi.edu/responsibilities). When assigning advisors to incoming students we consider what we know of advisor tendencies and the probable needs of the incoming student. The latter is, of course, very hard to evaluate and the deciding factor in assigning advisors is more often the matching of research interests with available resources including funding and time.

When problems arise

Most JP students move through the PhD program without major delays or complications. However, when problems do arise from personal or academic issues, there are many and varied resources at MIT and at WHOI that JP students may draw upon. WHOI provides quarter-time financial support for an Education Coordinator within each discipline, the J. Seward Johnson Chairs in Oceanography. These Education Coordinators are appointed for three-year terms that may be renewed once with approval of the WHOI Dean. These Education Coordinators are Joint Committee members and provide continuity in the education program within each discipline; they also serve as experienced, on-call consultation resources for JP students. The Department Heads (MIT) and Chairs (WHOI), WHOI Dean, WHOI Associate Dean, MIT JP Director and the JP support staff at MIT and WHOI are also available to JP students for consultation and advice on any subject affecting student life. Another excellent resource is the MIT Office of the Dean of Graduate Education. Senior Associate Dean Blanche Staton and Assistant Dean Jason McKnight are available to meet with students and provide graduate personal support (http://odge.mit.edu/development/gps/). Professional counseling and other mental health services are available at both institutions.

The APO and MIT office support staff often know the JP students well since they deal with them on a regular basis for all manner of logistical and administrative tasks. These support staff members are also often the first to learn when problems arise, and will steer students to the assistance they may need. JP students very often express their heartfelt appreciation for this support in the acknowledgments of their thesis.

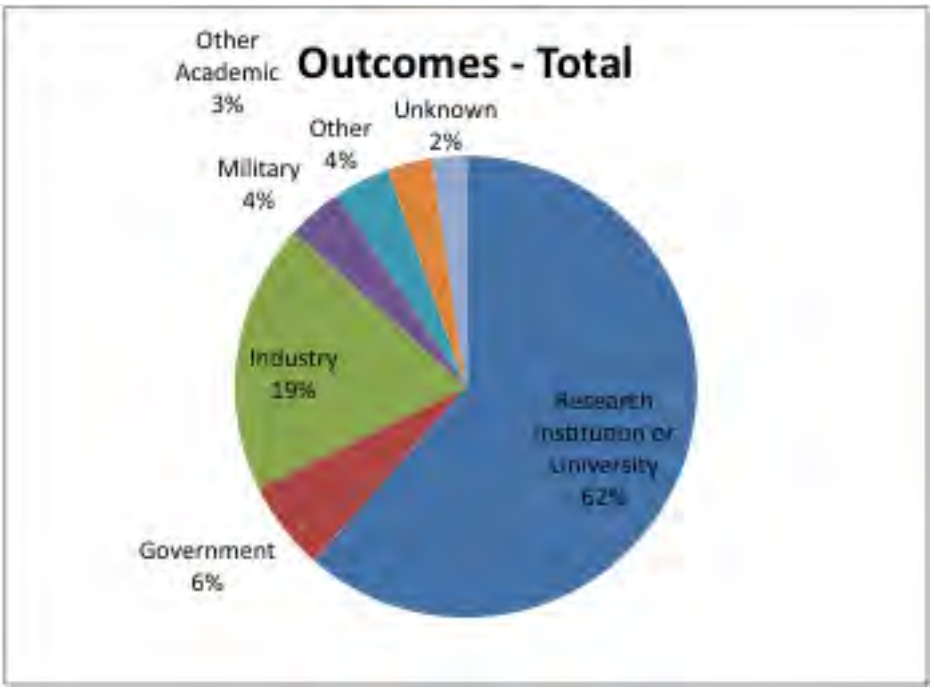
If a Joint Discipline Committee determines that a JP student is struggling unduly with PhD degree requirements or if a student performs less than satisfactorily on a general examination, the student may then be directed toward an interim or possibly terminal master's (SM) degree. Research and writing of a

project that could result in a SM thesis are usually completed fairly quickly, e.g. within a year. The Joint Discipline Committee will then decide whether the successful completion of this research and write-up warrants continuation towards a PhD degree or whether the best course is to finish with an SM.

Mentoring and extra-academic opportunities

There is much more expected of a newly-minted PhD-level scientist than can ever be learned in a classroom, laboratory, or even in a field-intensive program such as the JP. JP students have access to many extra-academic activities and opportunities for learning about the practice of science and science careers at both MIT and WHOI.

Career information and career forums. The expectation has always been that most JP graduates will begin their professional careers as research scientists, either within the academic sector, or within a governmental or industrial research laboratory. This remains largely true today (see chart below) but less so than in the past (pre 90s) because the outlook for tenure-track academic research positions in US universities has declined significantly since about the late 1980s (and this includes the ten original members of the Joint Oceanographic Institutions, Inc.). As a result, PhD graduates of the JP have necessarily considered and have taken career paths involving more than academic research. The pie chart below summarizes where JP graduates go after graduation, and details are provided in the spread sheet that was included with the review material.



Advising on possible career paths is now an essential part of mentoring within the JP and at the MIT Career Development center. In addition to frequent MIT career events, specific JP-related career panels and workshops are held at WHOI. These have included panels with JP alumni and others with WHOI Corporation and Trustee members on careers other than academia, and a similarly themed Science Café that the MIT/WHOI JP student Broader Impacts Group co-hosted, titled "A Versatile PhD: industry, education, policy, and consulting career paths after graduate school." Workshops have been held on such topics as "Dos and Don'ts of Academic Application" and "Writing a research and teaching statement." A panel discussion and reception, open only to JP students and postdoctoral researchers, has been held annually involving program managers from NSF, NASA and NOAA when they were visiting as part of the summer Ocean Carbon and Biogeochemistry workshop at WHOI. There has also been a private luncheon for Navy students with the Oceanographer of the Navy during the bi-annual Navy visit to MIT and WHOI.

Science and Policy. Many JP students are interested in science and policy, and several have opted to participate in the MIT Graduate Certificate Program in Science, Technology and Policy (http://web.mit.edu/stp/). Students can apply once they have advanced to candidacy. The program provides a social and policy context to a student's research field. The requirements of one full STP course, a one-week science policy "bootcamp," one elective course, and a capstone project are designed to fit within the traditional PhD workload. In the past three years, four Joint Program alumni were awarded and accepted Knauss Fellowships to work for a year in the Congress or the Executive Branch, and another will begin a fellowship in February.

Teaching and communicating ocean science. The JP course 'Communicating Ocean Science' aims to provide theory and practice for science teaching at college or secondary school level. The course is open to JP students from all disciplines and is most suitable for post-general exam students.

Quality of life within the JP

Student life at two campuses. The physical separation of the two JP institutions raises a number of challenges for JP students and efforts have been made to address these. Since the last external review there have been improvements in several areas.

Improvements include increased access to health and fitness services at WHOI. As MIT students, JP students have access to the MIT student health facility and most are covered by MIT health insurance (some have other health care options). However, it is very inconvenient for a JP student based at WHOI to travel to MIT when ill or with a minor injury (serious injury or serious illness is considered as emergency care with treatment covered by MIT insurance at the nearest location). A Health Reimbursement Account (HRA) is now available for WHOI-based students who are covered by the MIT Student Extended Insurance Plan. The HRA reimburses WHOI-based students for urgent or chronic care close to the WHOI campus without having to travel to MIT. WHOI's Academic Programs Office now offers subsidized access to an exercise facility chosen by the JP students located on Main Street in Falmouth for WHOI-based JP students.

Concerns about a lack of access to student-life benefits offered on the MIT Campus were brought to the attention of the Office of the Dean of Graduate Education (ODGE) by WHOI-based JP students in 2012. In response, since 2013 ODGE is providing the MIT/WHOI JP Student Organization with funds to improve student life, hold social events, and increase professional development opportunities in Woods Hole.

Also at the request of the students there is now a student orientation at MIT prior to the beginning of fall semester in addition to the orientation held at WHOI in July. This orientation provides an opportunity for the JP students, who reside in five different MIT departments, to get to know one another and learn about JP resources on the MIT campus.

Travel to and from MIT and WHOI is provided by a chartered bus on Tuesdays and Thursdays when classes are in session, and travel costs are reimbursed when the bus is not available. During the academic year, WHOI assigns a dormitory room in WHOI housing to all JP students who are based at MIT, so that they incur no housing expenses when they need to spend an overnight or longer in Woods Hole visiting co-advisers, committee members, etc. Similarly, MIT provides an apartment in Cambridge for JP students based at WHOI who wish to visit MIT faculty or participate in MIT events.

Diversity. Diversity within the total JP student population mirrors that of other oceanography programs, with there being slightly greater numbers of female vs. male students enrolled during the last six years (55% to 61%), but low numbers of underrepresented minorities enrolled even when including Asian-Americans as minorities (11% to 14%). There is lower diversity with respect to gender within AOSE, with lower percentages of female vs. male students enrolled from 2009 through 2014 (32 to 44%). As with

many other oceanography programs, and as commented on during annual reviews by some of the JP students, for all disciplines the diversity within the faculty, particularly at senior levels, is considerably less.

Harassment Prevention Training. Each entering JP class participates in a sexual harassment afternoon workshop as part of orientation. The workshop includes case studies, briefing on crew training, briefing from the EEO officer at WHOI, and a general discussion of issues. Given the recent media attention to the inadequate responses at some universities to accusations of sexual harassment and assault, the WHOI Director asked WHOI Human Resources to review WHOI's Title IX policies. The Academic Programs Office is participating in that review and discussion. WHOI Academic Programs Office has recently consolidated several documents related to sexual harassment and assault on the Education website (http://www.whoi.edu/main/title-ix-information). MIT has also held recent meetings for those of us who oversee graduate programs to review and discuss MIT policy in this area and make sure it is well understood. The WHOI attorney has also touched base with MIT attorneys.

Other Short Courses and Opportunities for JP students

Responsible conduct for research workshops are held annually for JP students and postdoctoral researchers to supplement the on-line training they receive through the Collaborative Institutional Training Initiative (CITI) web site: https://www.citiprogram.org/ . The workshops cover a range of topics including those surrounding authorship and sharing of credit among research collaborators, plagiarism, and web page ethics.

Research proposal writing is the topic of a short course, 'Writing a Better Science Proposal,' offered to JP students, postdoctoral students and other young scientific staff members. The participants write or revise an NSF-style proposal during this short course, and many of these proposals are submitted to funding agencies.

Science writing for a lay audience is a non-credit course that has been offered in 2008, 2010, and 2013 by Chris Reddy (Senior Scientist in the MCG Department at WHOI) and Lonny Lipsett, Editor of WHOI's publication, *Oceanus.* This course meets once per week for two months. Student-authored articles are critiqued by the instructors and the class during each step of the process, with editing of stories for publication in Oceanus continuing over the next year. Articles can be found at http://www.whoi.edu/oceanus/series/students-at-work

The Steinbach visiting scholar program (named after the first WHOI Dean of Graduate Studies, H. Burr Steinbach) brings distinguished scholars from a wide range of fields to WHOI during the summers for visits of three to four days. These visits give JP students an opportunity to meet with the Steinbach Scholars in an informal, relaxed atmosphere where a free exchange of ideas is promoted. The program is run by JP students who choose the Scholars and then host their visits (see Appendix III for a list of Steinbach Scholars from 2009-2014).

The Jake Peirson Summer Cruise is one of the highlights of the first summer for most entering JP students. Using funds provided by a JP alumnus, WHOI charters the Sea Education Association (SEA) research sailing vessel, *Cramer*, for a 10-day Jake Peirson Summer Cruise to the continental shelf and slope off New England. SEA provides the chief scientist, and the research program is designed in cooperation with WHOI scientists. WHOI scientists have on several occasions gone along to help guide the research. In recent years, the focus of the cruises has been on the shelf-slope front in the vicinity of one of the NSF-sponsored Oceanographic Observatory Initiative's study site. This cruise provides an excellent opportunity for JP students to get know one another. The Cramer, however, was in the Mediterranean in 2014 and is expected to be there in 2015, so we are in the process of looking into alternative ways of giving a similar experience to future entering classes.

Participation in national meetings and workshops is encouraged for all JP students by providing financial support for travel to scientific meetings, conferences, special courses (e.g. during summer at Friday Harbor or at the Marine Biological Laboratory), and to support student research in special circumstances.

Broader Impacts Group (BIG). Joint Program students also take the initiative to enhance their education and training opportunities. An example is the student group, *Broader Impacts Group (BIG)*. BIG organizes events that generally fall under the NSF category of Broader Impacts. One of the first BIG programs was the Synergy Project (see summary at http://coseenow.net/blog/2013/02/ocean-stories-a-synergy-of-art-and-science/). JP graduate students paired eight scientists and eight professional artists to jointly develop art projects with ocean science themes. The project was so successful that an exhibit of the art work was hosted for four months at Boston's Museum of Science and is currently exhibiting at the New Bedford Art Museum. Another BIG project involved three JP students and a WHOI postdoc who participated in New York City's first marine science festival (*Submerge*). At the event, they presented a booth on the biological pump and field work at sea. The students reported that

participating in *Submerge* was a great chance to practice science communication and to learn what ocean science means to the broader public.

These and other BIG projects are student organized and student led, although some financial resources are provided by both MIT and WHOI.

Progress on the JP Strategic Plan of 2011

Following the 2009 JP External Review, a committee of JP faculty from MIT and WHOI was established to develop a JP Strategic Plan. This committee echoed findings of the external review committee, identifying two major challenges to address within the MIT/WHOI JP: how to "bridge the widening gap between WHOI and MIT researchers," and how best to "promote and facilitate interdisciplinary (multi-disciplinary, cross-disciplinary) research while maintaining a foundation of disciplinary excellence." JP Strategic Plan recommendations to the MIT JP Director and WHOI Dean were to create a Joint Program Education Council, establish a Joint Program Faculty, create an engaging and effective JP web site, and take steps to facilitate interdisciplinary steps (including moving to a more uniform general exam structure).

With the exception of the Joint Program Education Council, significant progress has been made on each of these recommendations. Protocols have been established for being identified and listed as JP faculty, with the WHOI Dean responsible for approving JP faculty membership and overseeing periodic review of WHOI JP faculty (all faculty are reviewed every four years), and the MIT Director responsible for approving JP faculty membership and review at MIT. JP faculty members are listed on the JP web site.

JP faculty meetings (mini-retreats) are held annually or bi-annually at either WHOI or MIT and include discussions of JP issues as well as short research presentations from WHOI- and MIT-based faculty. Meetings were held on September 27, 2011 at WHOI, November 19, 2012 at MIT, and another will be held November 13, 2014 at MIT. In addition a JP Committee (WHOI Dean, MIT JP Director, and Chairs of each disciplinary Joint Committee) meeting was held to discuss implementation of the JP Strategic Plan on January 25, 2012.

Although a Joint Program Education Council is an excellent idea, the logistics of arranging a joint meeting of MIT Department Heads and WHOI Department Chairs for those departments involved

in the Joint Program is too difficult. Thus, high level program oversight is provided in other ways. For example, Dean Yoder meets regularly with the WHOI Director, attends WHOI's Staff Council which also involves all WHOI Department Chairs, and meets regularly with MIT's Rob van der Hilst, Department Head of Earth, Atmosphere and Planetary Science who is the high level point of contact for the Joint Program at MIT. Dean Yoder and Program Director Boyle regularly discuss Joint Program issues.

The JP web site has been updated, and detailed information about interdisciplinary and cross-disciplinary research in climate variability and impacts has been added, and procedures for pursuing an interdisciplinary focus are highlighted (see Appendices I and II). The JP aims to be an ocean science program in the broadest sense. Between MIT and WHOI, JP students can find the faculty expertise and the resources to pursue thesis research into areas including earth science, hydrology, glaciology, marine conservation, environmental chemistry, etc. There are no administrative or bureaucratic obstacles in the way of forming thesis committees consisting of faculty representing multiple Joint Committees, and from 2010-2014, between twelve and fourteen JP students each year have been advised by faculty normally affiliated with a different discipline (e.g., a student within the Biological Oceanography discipline with an advisor normally affiliated with Physical Oceanography).

A concerted effort has also been made to make disciplinary requirements more similar. In 2011, in response to a request from WHOI Dean Jim Yoder and MIT JP Director Ed Boyle, each discipline re-examined their general exam and curriculum (see disciplinary reports at the end of this document). Significant and moderate changes were made to the Biological and Physical Oceanography general exams and course requirements, respectively, and less drastic changes were made to the Chemical Oceanography general exam. As noted previously, following these revisions the general exams in all but the AOSE discipline have similar elements, with each requiring a report (or two reports in the case of Marine Geology and Geophysics) on research conducted by the student, and an exam, written and/or oral, that tests specific and general knowledge.

The JP Strategic Plan also included recommendations to MIT and WHOI administrations to provide first-year fellowships for JP students, raise the visibility of the JP at MIT, broaden the scope of the JP by establishing cooperative links with other programs, and include the JP in strategic planning

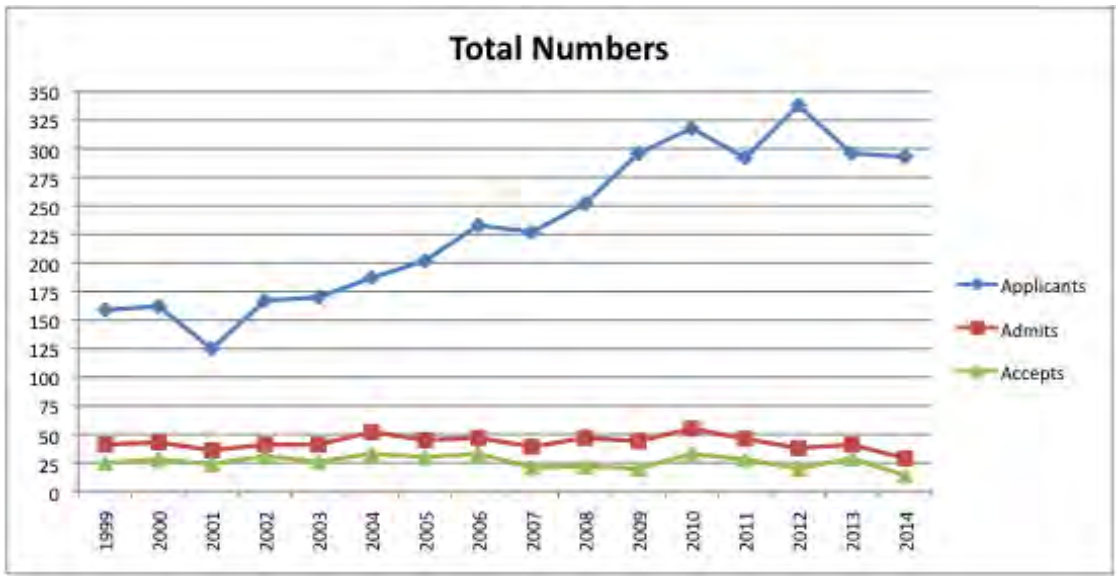
at MIT and WHOI. Some progress has been made on these recommendations. Perhaps of greatest significance is the renovation of the 8th floor of the Green Building at MIT, which now includes the MIT/WHOI Joint Program Office, a large student office that has desks for twelve JP students, a visitor's office for WHOI President Susan Avery and WHOI Dean Jim Yoder, and a classroom with video-conference capabilities (MIT 54-827). This floor now serves as a home at MIT for JP students, and the renovation has provided much needed desk space for JP students. The MIT/WHOI Joint Program in Oceanography is also visible on the relatively new *Oceans at MIT* web page (http://oceans.mit.edu/).

There have also been efforts aimed at increasing numbers of first-year fellowships for JP students and including the JP in strategic planning at MIT and WHOI, but these have met with less success. In late 2011 there was a joint meeting of Development and Philanthropic Officers from WHOI and MIT to discuss possible cooperative approaches to industry and other donors, though this meeting did not result in cooperative fundraising for the JP. While we are far from having first-year fellowships for all entering students, there have been a few new ones made available to the JP. These include a nine-month MIT Energy Initiative Fellowship that has been made available for an incoming JP student in each of the past two years (2013-2014 and 2014-2015), and an endowed 12-month first-year fellowship from the WHOI Ocean Ridge Initiative (beginning in 2011). These are in addition to other MIT and WHOI first-year fellowships.

Challenges facing the MIT/WHOI Joint Program

Perhaps the biggest challenge facing the MIT/WHOI JP in the near term is enrollment, and maintaining viable class sizes within the current federal funding climate. This is an issue that all graduate programs are currently facing. The incoming class for 2014 is the smallest since before 1999 – fourteen students, two in each of four disciplines and six in Marine Geology and Geophysics. Fortunately a number of the incoming students are inter-disciplinary, and enrolling in courses outside of their disciplinary home. Our hope is that this will help to maintain viable class sizes (three JP students minimum) and allow courses to be offered. The low enrollment does not reflect any decrease in applications, but does reflect the more conservative numbers of admits made (reflecting both fewer existing federal grants in hand and anticipated difficulties in grant success), as well as low accept rates in Biological, Chemical, and Physical Oceanography (33%,

50%, 33% respectively). We do not yet know if this small incoming class size is an anomaly, and are aiming for a class size of closer to 20 in 2015.



The other major challenge facing the JP is faculty turnover due to retirements and faculty leaving WHOI and MIT, and the possibility that there may be JP faculty attrition at MIT depending on hiring priorities within MIT departments. This concern is discussed more fully within the disciplinary reports below.

In Closing

The success of the Joint Program depends upon the voluntary participation of MIT faculty and WHOI scientists, and neither MIT nor WHOI hire faculty or scientists specifically to teach or advise in the Joint Program. Yet, the program is sufficiently popular that there are more potential advisors between the two institutions than there are graduate students in the program. In addition, the Joint Program is recognized as making important and significant contribution to the ocean science and ocean engineering research programs at both MIT and WHOI. For the future, we do not anticipate significant changes to the structure and organization of the program, although we do recognize that the program is being influenced by national trends. We believe that the review of and modifications made to general exams and curricula over the last few years balance needs for disciplinary depth with flexibility that allows students to pursue research across disciplines in areas of increasing interest such as in the environment and sustainability, and in applied or “problem solving” ocean research.

Applied Ocean Science and Engineering

Students admitted into the Applied Ocean Science and Engineering (AOSE) discipline within the MIT/WHOI Joint program are associated with the Department of Applied Ocean Physics and Engineering (AOPE) at WHOI and one the three engineering departments at MIT: Civil and Environmental Engineering (CEE), Mechanical Engineering (ME), or Electrical Engineering and Computer Science (EECS). Oversight of the AOSE JP students is provided by the AOSE Joint Committee (JCAOSE). The current members of JCAOSE include representatives from AOPE and from all three engineering departments at MIT. The main activities of the Joint Committee on Applied Ocean Science and Engineering (JCAOSE) involve the student admissions process, continuously tracking and evaluating the progress of AOSE JP students, monitoring the overall health of the AOSE program, and facilitating changes that resolve problems and insure the longevity and continued high quality of the program. The AOSE program is particularly well balanced from the perspective of number of students with a primary advisor at MIT versus WHOI, with a recent trend of slightly more MIT-based advisors. Overall, the health of the program has been fair, though a sharp decline in enrollment was experienced in 2014 (there are currently 20 students enrolled within AOSE, with only two new admissions in 2014, including 1 Navy student). Furthermore, since the last JP review in 2009, there has been a pronounced shift in the demographics and research focus of students in AOSE.

Unlike the other four disciplines that make up the Joint Program, students admitted through the AOSE program must satisfy the regular degree program requirements of the MIT department they are affiliated to, listed in the AOSE handbook (http://mit.whoi.edu/handbooks). The only other requirements within the AOSE program include an introductory course on physical oceanography (MIT course catalog 12.808 or equivalent), a course on the fundamentals of oceanographic instrumentation (MIT course catalog 2.688 or equivalent), and a one-semester WHOI research requirement. Once students have successfully presented their thesis proposal, they must form a thesis committee with representation from both AOPE and their home MIT department. Though the number of faculty in the MIT engineering departments involved in the JP has declined slightly in recent years, for a number of reasons, most notably retirements and faculty attrition, there remain common interests between a small group of MIT faculty and WHOI scientific staff which serve as a basis for representation by both institutions in terms of advising, serving on thesis committees, and the PhD qualifying exams process. Of some concern in that regard, there appears to be less interest in participating the JP among younger faculty, in part due to fewer MIT hires in the ocean-related disciplines, and a lack of a cohesive oceanographic engineering faculty community at MIT. With the JP at MIT now reporting to the EAPS Department Head instead of the Provost' office, and the lack of equivalent oceanographic engineering entity, this situation is in danger of deteriorating further unless action is taken to strengthen the administrative ties between the JCAOSE faculty in the School of Engineering and EAPS.

The majority of currently enrolled students in the AOSE program (13 out of 20) are affiliated to the MIT ME department. There is relatively little flexibility in this program regarding the qualifying exam compared to other disciplines in the JP. Within ME, most of the faculty that participate in the Joint Program are affiliated to the Center for Ocean Engineering (current director *Michael Triantafyllou).* There has been a drastic decrease in the number of students in ocean acoustics research over the last five years (two PhD student currently enrolled versus 10 in 2010), in part due to decreases in funding from the Office of Naval Research, and also due to the dwindling MIT faculty in acoustics, victims of the merger between Department of Ocean Engineering and Mechanical Engineering in early 2005.

Though there was a brief resurgence in the number of students within AOSE affiliated to EECS in 2009/2010 (eight students affiliated to EECS), the number of students currently enrolled through EECS is relatively small (only three, and their primary advisors are in ME or AOPE). Though there have been efforts to improve the visibility of the JP in the EECS, key MIT faculty and WHOI staff losses have had a severe impact on this part of the program. The AOSE students in EECS typically perform research in underwater acoustic communications and imaging from underwater vehicles, and have generally performed very well and have secured challenging, diverse, and often lucrative employment upon completion of their degrees. It will be important to continuing to build bridges between AOPE and EECS for JP students to continue to thrive in these areas, and to recruit new talent.

In contrast, the number of JP AOSE students affiliated with the CEE department has grown, generally reflecting growth in the number of staff in the Coastal Ocean Fluids Dynamics Laboratory (COFDL) at WHOI. Though no JP students were enrolled through CEE in 2009, there are currently 4 students enrolled through CEE, three with advisors in COFDL. It is generally perceived by the WHOI scientific staff that there is more flexibility, and perhaps slightly less rigor, through the CEE department. Some scientific staff in AOPE have chosen to advise students affiliated with the MIT Department of Earth and Planetary Sciences (EAPS) working through the Joint Committee on Physical Oceanography (JCPO) instead of JCAOSE. This requires active coordination between JCAOSE, JCPO, and education coordinators, during the admissions process. However, these students formally fall under the umbrella of JCPO and AOPE scientific staff remains concerned about these students having to go through the JCPO PhD qualification process. A formal EAPS/AOPE connection via JCAOSE could address these concerns (there was an MIT EAPS faculty member on JCAOSE from May 2003 through December 2004). The number of JCAOSE students working in biology is small (currently, one) and appropriate arrangements for handling interdisciplinary issues are made as they arise.

The AOSE program continues to accept Navy Master's students, and these students will soon have the option of admission through JCPO. The usual terminal degree for the Navy students is the SM degree and must be completed in 27 months. In general, the quality of the applicant pool to the Navy Master's degree is relatively low, and only one or two offers of admission are given in any year. There are currently two Navy and one Coast Guard students in the SM degree.

Biological Oceanography

The Biological Oceanography component of the MIT/WHOI Joint Program in Oceanography/Applied Ocean Science and Engineering provides students with an educational experience that combines the relevant faculty and facilities of the two institutions. Overall, the Joint Committee for Biological Oceanography believes that the program continues to provide an educational experience that is at the cutting edge. The number of applications to the JP in Biological Oceanography has declined slightly during the five years since the past review, but we continue to be able to attract exceptional applicants to the program. However, financial constraints mean that we decline a number of highly qualified and motivated applicants every year. Our students are finishing their degrees in a timely fashion, with a median time-to-degree of 5.6 years (half of the students finished in less than 5.5 years). Graduates from our program are found in academia, government and non-governmental organizations throughout the world.

We believe that the program has made significant progress in addressing a primary concern raised in the 2009 review. JCBO made considerable changes to the curriculum and the comprehensive exam. The curriculum was revised by reducing the number of core courses that students are expected to take. They are now required to take only Biological Oceanography and Applied Statistics, with the remainder of the required 120 non-research credits comprised of courses related to their research interest. Each student's curriculum is guided by the student's primary advisor and members of an Academic Advisory Committee (AAC; includes a total of at least three faculty, at least one from MIT).

The comprehensive exam has been revised by replacing the traditional written/oral exam with a Research Report and Thesis Proposal defense. The report is due after 18 months in the program, and the Thesis Proposal defense must be completed by the end of the 25th month in the program (usually the end of June in the second year). The Research Report is evaluated by the AAC, with the comments and results collated by an exam chair chosen by the student and advisor. This report is based upon research conducted by the student in their first 1.5 years, and the advisor's input to the report is limited. While some of these reports may result in publications, the primary goal is to evaluate the student's ability to assess, synthesize and explain research data.

The Thesis Proposal defense portion of the exam includes a written thesis proposal, a short presentation of the proposed research by the student, followed by questions from the student's thesis committee. The thesis committee is composed of at least four members, including the advisor and one faculty member from MIT, and will serve to guide the student's thesis research. In the exam, the committee asks questions that probe the student's depth and breadth of knowledge in general oceanography as well as the chosen course of study.

This new exam structure was implemented late in 2012, and the students from the 2010 and 2011 incoming classes petitioned to be allowed to follow this new structure. Based upon experience with the first groups going through the new process, we have been able to generate guidelines for the committees and the students that clarify the procedure and what is expected from all participants. Although only one class has gone through the comprehensive exam in the real timeframe, these changes have been received well by our students. We believe that the program in its current form is very amenable to interdisciplinary research, and note that many of our students are indeed actively involved in such research activities, especially our recent admits.

One area where we haven't made as much progress as we would have liked concerns the relationship between the Biology Departments at MIT and WHOI. JPBO students still lack connections with the MIT Biology students in Cambridge, but some of the issues regarding a lack of space and a cohort have improved. Desk space is now provided to Biological Oceanography JP students who are resident at MIT and are without an MIT advisor, in an area with other JP students.

The substantial curriculum and exam changes were the primary focus of the past several years, but we have made some steps towards improving connections with MIT. In July of 2012, the JCBO Chair, the WHOI Biology department chair and the Biology Education Coordinator met with Tania Baker (MIT Biology Department Head at the time) to provide her with information on the JP and the changes that we had recently put into place. This was viewed largely as an "ice breaker" meeting to re-introduce the program and indicate that we were open to their participation. Since then, the Education Coordinator has evaluated admissions files for potential advisors in the MIT Biology department, and has directly contacted individual faculty about potential matches. While there are no JPBO students currently advised by MIT Biology department faculty, at least one member has recently expressed an interest, and another currently serves on a JPBO student's thesis committee.

Currently, two out of 25 total JPBO students are advised by MIT faculty (one in CEE and one in EAPS). Many of the same difficulties mentioned in the 2009 report still exist, although the change in curriculum requirements may be helpful as the two students being advised by MIT faculty are ones who have entered in the past two years. We would like to indicate that while these numbers are low, the JP has small overall class sizes. As students are not admitted without a faculty sponsor and first year funding, they must compete for positions in MIT faculty laboratories with graduate students admitted through other MIT programs, where fellowship funding may be more accessible.

While the curriculum changes have made it possible for students to take advantage other courses at MIT (and Harvard), there are still serious time constraints, and it is difficult for students to take courses in Cambridge after their first year when they usually reside in Woods Hole. We were successful in having one of the MIT Science, Technology and Policy program courses use the video link this fall. While we strongly encourage JPBO WHOI faculty teaching courses to offer video link for MIT-based students, it has rarely come the other way (at least for Biology). It is possible that more of our students would take MIT courses in their third year (or fourth) if MIT instructors would use the link.

We would like to highlight a new course that was added this year – Elements of Modern Oceanography – that is taught by a faculty member in JPBO and another in JPPO. The course is designed as an introduction to oceanography since many of our incoming do not have marine backgrounds. It is targeting primarily first semester JP students in all of the disciplines, and is taught at MIT. Enrollment this year was good, and we look forward to seeing the class evolve over the next few years.

Overall, the JPBO program continues to attract and train talented students in diverse fields of study related to oceanography. These students are assets to both institutions, and we are fortunate to have the opportunity to work with them.

Chemical Oceanography

Students: The MIT/WHOI JP in Chemical Oceanography (CO) continues to thrive. As of early November there are 28 students enrolled. Of these 28 students, 17 are female and 11 male. Five of the main advisors of these students are MIT faculty (Ed Boyle, Phil Gschwend, Shuhei Ono, Roger Summons), while 23 are WHOI faculty. Of the 25 JP students that have entered the JP between 2005 and 2009, 20 were awarded doctoral degrees, one earned a master's degree, two are currently enrolled and two left without a degree. The overall retention rate for the period since the last external review is thus 88%. On average, CO students take 5.6 years to earn their doctoral degrees.

Admission: Since the last external review, four students were admitted in 2009, five in 2010, 10 in 2011, two in 2012 (one transferred from Harvard University), seven in 2013, and two in 2014. For the first time in 2014 WHOI faculty were required to have 18 months of student support in hand in order to have a student offered admission into the JP.

MIT Participation: The following faculty from two MIT Departments participate in the JP as advisors and members of thesis committees: EAPS – Sam Bowring, Ed Boyle, Stephanie Dutkiewicz, Mick Follows, Patrick Heimbach, David McGee, Shuhei Ono, Dan Rothman, Roger Summons; CEE – Ed DeLong, Phil Gschwend, Charles Harvey, Harry Hemond. Gschwend, Ono and Summons also serve on the JCCO program committee.

WHOI Participation: All except three of the six female and 20 male faculty members that currently make up the MCG Department participate in the JP in some capacity (advising, teaching, committee members). Since 2009, the appointments of three female (Amy Apprill, Colleen Hansel, Amanda Spivak) and four male (Valier Galy, Frieder Klein, David Nicholson, Scott Wankel) faculty members were balanced by departures of five female (Karen Casciotti, Deirdre Toole, Phoebe Lam, Laura Robinson, Rachel Stanley) and three male (Tim Eglinton, Olivier Rouxel, Carl Lamborg) colleagues.
Interdisciplinary Research: The trend towards more interdisciplinary research topics chosen by JP students is continuing. Currently, 12 CO students have non-JCCO faculty members on their thesis committee. Those faculty members are with WHOI's PO, MGG and BIO Departments, the USGS in Woods Hole, MBL, LDEO, Harvard and Florida State Universities. Three MCG faculty members currently advise JP students in other disciplines: Amy Apprill advises a BIO student, whereas Meg Tivey and Frieder Klein each advise an MGG student.

Changes in the General Exam: In order to provide JP students with sufficient flexibility to design their course of study and research programs, JCCO has implemented several changes to the General Exam structure, including the exam topical areas, the oral exam format and the inclusion of a pre-generals research project. Specifically, students define five subject areas that are relevant to their research and course of study, with guidance from their advisors and instructors. These subject areas form the basis of five questions posed in the four-hour written exam. In order to guide the students in the selection of the five topical areas, the JCCO faculty briefly meets with JP students and their advisors in the summer before their second year. The oral exam now starts with an AGU-style presentation of the student's pre-generals research project. A pre-generals research project is mandatory. Only two JP courses are mandatory for CO students. They have to pass Marine Chemistry and participate twice in the Seminar in Chemical Oceanography.

Careers: Graduates of our program have been very successful in their search for fulfilling post-graduate careers. Of the 30 CO students that graduated between 2009 and 2013, 77% found employment (mostly postdoctoral positions) at Research Institutions or Universities, whereas an additional 7% went to other academic institutions. Ten percent moved to positions in Government (USGS, Congress), and 3% to Industry. We could not track current employment of one student who left the program with the master's degree.

Challenges: The unique challenge of the JP is the geographic separation between the MIT campus and WHOI. This separation poses challenges to students and faculty alike. While modern communication equipment helps to bridge the gap, particularly with smaller meetings (thesis committee meetings, thesis proposal defenses), the two largest venues at WHOI – Clark 507 and the Redfield Auditorium – that are used for thesis defenses and many seminars are not set up for video-conferencing. MIT colleagues who would like to participate in master's and doctoral defenses or seminars therefore either have to rely on a *Skype* link or make a trip to WHOI. The smaller number of MIT faculty participating in the JP and the requirement to have at least one MIT faculty member on every thesis committee places a heavy travel burden on those MIT faculty members who are most engaged in the JP.

The challenge of acquiring extramural funding (both current and projected) has a significant negative impact on all aspects of the JP. In admissions, we have observed a marked decrease in the number of students that can be supported. For example, WHOI-based JP faculty was required to have 18 months of support in hand in order to have a student admitted into the program in 2014. Of the seven offers made, only two were accepted. As the JP guarantees students five years of support, a conservative approach is required in times of financial strain; however this approach may have a negative impact on admissions itself. This is not only frustrating to junior faculty members who face challenges in matching available support with the vagaries of this process, but also to senior faculty members who strive for continuity in their research programs that are, to a large extent, carried out by JP students. More broadly, the drop in federal funding adversely impacts retention and recruitment at WHOI and thus may eventually affect the distribution and quality of our admissions pool.

Due to the small size of the JP, opportunities for faculty to engage in teaching and advising are limited. In addition, the small number of JP courses limits opportunities for JP students to gain direct experience in teaching, despite the concerted efforts by the Academic Programs Office and MIT to provide options to the classic Teaching Assistantships. One possible growth area is teaching assistantships in Civil & Environmental Engineering (MIT Course 1) where students can also participate in a teaching training seminar.

If members of the review committee have any questions, or requests for a site visit, please contact us: Liz Kujawinski (ekujawinski@whoi.edu) JCCO Chair, Bernhard Peucker-Ehrenbrink (behrenbrink@whoi.edu) Education Coordinator.

Marine Geology and Geophysics

The information that you will receive from the Academic Programs Office includes a variety of departmental and program statistics, which we will not repeat here. We believe we have a very strong graduate program in Marine Geology and Geophysics, and that we are successfully training and mentoring our graduate students as they define cutting-edge research projects, and carry them to completion. We remain committed to a research-based General Examination structure, which enables our students to engage in independent research early in their graduate school careers. Our students leave the Joint Program ready to become leaders in their field, many with a strong record of cross-departmental / interdisciplinary education and research. In part, of course, their success reflects their high caliber upon entering the program, but the faculty at both MIT and WHOI devote considerable effort to the Joint Program – classroom instruction, research advising, and general mentoring.

While the Joint Program in Marine Geology and Geophysics (JPMGG) continues to face some of the same challenges as noted in 2009, we believe considerable progress has been made since the last review. Highlights include the promotion of two MIT faculty – a geochemist and a geomorphologist – who have a strong record of involvement in JPMGG through teaching, advising, participation on exam and thesis committees, and on the Joint Committee. Another significant development was a recent hire in Paleoclimate, an area in which MIT faculty was recently underrepresented relative to the number of JP students enrolled, and in which additional course offerings were sorely needed. WHOI also hired seven assistant scientists in MGG – four geochemists, two paleoclimatologists, and a climate dynamicist. Unfortunately, the climate dynamicist will leave WHOI next year.

In 2009, we flagged the MGG curriculum as an issue. There have been both positive and negative developments. On the positive side, new faculty at MIT and WHOI are offering courses in Paleoclimate and Climate Diagnostics, respectively, greatly expanding options for Climate (including Paleo) students. Climate students tend to be very interdisciplinary and take 50% of their courses in other departments at WHOI and 30% at MIT. We have also added a WHOI-based coastal class, but anticipate that JPMGG coastal students will continue to take most of their classes at MIT (90%). Unfortunately, the recent retirement of Ole Madsen means courses critical for coastal students are no longer being taught, unless he is replaced.

Although the total number of students in JPMGG has not changed significantly, we have seen a shift from more Geophysics and Geochemistry students to more students studying climate-related topics. Fortunately, Geophysics and Geochemistry students take approximately 60-65% of their classes at MIT. However some of the more marine-specific material is only offered at WHOI, but enrollment in Geophysics and Geochemistry classes has dwindled to the point that these classes, which require a minimum of three JP students, are often cancelled. In order to provide the material that the students need in a cost-effective manner, we are in the process of consolidating material into two core classes, one each in Geophysics and Geochemistry. WHOI faculty are also planning to offer shorter “Topics” classes that cover some of the material the students need. Limited funding for students in NSF grants is the primary reason for the reduced numbers of Geophysics and Geochemistry students. Indeed, decreased funding from NSF has affected our ability to offer admission to excellent applicants in all MGG subdisciplines.

We continue to have limited opportunities for junior WHOI faculty to teach, although the addition of the Climate Diagnostics class provides one opportunity. To address this issue, a few senior faculty have begun sharing/alternating teaching with junior colleagues. We have discussed alternating or rotating instructors for some other specific classes more frequently. Finally, the addition of more "Topics" classes should provide more opportunities. Nevertheless, this is an issue that must be closely watched.

"Joint-ness" of the Joint Program in Marine Geology and Geophysics is still an issue. Despite promotions and hires of JP-active faculty at MIT, primary advisors are still skewed towards WHOI. The departures of two sedimentologists in 2005-2006 from MIT initially meant a loss of potential advisors and collaborators for MGG coastal students, but this situation was remedied by the 2009 hiring, and recent tenuring, of a geomorphologist who has been very involved in the JP.

Whereas at the last review, only one of 23 JPMGG students had a primary advisor at MIT, three of 25 now do, with one other having a co-advisor at MIT (EAPS). In addition, three current WHOI-based MGG students have carried out (or are carrying out) a General's project or part of their thesis research with, or in collaboration with, an MIT faculty member. All three current MIT-based students did, or are carrying out, a General's project with a WHOI faculty member. Membership of the Joint Committee, which oversees student progress, is balanced between the two institutions.

We believe that we must identify the reasons why the program is not as "joint" as it should be and then seek to address the underlying issues. For example, any barriers to collaboration between JP faculty at the two institutions, even if not directly related to the JP, should be identified and overcome.

We hope we have adequately highlighted progress since the last review and the remaining challenges. We want to maintain a program that continues to attract excellent students, that provides them with a top quality education, and prepares them for their selected careers. We feel that to do this, we must continue to improve the "joint-ness" of the program and to attract (and afford) enough students in each subdiscipline of MGG so that the classes they need are offered and so they have peers in their subdiscipline. We would appreciate suggestions on how we can achieve these goals, as well as any other advice on how we may improve the program.

Joint Committee for Marine Geology and Geophysics:
Tim Grove (chair), David McGee, Dan Lizarralde, Horst Marshall, Delia Oppo, Taylor Perron

Physical Oceanography

JPPO has continued to evolve and broaden the program into the areas where ocean physics is an important element, but not the only one. This reflects the increasingly broader interests of the faculty at both institutions and the growing diverse foci of the student applicants. Many of the major concerns from the 2009 review have been addressed. These included an aging curriculum, challenges to conducting interdisciplinary studies, declining recruitment, potentially high attrition rates, and a divergence in MIT and WHOI faculty interest between the two institutions. At the same time, some of these problems remain and continued efforts will be needed to maintain a healthy and vibrant program. Below, the major changes since the 2009 review are briefly summarized.

Curriculum and Interdisciplinary studies

In addition to the 'General PO' curriculum, the JPPO handbook now explicitly lists suggested curricula for students interested in the overlap of physical oceanography and a) ocean biogeochemistry (including bio-physical interactions), b) climate, c) near-shore/coastal processes – the three cross-disciplinary areas where we have seen the most growth and interest. Three of the last 17 'PO' PhDs awarded since 2010 have been in biogeochemical-physical topics and this fraction is projected to grow in the next few years. The overlap with ocean biogeochemistry has been strengthened, with Follows now an Associate Professor at MIT and with the hiring of Mahdevan at WHOI. Similarly, students interested in climate studies benefit from an expanded MIT Program in Atmospheres, Oceans, and Climate (PAOC), hires from the WHOI Climate Initiative e.g. Gebbie (Paleo-climate), Ummenhofer (Atmosphere/Ocean interaction) and Clayson (Air-sea exchange) and the increasing climate focus of many WHOI scientists (e.g. Kwon, climate models; Schmitt, hydrological cycle; Straneo, ice sheet-ocean interactions; Arctic change, Toole and Pickart). These interdisciplinary foci would benefit from even stronger links with the BO and MGG faculty and respective JP programs. Near-shore focused research and education has continued to occur largely via cross- advising between the WHOI AOPE and PO departments. Stronger ties with MIT should be developed here.

Curriculum reform, agreed upon both by JPPO and PAOC, has included modifying the first fluid dynamics course to give a fuller introduction to rotating stratified dynamics and serve different curricula better. Similarly, the second term dynamics courses were revised somewhat to eliminate the artificial split between waves and mean circulations and instead target different scales of motion. We continue to work on merging oceanography and meteorology courses to ensure serving a broader community and address the problems of fluctuating enrollments. The general exam format has also been modified to address the growing student demand to engage in research earlier and, also, to be more in line with other JP programs and with PAOC (a necessary condition to facilitate cross-disciplinary studies). It now includes a written and oral report on a research problem, a single written exam (intended to probe the ability to synthesize and to think of ways to approach problems rather than test basic course knowledge), and additional questioning during the oral presentation. As stated in the handbook, and stressed to all incoming students, the JPPO curriculum, including courses taken and the general exam, is flexible and can be tailored to a students' specific interests.

Recruitment and Retention

The number of applicants, offers, acceptances to JPPO have ranged between 32-63, 6-12, 2-8, respectively over the last ten years. These numbers fluctuate but show no significant trends. Similarly the number of student enrolled in PO has remained steady at around 22. At present, there is no

evidence of a decrease in applications or recruitment. Small class sizes within these fluctuating numbers, however, do pose a problem both for teaching courses and for camaraderie/collaboration amongst students. Notably, funding pressures have resulted in a new rule that each program can only admit as many students as there are GRAs (in the past we were allowed to admit a few more students to compensate for rejections). Last year, this resulted in three unused GRAs and a class size of only two. This change has the potential to lead to a decrease in class size even when funding is available. It should be addressed. Approximately 70% of the students complete a PhD (average time to degree is 5.5 years) while the remaining students leave the program with a Masters. This attrition rate is within the range of other JP disciplines.

Divergence of faculty at the two Institutions

JPPO continues to suffer from limited interactions amongst the WHOI/MIT faculty. Traditionally, 25-30% of the students have been advised by MIT faculty. This number is projected to decrease since Carl Wunsch has retired, Paola Rizzoli has been involved with the Singapore program and is not taking new students, and John Marshall is concentrating on the PAOC program (but is teaching the introductory GFD course). Thus the faculty situation at MIT in physical oceanography has worsened since the last review. MIT *is* actively searching for candidates with physical oceanography expertise. The EAPS Head, Robert van der Hilst, is aware of the critical situation in PO at MIT and supports the search for new faculty. As discussed elsewhere, the Head of EAPS has taken the academic responsibility for the Joint Program. Since JPPO (and other JP) students were already part of the Program in Atmospheres, Oceans, and Climate (PAOC) and participated fully in their activities such as the annual retreat, this change strengthens the ties that were already there. But we believe that it will also increase the visibility of the JP at MIT and provide strong advocacy for it. As part of undertaking this role, the EAPS Head has provided space for all JP students and videoconferencing on the 8th floor of building 54.

From the WHOI end, WHOI PO faculty teaching courses have made a greater effort to partly teach at MIT and several other WHOI PO faculty regularly spend time at MIT. Many of the WHOI-taught courses are now being taught by junior faculty (addressing another concern from the last review) such as Gebbie, Todd, Andres and Kirincich – thus expanding the WHOI faculty involved in the JP. This should provide new opportunities for interaction amongst the two faculties. Successful examples of interaction include students co-advised by WHOI/MIT advisers (e.g. Barry by Mahadevan/Follows/Flierl, Wilson – technically in MGG – by Straneo/Heimbach) and the engagement of non-PO MIT faculty in JPPO students committees. Still, the jointness of the two institutions remains a problem that needs to be addressed.

Appendix I. The MIT/WHOI Joint Program Interdisciplinary Statement

(http://mit.whoi.edu/interdisciplinary-research)

Joint Program Interdisciplinary Statement

MIT/WHOI Joint Program Students have courses of study and research that are tailored to each student's scholarly interests.

The MIT/WHOI Joint Program's goal is for each student to achieve their full intellectual potential in their chosen area of study and research, either within the more traditional disciplines of ocean sciences and engineering or within interdisciplinary studies incorporating two or more disciplines.

To guide students in this endeavor the MIT/WHOI Joint Program faculty has established five focal areas: biological oceanography, chemical oceanography, marine geology and geophysics, physical oceanography and applied ocean physics and engineering. The Joint Committee associated with each focal area provides guidance as to the course of study for incoming students who have strong interests in that focal area.

Many applicants have interests, academic background, and experience that are appropriate for one of these focal areas and they will be admitted to pursue their degree in that area. It is also likely that some incoming students will have, or develop, interests that span two or more of these focal areas. These students will be admitted to the focal area that is most appropriate for their preparation and stated interests. This ensures that the student has a well defined 'home' within the Joint Program.

During the first semester in the Joint Program, as early as practical, each student should assemble and meet with an academic advisory committee to discuss their research interests and formulate a tentative individual course of study. The structure of the advisory committee will be defined by the student's primary Joint Committee, but typically the advisory committee will consist of at least the student's primary research advisor (who may or may not be from the 'home' focal area) and a faculty member from the other institution.

For those students whose research interests significantly overlap two or more Joint Committee focal areas this advisory committee should, at the request of the student and the principal advisor, include faculty from the related focal area(s) at one or both institutions. The individual course of study will lead to a general examination with a format and scope that are both generally consistent with the requirements of the primary focal area's Joint Committee and flexible enough to recognize the individualized aspects of the course of study. The course of study must be approved by the primary Joint Committee, preferably by the end of the first year. The format of the exam also must be determined by the primary Joint Committee, and will be set no later than early in the semester before the exam. It is expected that the advisory committee will guide the student up to and through the general exam, after which the oversight will move to the student's Ph.D. thesis committee, whose membership must be approved by the home Joint Committee. The home Joint Committee will be responsible for monitoring the student's academic progress through the thesis defense.

Appendix II. Information about climate-related research within the JP

Since the last review, an effort has been made to highlight the opportunities within the Joint Program for research on climate. The following is from http://mit.whoi.edu/climate-variability-and-impacts.

Climate Variability and Impacts

Oceans and Climate Variability: The ocean covers 70% of the Earth's surface and, through its exchange of heat, water and compounds with the atmosphere, the lithosphere, and the cryosphere, it plays a key role in our climate system. The ocean also hosts a significant fraction of the Earth's biosphere, which both responds to, and plays a role in, climate variability. Our scientists study both the role of the ocean in the climate system and the impact of climate change on the ocean. Depending on the area of interest, climate research can be undertaken within existing JP focal areas or as interdisciplinary studies across multiple areas, including the atmosphere and the cryosphere.

Climate Impacts: Climate research within the JP also spans the whole globe, from Greenland's glaciers to tropical Pacific coral atolls, from Bhutan's old-growth forests to the central Atlantic subtropical gyre, from salt marshes on Cape Cod to the deserts surrounding the Red Sea, from the Kuroshio western boundary current in the North Pacific to the monsoon rains in the Gangetic plain in India, from water resources in the US breadbasket to fragile ecosystems on the Antarctic Peninsula. Research topics within the Joint Program (JP) range from the reconstruction of past climate variability over the Earth's history to understanding climate variability and change in the instrumental/historic period and in the future, from studies of the dynamics of the physical/chemical climate system to its impacts on the marine and terrestrial environment, such as the sustainability of marine ecosystems, water resources on land, melting of land and sea-ice, and ultimately human civilizations.

Areas of Study

Examples of areas of climate covered by JP Faculty and students include:

Climate and Marine/Terrestrial Ecosystems

* Ocean climate variability and marine productivity, including fisheries
  * Climate change and marine mammals
  * Terrestrial water resources
  * Human health

Climate Reconstructions/Paleoclimate

  * Ocean circulation in past climates
  * Paleoclimate reconstruction from ice cores, ocean and lake sediments, corals, and tree rings

Dynamics of the Climate System (Ocean, Atmosphere, Cryosphere)

  * Coupled global water cycle and ocean
  * Global and regional climate modeling and future climate predictions
  * Arctic/Antarctic climate change

* El Ninõ-Southern Oscillation and tropical climate
* Interactions such as ocean/ice, ocean/atmosphere and air-sea
* Droughts in the past and modern climate
* Polar Ice Sheet mass balance
* Glacier dynamics
* Sea-ice

Carbon Cycle and Biogeochemistry

* Oceanic uptake and release of greenhouse gases
* Environmental sensitivities of biogeochemical cycles and marine ecoystems
* Ocean acidification
* Riverine inputs to marine systems

<u>Courses</u>

12.300 Global Change Science

12.301 Past and Present Climate

12.306/10.571/12.806 Atmospheric Physics & Chemistry

12.708 Special Topics in Paleoclimatology

12.740 Paleoceanography

12.753 Geodynamics (2006 - ICE!; 2009 – Climate Change: Forcing, Responses and Geo-engineering)

12.756 Climate Variability & Diagnostics

12.757 Climate Change Science: Current Topics, Controversies and Communication (2012); The Arctic System: An Interdisciplinary Approach (2007)

1.84/10.817/12.807 Atmospheric Chemistry

12.842 Climate Physics and Chemistry

12.846 Global Environmental Science and Politics

Recent Dissertations and Theses in Climate Variability and Impacts

2014

An Inverse Approach to Understanding Deglacial Benthic Oxygen Isotope Records from the Last Glaciation

Daniel Amrhein, S.M., 2014; Carl Wunsch, Advisor

Quaternary Morphology and Paleoenvironmental Records of Carbonate Islands

Michael Toomey, Ph.D., 2014; Jeffrey Donnelly, Advisor

Amundsen Sea Sea-Ice Variability, Atmospheric Circulation, and Spatial Variations in Snow Isotopic Composition from New West Antarctic Firn Cores

Alison Criscitiello, Ph.D., 2014; Sarah Das, Advisor

2013

Climate Controls on Coral Growth in the Caribbean

Sara Bosshart, S.M., 2013; Delia Oppo & Anne Cohen, Advisors

Variations in Coral Reef Net Community Calcification and Aragonite Saturation State on Local and Global Scales

Whitney Bernstein, Ph.D., 2013; Konrad Hughen, Advisor

Growth and Development of Larval Bay Scallops (Argopecten irradians) in Response to Early Exposure to High CO2

Meredith White, Ph.D., 2013; Lauren Mullineaux, Advisor

2012

Hydrological and Biogeochemical Cycling Along the Greenland Ice Sheet Margin

Maya Bhatia, Ph.D., 2012

Sarah Das and Elizabeth Kujawinski, Advisors

Aridification of the Indian Subcontinent During the Holocene: Implications for Landscape Evolution, Sedimentation, Carbon Cycle and Human Civilizations

Camilo Ponton, Ph.D., 2012; Timothy Eglinton and Liviu Giosan, Advisors

Constraining Circulation Changes Through the Last Deglaciation with Deep-sea Coral Radiocarbon and Sedimentary 231Pa/230Th

Andrea Burke, Ph.D., 2012; Laura Robinson and Olivier Marchal, Advisors

The Centennial and Millennial Variability of the IndoPacific Warm Pool and the Indonesian Throughflow

Fern Gibbons, Ph.D., 2012; Delia Oppo, Advisor

2011

Lipid Biomarkers of Coral Stress: Calibration and Exploration

Jessie Kneeland, Ph.D., 2011; Konrad Hughen, Advisor

Late Holocene Hurricane Activity and Climate Variability in the Northeastern Gulf of Mexico

D. Philip Lane, Ph.D., 2011; Jeffrey Donnelly and Kerry Emanuel, Advisors

2010

Understanding the Ocean Carbon and Sulfur Cycles in the Context of a Variable Ocean: A Study of Anthropogenic Carbon Storage and Dimethysulfide Production in the Atlantic Ocean

Naomi M. Levine, Ph.D., 2010; Scott Doney and Dierdre Toole, Advisors

Near-Inertial and Thermal Upper Ocean Response to Atmospheric Forcing in the North Atlantic Ocean

Katherine E. Silverthorne, Ph.D., 2010; John Toole, Advisor

The Seasonal and Interannual Variability of the West Greenland Current System in the Labrador Sea

Tatiana Rykova, Ph.D., 2010; Fiamma Straneo, Advisor

Coral Calcifications Insights from Inorganic Experiments and Coral Responses to Environmental Variables

Michael C. Holcomb, Ph.D., 2010; Anne Cohen and Daniel McCorkle, Co-Advisors

2009

Uranium-Series Radionuclide Records of Paleoceanographic and Sedimentary Changes in the Arctic Ocean

Sharon Hoffmann, Ph.D., 2009; Jerry McManus, Advisor

Low-Latitude Western North Atlantic Climate Variability During the Past Millennium: Insights from Proxies and Models

Casey P. Saenger, Ph.D., 2009; Delia Oppo, Co-Advisor; Anne Cohen, Co-Advisor

Tropical Cyclones Within the Sedimentary Record: Analyzing Overwash Deposition from Event to Millenial Timescales

Jonathan Woodruff, Ph.D., 2009; Jeffrey Donnelly, Advisor

Appendix III. H. Burr Steinbach Visiting Scholars, 2009-2014

2014

Professor David Battisti	*University of Washington*	*Physical Oceanography*
Professor Wallace S. Broecker	*LDEO, Columbia University*	*At-Large*
Dr. Rob Knight	*University of Colorado at Boulder*	*Biological Oceanography*

2013

Dr. Lihini Aluwihare	Scripps Institution of Oceanography	*Chemical Oceanography*
Dr. Robert Dalrymple	Johns Hopkins University	*Applied Ocean Science and Eng*.
Dr. Patricia Fryer	University of Hawaii at Manoa	*Marine Geology and Geophysics*

2012

Professor Steve Gaines	University of California Santa Barbara	*Biological Oceanography*
Professor Sarah T. Gille	Scripps Institution of Oceanography	*Physical Oceanography*
Dr. Andrew Dessler	Texas A&M University	*At-Large Scholar*

2011

Dr. Marcia McNutt	United States Geological Survey	*Marine Geology and Geophysics*
Dr. James Fleming	Colby College	*At-Large Scholar*
Dr. Robert Mason	University of Connecticut	*Chemical Oceanography*

2010

Dr. John P. Craven	Common Heritage Corporation	*Applied Ocean Physics and Eng.*
Prof. Jochem Marotzke	Max Planck Institute for Meteorology	*Physical Oceanography*
Dr. Christopher Scholin	Monterey Bay Aquarium Research Institute	*Biological Oceanography*

2009

Dr. Ben Halpern	University of California, Santa Barbara	*Chemical Oceanography*
Dr. Gene Likens	Cary Institute of Ecosystem Studies	*At-Large Scholar*
Dr. John Eiler	California Institute of Technology	*Marine Geology and Geophysics*

Appendix IV. The Joint Program Committee Members 2014

THE JOINT PROGRAM COMMITTEE				
Yoder, James	Co-Chair	2200	jyoder@whoi.edu	
Boyle, Edward	Co-Chair	253-3388	eaboyle@whoi.edu	
Tivey, Margaret K.	APO	2436	mktivey@whoi.edu	
Polz, Martin	B	253-7128	mpolz@mit.edu	Jul-16
Kujawinski, Elizabeth	C	3493	ekujawinski@whoi.edu	Jan-15
Grove, Timothy	G	253-2878	tlgrove@mit.edu	Aug-14
Schmidt, Henrik	A	253-5727	henrik@mit.edu	Jan-15
Flierl, Glenn	P	253-4692	glenn@lake.mit.edu	Aug-15
JCBO				
Polz, Martin	Chair sabbatical	253-7128	mpolz@mit.edu	Jul-16
DeLong, Edward		253-5271	delong@mit.edu	Aug-14
Gast, Rebecca*		3209	rgast@whoi.edu	Jul-15
Mullineaux, Lauren		2898	lmullineaux@whoi.edu	Jul-16
Stocker, Roman		253-3626	romans@mit.edu	Oct-14
Tarrant, Ann		3398	atarrant@whoi.edu	Sept-15
Follows, Mick		253-5939	mick@ocean.mit.edu	Aug-14
JCCO				
Kujawinski, Elizabeth	Chair	3493	ekujawinski@whoi.edu	Jan-15
Ono, Shuhei		253-0474	sono@mit.edu	Dec-12
Peucker-Ehrenbrink, Bernard*		2518	bpeucker@whoi.edu	Jun-16
Gschwend, Philip		253-1638	pmgschwe@mit.edu	Aug-13
Saito, Mak		2393	msaito@whoi.edu	Jun-16
Summons, Roger		452-2791	rsummons@mit.edu	Dec-14
JCMG&G				
Grove, Timothy	Chair	253-2878	tlgrove@mit.edu	Aug-14
Oppo, Delia*		2681	doppo@whoi.edu	Aug-16
Lizarralde, Daniel		2942	dlizarralde@whoi.edu	Jul-14
Perron, Tayler		253-5735	perron@mit.edu	Oct-16
Marschall, Horst		2776	hmarschall@whoi.edu	Sept-16
McGee, David		324-3545	davidmcg@mit.edu	Oct-16
JCAOSE				
Schmidt, Henrik	Chair	253-5727	henrik@mit.edu	Jan-15
Nepf, Heidi		253-8622	hmnepf@mit.edu	Sept-13
TBD				
Lermusiaux, Pierre		324-5172	pierrel@mit.edu	Aug-13
Breier, John 'Chip'		2932	jbreier@whoi.edu	Dec-16
Leonard, John		253-5305	jleonard@mit.edu	Sept-11
Lavery, Andone*		2345	alavery@whoi.edu	Dec-16
Elgar, Steve		3614	elgar@whoi.edu	Apr-15

JCPO

Flierl, Glenn	Chair	253-4692	glenn@lake.mit.edu	Aug-15
Farrar, J. Thomas		2691	jfarrar@whoi.edu	Aug-15
Straneo, Fiamma*		2914	fstraneo@whoi.edu	Dec-15
Pratt, Larry		2540	lpratt@whoi.edu	Aug-15
Rizzoli, Paola		253-2451	rizzoli@mit.edu	Aug-12
Follows, Mick		253-5939	mick@ocean.mit.edu	May-16

*Education Coordinator

Summary of Statistics Shown in Tables and Figures

Admissions statistics: 2009-2014

Detailed admissions statistics are provided for 2009-2014 (3 tables per year) in Tables 1-18, and in previous years in Tables 19-33. A compilation of data from 1999-2014 is provided in Table 34 and displayed, by discipline, in Figure 1. Table 35 is an overall summary of 2004-2014 application statistics.

During the past six years (2009-2014) the number of applicants to the Joint Program has been relatively stable at approximately 300 (292 to 338), in contrast to the previous five-year period when applicant numbers were steadily increasing from 187 to 252. From 2009-2014 roughly similar numbers of male and female applicants applied, with approximately one-third international applicants, and a much small percentage (6 to 12%) of self-identified underrepresented minority (includes Asian American) applicants. While gender is not an issue when averaged across the total Joint Program applicant population for the years 2009-2014, there are gender issues within the applicant pool for the Applied Ocean Science and Engineering (AOSE) discipline with the applicant pool 18 to 31% female, the admit pool 13 to 55% female, and the accept offer pool 0 to 50% female. In contrast, the accept offer pools during the same years for the other disciplines were greater than 50% female with a few exceptions (33% for BO in 2012, 25% for MGG in 2012, 20% for PO in 2013, and 0% for PO in 2014).

The Joint Program admitted 14% of applicants during the past six years compared to 21% of applicants during the previous five years (2004-2008). This decrease largely reflects the greater number of applicants, though there was also a slight decrease in the average number of admits (from 46 to 42). The six-year average of those accepting our offer was 56%, comparable to the average of 60% for the five-year average from 2004-2008. The six-year averages of those accepting our offer by discipline are very similar to the overall average for BO, CO, and MG&G, with a lower average in PO of 46% and higher average in AOSE of 68%.

Fall Enrollment Statistics

Fall enrollment statistics for 2009 through 2014 are summarized in Table 36. The average of 125 students is comparable to the average from 1998-2003 of 123, and has decreased from an average of 139 for 2004-2008. From 2009 to 2014, more than half of the student population (55 to 61%) was female, though there was a significantly smaller percentage of women in the AOSE discipline (32 to 44%). There is a reasonable balance of student numbers among the five disciplines. However, there is concern with both overall enrollment and enrollment in each discipline given current funding pressures. The entering class in fall 2014 was the smallest since 1968, with 13 students total, two in AOSE, BO, CO and PO, and five in MG&G (with a sixth to enter in January 2015).

Summary of Statistics Shown in Tables and Figures

Time to degree

Table 37 shows time to degree statistics for a ten-year period. The goal of the Joint Program is to have students complete their doctoral degree within five years, but this is not often achieved. However, very few Joint Program students enter their seventh year. The average time to degree is about the same for 2009-2014 (5.5 years) as for 2004-2008 (5.6 years).

Distribution of Effort between MIT and WHOI

Figure 2 shows the institution of the primary advisors for Joint Program students. Since 2003, roughly 25% of primary advisors are or have been from MIT and approximately 75% from WHOI. However this has varied considerably by discipline as shown in Figure 3. Roughly 10 and 20% of advisors of BO and CO students, respectively, were MIT-based during 2010-2014. During the same time period there were increases in numbers of MIT-based advisors, from 5 to 15% and 35 to 65%, respectively, in the MG&G and AOSE disciplines, and a decrease from about 40 to about 20% in the PO discipline.

Figure 4 shows the source of funding for Joint Program students. From 2003-2012 roughly 20% of financial support was from MIT, 60% from WHOI, and 20% from outside sources (e.g., NSF, NDSEG, and other fellowships). In the last two years there has been an increase in outside support sources (to roughly 34%) and decrease in financial support from WHOI (to roughly 46%).

Career Choice

Figure 4 shows current employment (percentage in each category) of the 103 Joint Program doctoral graduates for 2009 through 2014, with most graduates in some sort of research position at a university or research institution. Figure 5 shows current employment (percentage in each category) of the 23 SM graduates for the same years, including those currently in the Navy. Figure 6 summarizes current employment (percentage in each category) of all 127 Joint Program graduates for 2009 through 2014 (including one who received an Engineer's degree). The "Other Academic" category refers to liberal arts colleges, high schools, and junior colleges. The "Other" category includes three terminal master's recipients who are now pursuing advanced degrees (two in science, one in law), a PhD recipient who is deceased, and a PhD recipient working at the Museum of Natural History.

Section 4. MIT/WHOI Joint Program Statistics

Table 1. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2014
APPLICANT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY**	*% OF DISCIPLINE TO APPLICANT POOL*
Biological Oceanography	25	51	76	20 M =8, F = 12	11 M = 2, F = 9	25.9%
Chemical Oceanography	16	30	46	15 M = 8, F = 7	6 M = 2, F = 4	15.7%
Marine Geology & Geophysics	34	38	72	26 M = 19, F = 7	9 M = 2, F = 7	24.6%
Physical Oceanography	25	16	41	21 M = 13, F = 8	5 M = 3, F = 2	14.0%
Applied Ocean Science & Engineering	40	18	58	25 M = 21, F = 4	4 M = 2, F = 2	19.8%
TOTAL	***140***	***153***	***293***	***107***	***35***	
%	***47.8%***	***52.2%***	***100.0%***	***36.5%***	***11.9%***	***100.0%***

*Minority students are defined as US citizens who self-identify on their applications: American Indian or Alaskan Native, Asian American, Black or African American, Hispanic or Latino.

Table 2. MIT/WHIO JOINT PROGRAM ADMISSIONS - 2014
ADMIT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ADMIT POOL*
Biological Oceanography	2	4	6	0 M = 0, F = 0	3 M = 1, F = 2	20.7%
Chemical Oceanography	1	3	4	0 M = 0, F = 0	0 M = 0, F = 0	13.8%
Marine Geology & Geophysics	5	5	10	1 M = 1, F = 0	2 M = 1, F = 1	34.5%
Physical Oceanography	4	2	6	1 M = 1, F = 0	1 M = 1, F = 0	20.7%
Applied Ocean Science & Engineering	2	1	3	0 M = 0, F = 0	0 M = 0, F = 0	10.3%
TOTAL	***14***	***15***	***29***	***2***	***6***	
%	***48.3%***	***51.7%***	***100.0%***	***6.9%***	***20.7%***	***100.0%***

Table 3. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2014
ACCEPT OFFER POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL**	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ACCEPT POOL*
Biological Oceanography	0	2	2	0 M = 0, F = 0	1 M = 0, F = 1	14.3%
Chemical Oceanography	1	1	2	0 M = 0, F = 0	0 M = 0, F = 0	14.3%
Marine Geology & Geophysics	2	4	6	0 M = 0, F = 0	1 M = 0, F = 1	42.9%
Physical Oceanography	2	0	2	0 M = 0, F = 0	0 M = 0, F = 0	14.3%
Applied Ocean Science & Engineering	1	1	2	0 M = 0 F = 0	0 M = 0, F = 0	14.3%
TOTAL*	***6***	***8***	***14***	***0***	***2***	
%	***42.9%***	***57.1%***	***100.0%***	***0.0%***	***14.3%***	***100.0%***

*Includes one male student in MG&G who deferred to January 2015.

Table 4. MIT/WHOI JOINT PROGRAM - 2013
APPLICANT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY**	*% OF DISCIPLINE TO APPLICANT POOL*
Biological Oceanography	34	65	99	24 M = 6, F = 8	5 M = 0, F = 5	33.4%
Chemical Oceanography	14	27	41	12 M = 5, F = 7	4 M = 1, F = 3	13.9%
Marine Geology & Geophysics	24	24	48	10 M = 7, F = 3	4 M = 0, F = 4	16.2%
Physical Oceanography	26	19	45	23 M = 17, F = 6	2 M = 1, F = 1	15.2%
Applied Ocean Science & Engineering	49	14	63	28 M = 21, F = 7	2 M = 2, F = 0	21.3%
TOTAL	***147***	***149***	***296***	***97***	***17***	
%	***49.7%***	***50.3%***	***100.0%***	***32.8%***	***5.7%***	***100.0%***

*Minority students are defined as US citizens who self-identify on their applications: American Indian or Alaskan Native, Asian American, Black or African American, Hispanic or Latino.

Table 5. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2013
ADMIT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ADMIT POOL*
Biological Oceanography	2	4	6	0 M = 0, F = 0	1 M = 0, F = 1	14.6%
Chemical Oceanography	5	4	9	2 M = 1, F = 1	1 M = 0, F = 1	22.0%
Marine Geology & Geophysics	4	3	7	0 M = 0, F = 0	0 M = 0, F = 0	17.1%
Physical Oceanography	5	4	9	3 M = 2, F = 1	0 M = 0, F = 0	22.0%
Applied Ocean Science & Engineering	8	2	10	4 M = 3, F = 1	1 M = 1, F = 0	24.4%
TOTAL	***24***	***17***	***41***	***9***	***3***	
%	***58.5%***	***41.5%***	***100.0%***	***22.0%***	***7.3%***	***100.0%***

Table 6. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2013
ACCEPT OFFER POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL**	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ACCEPT POOL*
Biological Oceanography	2	2	4	0 M = 0, F = 0	1 M = 0, F = 1	13.8%
Chemical Oceanography	3	4	7	2 M = 1, F = 1	1 M = 0, F = 1	24.1%
Marine Geology & Geophysics	2	2	4	0 M = 0, F = 0	0 M = 0, F = 0	13.8%
Physical Oceanography	4	1	5	2 M = 2, F = 0	0 M = 0, F = 0	17.2%
Applied Ocean Science & Engineering	7	2	9	4 M = 3, F = 1	1 M = 1, F = 0	31.0%
TOTAL*	***18***	***11***	***29***	***7***	***3***	
*** %***	***62.1%***	***37.9%***	***100.0%***	***24%***	***10.3%***	***100.0%***

*Includes one male student in BO who deferred to January 2014.

Table 7. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2012
APPLICANT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY**	*% OF DISCIPLINE TO APPLICANT POOL*
Biological Oceanography	44	56	100	24 M = 14, F = 10	16 M = 7, F = 9	29.6%
Chemical Oceanography	22	28	50	16 M = 9, F = 7	10 M = 6, F = 4	14.8%
Marine Geology & Geophysics	38	18	56	30 M = 24, F = 6	3 M = 0, F = 3	16.6%
Physical Oceanography	26	25	51	30 M = 18, F = 12	4 M = 2, F = 2	15.1%
Applied Ocean Science & Engineering	63	18	81	41 M = 36, F = 5	9 M = 6, F = 3	24.0%
TOTAL	***193***	***145***	***338***	***141***	***42***	
%	***57.1%***	***42.9%***	***100.0%***	***41.7%***	***12.4%***	***100.0%***

*Minority students are defined as US citizens who self-identify on their applications: American Indian or Alaskan Native, Asian American, Black or African American, Hispanic or Latino.

Table 8. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2012
ADMIT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ADMIT POOL*
Biological Oceanography	4	3	7	1 M = 1, F = 0	2 M = 1, F = 1	18.4%
Chemical Oceanography	1	7	8	0 M = 0, F = 0	1 M = 1, F = 0	21.1%
Marine Geology & Geophysics	4	1	5	2 M = 2, F = 0	0 M = 0, F = 0	13.2%
Physical Oceanography	3	4	7	2 M = 1, F = 1	0 M = 0, F = 0	18.4%
Applied Ocean Science & Engineering	5	6	11	2 M = 1, F = 1	1 M = 0, F = 1	28.9%
TOTAL	***17***	***21***	***38***	***7***	***4***	
%	***44.7%***	***55.3%***	***100.0%***	***18.4%***	***10.5%***	***100.0%***

Table 9. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2012
ACCEPT OFFER POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ACCEPT POOL*
Biological Oceanography	2	1	3	1 M = 1, F = 0	0 M = 0, F = 0	15.0%
Chemical Oceanography	0	3	3	0 M = 0, F = 0	0 M = 0, F = 0	15.0%
Marine Geology & Geophysics	3	1	4	2 M = 2, F = 0	0 M = 0, F = 0	20.0%
Physical Oceanography	1	3	4	1 M = 1, F = 0	0 M = 0, F = 0	20.0%
Applied Ocean Science & Engineering	3	3	6	1 M = 1, F = 0	1 M = 0, F = 1	30.0%
TOTAL	***9***	***11***	***20***	***5***	***1***	
%	***45.0%***	***55.0%***	***100.0%***	***25.0%***	***5.0%***	***100.0%***

Table 10. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2011
APPLICANT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY**	*% OF DISCIPLINE TO APPLICANT POOL*
Biological Oceanography	31	65	96	17 M = 9, F = 8	13 M = 3, F = 10	32.9%
Chemical Oceanography	19	28	47	12 M = 3, F = 9	6 M = 1, F = 5	16.1%
Marine Geology & Geophysics	26	27	53	32 M = 20, F = 12	3 M = 0, F = 3	18.2%
Physical Oceanography	24	19	43	20 M = 14, F = 6	4 M = 2, F = 2	14.7%
Applied Ocean Science & Engineering	40	13	53	26 M = 21, F = 5	6 M = 4, F = 2	18.2%
TOTAL	***140***	***152***	***292***	***107***	***32***	***100.0%***
%	***47.9%***	***52.1%***	***100.0%***	***36.6%***	***11.0%***	

*Minority students are defined as US citizens who self-identify on their application: American Indian or Alaskan Native, Asian, Black or African American, Hispanic or Latino.

Table 11. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2011
ADMIT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ADMIT POOL*
Biological Oceanography	2	5	7	2 M = 1, F = 1	0 M = 0, F = 0	15.2%
Chemical Oceanography	7	6	13	2 M = 0, F = 2	4 M = 2, F = 2	28.3%
Marine Geology & Geophysics	5	6	11	2 M = 1, F = 1	1 M = 1, F = 0	23.9%
Physical Oceanography	3	7	10	2 M = 2, F = 0	1 M = 0, F = 1	21.7%
Applied Ocean Science & Engineering	4	1	5	1 M = 1, F = 0	0 M = 0, F = 0	10.9%
TOTAL	***21***	***25***	***46***	***9***	***6***	***100.0%***
%	***45.7%***	***54.3%***	***100.0%***	***19.6%***	***13.0%***	

Table 12. MIT/WHOI JOINT PRGORAM ADMISSIONS - 2011
ACCEPT OFFER POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ACCEPT POOL*
Biological Oceanography	2	3	5	2 M = 1, F = 1	0 M = 0, F = 0	17.9%
Chemical Oceanography	5	5	10	2 M = 0, F = 2	3 M = 1, F = 2	35.7%
Marine Geology & Geophysics	3	3	6	1 M = 1, F = 0	1 M = 1, F = 0	21.4%
Physical Oceanography	2	2	4	1 M = 1, F = 0	1 M = 0, F = 1	14.3%
Applied Ocean Science & Engineering	3	0	3	1 M = 1, F = 0	0 M = 0, F = 0	10.7%
TOTAL	***15***	***13***	***28***	***7***	***5***	***100.0%***
%	***53.6%***	***46.4%***	***100.0%***	***25.0%***	***17.9%***	

Table 13. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2010
APPLICANT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY**	*% OF DISCIPLINE TO APPLICANT POOL*
Biological Oceanography	33	77	110	19 M=9, F=10	7 M=2, F=5	34.6%
Chemical Oceanography	20	18	38	7 M=4, F=3	6 M=2, F=4	11.9%
Marine Geology & Geophysics	27	33	60	27 M=16, M=11	9 M=5, F=4	18.9%
Physical Oceanography	37	26	63	32 M=18, F=14	4 M=3, F=1	19.8%
Applied Ocean Science & Engineering	35	12	47	21 M=15, F=6	1 M=1, F=0	14.8%
TOTAL	***152***	***166***	***318***	***106***	***27***	***100.0%***
%	***47.8%***	***52.2%***	***100.0%***	***33.3%***	***8.5%***	

*Minority students are defined as US citizens who self-identify on their application: American Indian or Alaskan Native, Asian, Black or African American, Hispanic or Latino.

Table 14. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2010
ADMIT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ADMIT POOL*
Biological Oceanography	2	9	11	2 M=1, F=1	3 M=1, F=2	20.0%
Chemical Oceanography	5	8	13	0 M=0, F=0	2 M=1, F=1	23.6%
Marine Geology & Geophysics	3	8	11	1 M=1, F=0	4 M=2, F=2	20.0%
Physical Oceanography	5	7	12	4 M=2, F=2	1 M=0, F=1	21.8%
Applied Ocean Science & Engineering	6	2	8	2 M=2, F=0	0 M=0, F=0	14.5%
TOTAL	***21***	***34***	***55***	***9***	***10***	***100.0%***
%	***38%***	***62%***	***100%***	***16%***	***18%***	

Table 15. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2010
ACCEPT OFFER POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ACCEPT POOL*
Biological Oceanography	2	6	8	2 M=1, F=1	2 M=1, F=1	24.2%
Chemical Oceanography	4	4	8	0 M=0, F=0	1 M=0, F=1	24.2%
Marine Geology & Geophysics	0	4	4	0 M=0, F=0	2 M=0, F=2	12.1%
Physical Oceanography	3	5	8	2 M=1, F=1	1 M=0, F=1	24.2%
Applied Ocean Science & Engineering	4	1	5	2 M=2, F=0	0 M=0, F=0	15.2%
TOTAL	***13***	***20***	***33***	***6***	***6***	***100.0%***
%	***39.4%***	***60.6%***	***100.0%***	***18.2%***	***18.2%***	

Table 16. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2009
APPLICANT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY**	*% OF DISCIPLINE TO APPLICANT POOL*
Biological Oceanography	30	56	86	12 M=6, F=6	11 M=2, F=9	29.1%
Chemical Oceanography	17	31	48	12 M=4, F=8	5 M=2, F=3	16.2%
Marine Geology & Geophysics	29	25	54	22 M=12, F=10	1 M=0, F=1	18.2%
Physical Oceanography	25	23	48	31 M=19, F=12	1 M=0, F=1	16.2%
Applied Ocean Science & Engineering	49	11	60	33 M=28, F=5	1 M=1, F=0	20.3%
TOTAL	***150***	***146***	***296***	***110***	***19***	***100.0%***
%	***50.7%***	***49.3%***	***100.0%***	***37.2%***	***6.4%***	

*Minority students are defined as US citizens who self-identify on their application: American Indian or Alaskan Native, Asian, Black or African American, Hispanic or Latino.

Table 17. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2009
ADMIT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ADMIT POOL*
Biological Oceanography	4	4	8	2 M=2, F=0	0 M=0, F=0	18.2%
Chemical Oceanography	3	8	11	2 M=0, F=2	2 M=0, F=2	25.0%
Marine Geology & Geophysics	1	8	9	4 M=1, F=3	0 M=0, F=0	20.5%
Physical Oceanography	3	5	8	5 M=3, F=2	0 M=0, F=0	18.2%
Applied Ocean Science & Engineering	7	1	8	1 M=1, F=0	0 M=0, F=0	18.2%
TOTAL	***18***	***26***	***44***	***14***	***2***	***100.0%***
%	***40.9%***	***59.1%***	***100.0%***	***31.8%***	***4.5%***	

Table 18. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2009
ACCEPT OFFER POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL*	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ACCEPT POOL*
Biological Oceanography	1	3	4	1 M=1, F=0	0 M=0, F=0	20.0%
Chemical Oceanography	0	4	4	1 M=0, F=1	0 M=0, F=0	20.0%
Marine Geology & Geophysics	1	3	4	2 M=1, F=1	0 M=0, F=0	20.0%
Physical Oceanography	0	2	2	1 M=0, F=1	0 M=0, F=0	10.0%
Applied Ocean Science & Engineering	5	1	6	1 M=1, F=0	0 M=0, F=0	30.0%
TOTAL	***7***	***13***	***20***	***6***	***0***	***100.0%***
%	***35.0%***	***65.0%***	***100.0%***	***30.0%***	***0.0%***	

Table 19. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2008
APPLICANT POOL

PROGRAM	MALE	FEMALE	TOTAL	INTERNATIONAL	MINORITY	% OF DISCIPLINE TO APPLICANT POOL
Biological Oceanography	24	56	80	24	12	31.7%
				male: 13 female: 11	male: 3 female: 9	
Chemical Oceanography	18	25	43	14	3	17.1%
				male: 7 female: 7	male: 0 female: 3	
Marine Geology & Geophysics	21	26	47	17	2	18.7%
				male: 9 female: 8	male: 1 female: 1	
Physical Oceanography	25	14	39	23	2	15.5%
				male: 16 female: 7	male: 2 female: 0	
Applied Ocean Science & Engineering	28	15	43	22	4	17.1%
				male: 17 female: 5	male: 2 female: 2	
TOTAL	*116*	*136*	*252*	*100*	*23*	*100.0%*
%	*46%*	*54%*	*100%*	*40%*	*9%*	

Table 20. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2008
ADMIT POOL*

PROGRAM	*MALE*	*FEMALE*	*TOTAL**	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ADMIT POOL*
Biological Oceanography	2	8	10	0	3	21%
				male: 0 female: 0	male: 0 female: 3	
Chemical Oceanography	5	5	10	2	1	21%
				male: 1 female: 1	male: 0 female: 1	
Marine Geology & Geophysics	1	8	9	1	1	19%
				male: 0 female: 1	male: 0 female: 1	
Physical Oceanography	7	3	10	2	0	21%
				male: 0 female: 2	male: 0 female: 0	
Applied Ocean Science & Engineering	3	5	8	2	1	17%
				male: 1 female: 1	male: 0 female: 1	
TOTAL	*18*	*29*	*47*	*7*	*6*	*100%*
%	*38%*	*62%*	*100%*	*15%*	*13%*	

* The total number of admits includes students who were admitted to more than one discipline.
(one female listed in Chem, also admitted to G&G; one male in PO, also admitted to AOSE)

Table 21. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2008
ACCEPT OFFER POOL*

PROGRAM	MALE	FEMALE	TOTAL	INTERNATIONAL	MINORITY	% OF DISCIPLINE TO ACCEPT POOL	% OF DISCIPLINE OF ADMIT POOL
Biological Oceanography	1	4	5	0	2	22.7%	10.6%
				male: 0 female: 0	male: 0 female: 2		
Chemical Oceanography	1	4	5	0	1	22.7%	10.6%
				male: 0 female: 0	male: 0 female: 1		
Marine Geology & Geophysics	1	2	3	0	1	13.6%	6.4%
				male: 0 female: 0	male: 1 female: 1		
Physical Oceanography	1	2	3	1	0	13.6%	6.4%
				male: 0 female: 1	male: 0 female: 0		
Applied Ocean Science & Engineering	2	4	6	2	1	27.3%	12.8%
				male: 1 female: 1	male: 0 female: 1		
TOTAL*	***6***	***16***	***22***	***3***	***5***	***100.0%***	***46.8%***
%	*27%*	*73%*	*100%*	*14%*	*23%*		

*Shows 2 students (1 female in Biology and 1 male in Physical Oceanography) who accepted our offer, but have chosen to defer enrollment until 2009.

Table 22. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2007
APPLICANT POOL

PROGRAM	MALE	FEMALE	TOTAL	INTERNATIONAL	MINORITY	% OF DISCIPLINE TO APPLICANT POOL
Biological Oceanography	26	53	79	17	6	34.8%
				male: 7 female: 10	male: 2 female: 4	
Chemical Oceanography	18	25	43	13	1	18.9%
				male: 8 female: 5	male: 1 female: 0	
Marine Geology & Geophysics	17	21	38	14	2	16.7%
				male: 7 female: 7	male: 1 female: 1	
Physical Oceanography	21	14	35	22	1	15.4%
				male: 15 female: 7	male: 0 female: 1	
Applied Ocean Science & Engineering	22	10	32	14	2	14.1%
				male: 8 female: 6	male: 0 female: 2	
TOTAL	*104*	*123*	*227*	*80*	*12*	*100.0%*
%	*46%*	*54%*	*100%*	*35%*	*5%*	

Table 23. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2007
ADMIT POOL*

PROGRAM	*MALE*	*FEMALE*	*TOTAL**	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ADMIT POOL*
Biological Oceanography	1	6	7	0 male: 0 female: 0	1 male: 0 female: 1	18%
Chemical Oceanography	3	7	10	2 male: 1 female: 1	1 male: 1 female: 0	26%
Marine Geology & Geophysics	4	5	9	2 male: 1 female: 1	2 male: 1 female: 1	23%
Physical Oceanography	4	2	6	4 male: 2 female: 2	0 male: 0 female: 0	15%
Applied Ocean Science & Engineering	6	1	7	0 male: 0 female: 0	0 male: 0 female: 0	18%
TOTAL	*18*	*21*	*39*	*8*	*4*	*100%*
%	*46%*	*54%*	*100%*	*21%*	*10%*	

* The total number of admits includes students who were admitted to more than one discipline.
(one male listed in Bio, also admitted to Chem; one female in Chem, also admitted to G&G and PO; one female in Chem also admitted to G&G; one female in PO also admitted to AOPE)

Table 24. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2007
ACCEPT OFFER POOL

PROGRAM	MALE	FEMALE	TOTAL	INTERNATIONAL	MINORITY	% OF DISCIPLINE TO ACCEPT POOL	% OF DISCIPLINE OF ADMIT POOL
Biological Oceanography	1	3	4	0 male: 0 female: 0	1 male: 0 female: 1	19.0%	10.3%
Chemical Oceanography	1	3	4	1 male: 0 female: 1	0 male: 0 female: 0	19.0%	10.3%
Marine Geology & Geophysics	2	1	3	0 male: 0 female: 0	1 male: 1 female: 0	14.3%	7.7%
Physical Oceanography	4	2	6	4 male: 2 female: 2	0 male: 0 female: 0	28.6%	15.4%
Applied Ocean Science & Engineering	3	1	4	0 male: 0 female: 0	0 male: 0 female: 0	19.0%	10.3%
*TOTAL**	*11*	*10*	*21*	*5*	*2*	**100.0%**	*53.8%*
%	*52%*	*48%*	*100%*	*24%*	*10%*		

*In addition, there are 4 students who deferred from 2006 and will be enrolling in 2007; They are 4 females (2 in Biology, 1 in AOPE, 1 in Chemistry)

Table 25. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2006
APPLICANT POOL

PROGRAM	MALE	FEMALE	TOTAL	INTERNATIONAL	MINORITY	% OF DISCIPLINE TO APPLICANT POOL
Biological Oceanography	19	53	72	16	4	30.9%
				male: 8 female: 8	male: 1 female: 2	
Chemical Oceanography	11	29	40	8	1	17.2%
				male: 4 female: 4	male: 1 female: 0	
Marine Geology & Geophysics	17	23	40	13	0	17.2%
				male: 9 female: 4	male: 0 female: 0	
Physical Oceanography	23	19	42	19	2	18.0%
				male: 10 female: 9	male: 2 female: 0	
Applied Ocean Science & Engineering	23	16	39	14	7	16.7%
				male: 8 female: 6	male: 3 female: 4	
TOTAL	*93*	*140*	*233*	*70*	*14*	*100.0%*
%	*40%*	*60%*	*100%*	*30%*	*6%*	

Table 26. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2006
ADMIT POOL

PROGRAM	MALE	FEMALE	TOTAL*	INTERNATIONAL	MINORITY	% OF DISCIPLINE TO ADMIT POOL
Biological Oceanography	1	7	8	2 male: 0 female: 2	1 male: 0 female: 1	17%
Chemical Oceanography	0	12	12	1 male: 0 female: 1	0 male: 0 female: 0	26%
Marine Geology & Geophysics	3	7	10	3 male: 2 female: 1	0 male: 0 female: 0	21%
Physical Oceanography	3	3	6	0 male: 0 female: 0	0 male: 0 female: 0	13%
Applied Ocean Science & Engineering	10	1	11	3 male: 3 female: 0	0 male: 0 female: 0	23%
TOTAL	*17*	*30*	*47*	*9*	*1*	*100%*
%	*36%*	*64%*	*100%*	*19%*	*2%*	

* The total number of admits includes five female students who were admitted to more than one discipline.

(two listed in Bio - one also admit to AOSE, one to Chem; one listed in G&G - also admit to Bio and Chem; two listed in Chem - one also admit to Bio, one to G&G)

Table 27. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2006
ACCEPT OFFER POOL

PROGRAM	MALE	FEMALE	TOTAL	INTERNATIONAL	MINORITY	% OF DISCIPLINE TO ACCEPT POOL	% OF DISCIPLINE OF ADMIT POOL
Biological Oceanography*	1	5	6	1 male: 0 female: 1	0 male: 0 female: 0	18.2%	14.0%
Chemical Oceanography*	0	6	6	1 male: 0 female: 1	0 male: 0 female: 0	18.2%	14.0%
Marine Geology & Geophysics*	2	3	5	2 male: 2 female: 0	0 male: 0 female: 0	15.2%	11.6%
Physical Oceanography	1	3	4	0 male: 0 female: 0	0 male: 0 female: 0	12.1%	9.3%
Applied Ocean Science & Engineering	10	2	12	4 male: 3 female: 1	male: 0 female: 0	36.4%	27.9%
TOTAL	*14*	*19*	*33*	*8*	*0*	**100.0%**	*76.7%*
%	*42%*	*58%*	*100%*	*24%*	*0%*		

*Included is one student who accepted JP offer, but will be deferring admission until Spring 2007 (female in Bio)

*Included are two students who accepted JP offer, but will be deferring admission until Summer 2007 (one female in AOPE; one female in Bio)

*Included is one student who accepted JP offer, but will be deferring admission until Fall 2007 (female in Chem)

*Included is one student who applied during the year, was admitted and entered the JP in Spring 2006 (female in Chem)

Table 28. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2005
APPLICANT POOL

PROGRAM	MALE	FEMALE	TOTAL	INTERNATIONAL	MINORITY	% OF DISCIPLINE TO APPLICANT POOL
Biological Oceanography	20	46	66	13	3	32.7%
				male: 6 female: 7	male: 1 female: 2	
Chemical Oceanography	12	16	28	9	0	13.9%
				male: 3 female: 6	male: 0 female: 0	
Marine Geology & Geophysics	23	17	40	12	1	19.8%
				male: 7 female: 5	male: 1 female: 0	
Physical Oceanography	18	14	32	19	2	15.8%
				male: 11 female: 8	male: 1 female: 1	
Applied Ocean Science & Engineering	25	11	36	16	1	17.8%
				male: 13 female: 3	male: 0 female: 1	
TOTAL	*98*	*104*	*202*	*69*	*7*	*100.0%*
%	*49%*	*51%*	*100%*	*34%*	*3%*	

Table 29. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2005
ADMIT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL**	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ADMIT POOL*
Biological Oceanography	4	7	11	0 male: 0 female: 0	0 male: 0 female: 0	24%
Chemical Oceanography	2	4	6	1 male: 0 female: 1	0 male: 0 female: 0	13%
Marine Geology & Geophysics	5	2	7	0 male: 0 female: 0	0 male: 0 female: 0	16%
Physical Oceanography	4	4	8	3 male: 2 female: 1	1 male: 1 female: 0	18%
Applied Ocean Science & Engineering	8	5	13	5 male: 4 female: 1	1 male: 0 female: 1	29%
TOTAL	*23*	*22*	*45*	*9*	*2*	*100%*
%	*51%*	*49%*	*100%*	*20%*	*4%*	

* The total number of admits includes two female students that have been admitted in both Chemistry and Biology (are only listed in the Chemisty number).

Table 30. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2005
ACCEPT POOL

PROGRAM	MALE	FEMALE	TOTAL	INTERNATIONAL	MINORITY	% OF DISCIPLINE TO ACCEPT POOL	% OF DISCIPLINE OF ADMIT POOL
Biological Oceanography	2	4	6	0 male: 0 female: 0	0 male: 0 female: 0	20.0%	14.0%
Chemical Oceanography	2	2	4	0 male: 0 female: 0	0 male: 0 female: 0	13.3%	9.3%
Marine Geology & Geophysics**	4	1	5	0 male: 0 female: 0	0 male: 0 female: 0	16.7%	11.6%
Physical Oceanography	3	2	5	2 male: 2 female: 0	1 male: 1 female: 0	16.7%	11.6%
Applied Ocean Science & Engineering	6	4	10	4 male: 3 female: 1	1 male: 0 female: 1	33.3%	23.3%
TOTAL	*17*	*13*	*30*	*6*	*2*	**100.0%**	*69.8%*
%	*57%*	*43%*	*100%*	*20%*	*7%*		

*Included are three students who accepted JP offer, but will be deferring admission until Spring 2006 (one male in Bio; one male in AOPE; one female in G&G)

*Included are two students who accepted JP offer, but will be deferring admission until Fall 2006 (one male in AOPE; one female in PO)

*Does not include student who previously deferred until 2005, but decided not to come to Joint Program. - male in PO (B. Loose)

Table 31. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2004
APPLICANT POOL

PROGRAM	MALE	FEMALE	TOTAL	INTERNATIONAL	MINORITY	% OF DISCIPLINE TO APPLICANT POOL
Biological Oceanography	18	43	61	12	5	32.6%
Chemical Oceanography	8	16	24	4	2	12.8%
Marine Geology & Geophysics	21	9	30	5	3	16.0%
Physical Oceanography	22	10	32	12	1	17.1%
Applied Ocean Science & Engineering	35	5	40	16	3	21.4%
TOTAL	*104*	*83*	*187*	*49*	*14*	*100.0%*
%	*56%*	*44%*	*100%*	*26%*	*7%*	

Table 32. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2004
ADMIT POOL

PROGRAM	*MALE*	*FEMALE*	*TOTAL**	*INTERNATIONAL*	*MINORITY*	*% OF DISCIPLINE TO ADMIT POOL*
Biological Oceanography	5	10	15	0	2	29%
Chemical Oceanography	4	6	10	1	2	19%
Marine Geology & Geophysics	5	2	7	0	2	13%
Physical Oceanography	5	6	11	2	0	21%
Applied Ocean Science & Engineering	7	2	9	0	1	17%
TOTAL	***26***	***26***	***52***	***3***	***7***	***100%***
%	***50%***	***50%***	***100%***	***6%***	***13%***	

* The total number of admits includes four students that have been admitted cross-discipline. Thus, a total of 48 applicants were admitted, although it was a total of 52 offers. The cross disciplinary includes all males: Geology/Chemistry (minority); Geology/Biology; Physical Oceanography/Engineering; Geology/Physical Oceanography.

Table 33. MIT/WHOI JOINT PROGRAM ADMISSIONS - 2004
ACCEPT POOL* (revised 10/15/04)

PROGRAM	MALE	FEMALE	TOTAL	INTERNATIONAL	MINORITY	% OF DISCIPLINE TO ACCEPT POOL	% OF DISCIPLINE TO ADMIT POOL
Biological Oceanography	3	5	8	0	1	24.2%	15.4%
Chemical Oceanography	3	3	6	1	0	18.2%	11.5%
Marine Geology & Geophysics**	6	1	7	0	2	21.2%	13.5%
Physical Oceanography	2	3	5	1	1	15.2%	9.6%
Applied Ocean Science & Engineering	5	2	7	0	2	21.2%	13.5%
TOTAL	*19*	*14*	*33*	*2*	*6*	**100.0%**	*63.5%*
%	*58%*	*42%*	*100%*	*6%*	*18%*		

*Included are 2 applicants who had previously deferred admission (1 male in Chemical Oceanography, 1 male in Marine Geology and Geophysics) and are enrolling for Fall 2004.

*Two male students included will be deferring admission until 2005. One in Chemical Oceanography (international) and one in Physical Oceanography. *One male student accepted to both Chemical Oceanography and Marine Geology and Geophysics has been figured into only the Marine Geology and Geophysics numbers for this sheet.

Table 34. Total Admissions Statistics 1999-2014

	Applicant				Admit				Accept Offer			
	Male	Female	International	Minority	Male	Female	International	Minority	Male	Female	International	Minority
1999												
Biological Oceanography	28	32	9	5	4	2	1	0	3	2	1	0
Chemical Oceanography	9	16	3	1	2	4	1	1	0	3	1	1
Marine Geology & Geophysics	12	15	5	3	3	7	0	2	3	5	0	1
Physical Oceanography	11	9	11	1	5	2	4	0	1	0	1	0
Applied Ocean Science & Engineering	23	4	3	5	9	3	1	1	7	1	1	0
2000												
Biological Oceanography	28	46	11	5	4	7	2	1	3	5	2	1
Chemical Oceanography	10	17	10	1	0	4	1	0	0	4	1	0
Marine Geology & Geophysics	8	10	5	1	3	2	1	0	3	2	1	0
Physical Oceanography	4	14	5	0	8	3	2	0	4	2	0	0
Applied Ocean Science & Engineering	19	6	8	1	10	2	3	0	4	1	1	0
2001												
Biological Oceanography	22	35	17	4	3	6	4	2	2	4	1	2
Chemical Oceanography	6	11	4	0	5	2	0	0	2	2	0	0
Marine Geology & Geophysics	6	11	5	0	2	4	1	0	1	4	1	0
Physical Oceanography	6	12	6	0	4	2	1	0	3	1	1	0
Applied Ocean Science & Engineering	13	3	6	0	6	2	4	0	5	0	3	0
2002												
Biological Oceanography	17	52	19	8	3	7	2	1	3	5	1	1
Chemical Oceanography	7	9	5	2	3	3	1	1	1	2	1	0
Marine Geology & Geophysics	11	15	4	3	1	5	1	1	2	4	1	1
Physical Oceanography	25	6	15	1	8	2	3	1	7	1	3	1
Applied Ocean Science & Engineering	18	7	10	1	7	2	2	1	5	1	1	0
2003												
Biological Oceanography	23	35	10	11	1	5	0	0	1	5	0	0
Chemical Oceanography	12	6	3	5	5	3	1	2	4	3	1	2
Marine Geology & Geophysics	16	17	10	4	5	5	3	0	0	2	0	0
Physical Oceanography	14	13	16	0	6	4	6	0	2	4	6	0
Applied Ocean Science & Engineering	24	10	13	6	4	3	1	2	4	1	2	1
2004												
Biological Oceanography	18	43	12	5	5	10	0	2	3	5	0	1
Chemical Oceanography	8	16	4	2	4	6	1	2	3	3	1	0
Marine Geology & Geophysics	21	9	5	3	5	2	0	2	6	1	0	2
Physical Oceanography	22	10	12	1	5	6	2	0	2	3	1	1
Applied Ocean Science & Engineering	35	5	16	3	7	2	0	1	5	2	0	2

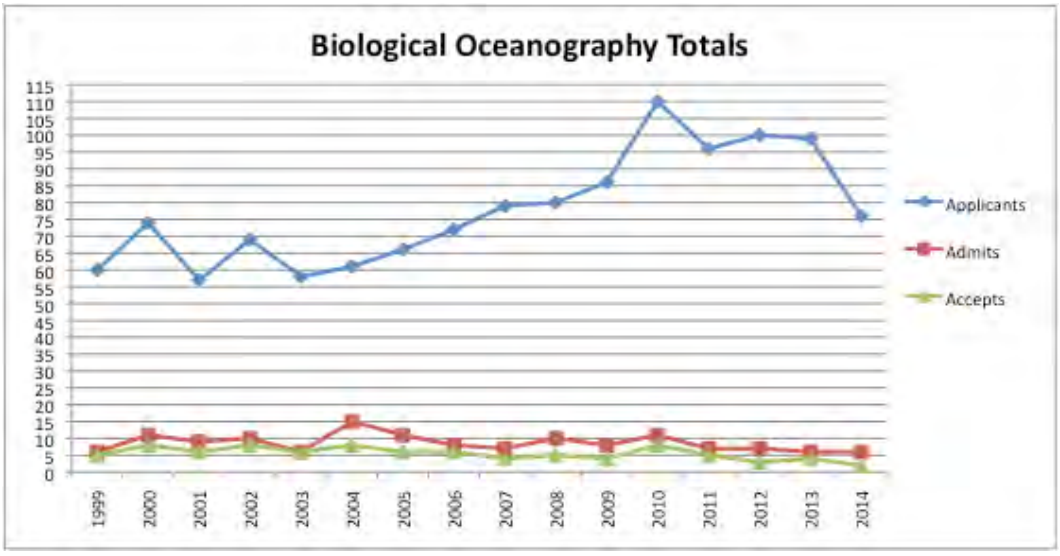
Table 34. Total Admissions Statistics 1999-2014

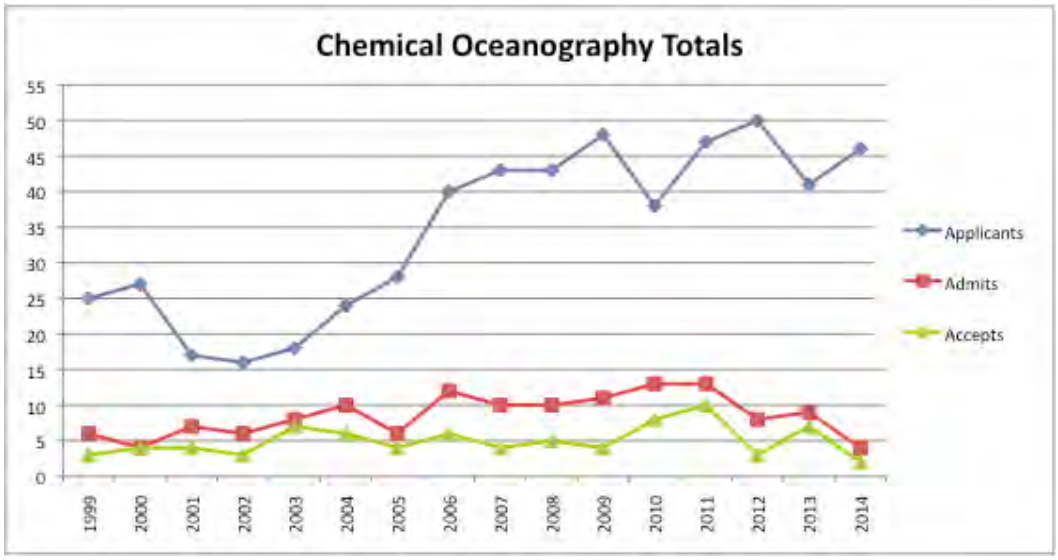
	Applicant				Admit				Accept Offer			
	Male	Female	International	Minority	Male	Female	International	Minority	Male	Female	International	Minority
2005												
Biological Oceanography	20	46	13	3	4	7	0	0	2	4	0	0
Chemical Oceanography	12	16	9	0	2	4	1	0	2	2	0	0
Marine Geology & Geophysics	23	17	12	1	5	2	0	0	4	1	0	0
Physical Oceanography	18	14	19	2	4	4	3	1	3	2	2	1
Applied Ocean Science & Engineering	25	11	16	1	8	5	5	1	6	4	4	1
2006												
Biological Oceanography	19	53	16	4	1	7	2	1	1	5	1	0
Chemical Oceanography	11	29	8	1	0	12	1	0	0	6	1	0
Marine Geology & Geophysics	17	23	13	0	3	7	3	0	2	3	2	0
Physical Oceanography	23	19	19	2	3	3	0	0	1	3	0	0
Applied Ocean Science & Engineering	23	16	14	7	10	1	3	0	10	2	4	0
2007												
Biological Oceanography	26	53	17	6	1	6	0	1	1	3	0	1
Chemical Oceanography	18	25	13	1	3	7	2	1	1	3	1	0
Marine Geology & Geophysics	17	21	14	2	4	5	2	2	2	1	0	1
Physical Oceanography	21	14	22	1	4	2	4	0	4	2	4	0
Applied Ocean Science & Engineering	22	10	14	2	6	1	0	0	3	1	0	0
2008												
Biological Oceanography	24	56	24	12	2	8	0	3	1	4	0	2
Chemical Oceanography	18	25	14	3	5	5	2	1	1	4	0	1
Marine Geology & Geophysics	21	26	17	2	1	8	1	1	1	2	0	1
Physical Oceanography	25	14	23	2	7	3	2	0	1	2	1	0
Applied Ocean Science & Engineering	28	15	22	4	3	5	2	1	2	4	2	1
2009												
Biological Oceanography	30	56	12	11	4	4	2	0	1	3	1	0
Chemical Oceanography	17	31	12	5	3	8	2	2	0	4	1	0
Marine Geology & Geophysics	29	25	22	1	1	8	4	0	1	3	2	0
Physical Oceanography	25	23	31	1	3	5	5	0	0	2	1	0
Applied Ocean Science & Engineering	49	11	33	1	7	1	1	0	5	1	1	0
2010												
Biological Oceanography	33	77	19	7	2	9	2	3	2	6	2	2
Chemical Oceanography	20	18	7	6	5	8	0	2	4	4	0	1
Marine Geology & Geophysics	27	33	27	9	3	8	1	4	0	4	0	2
Physical Oceanography	37	26	32	4	5	7	4	1	3	5	2	1
Applied Ocean Science & Engineering	35	12	21	1	6	2	2	0	4	1	2	0
2011												
Biological Oceanography	31	65	17	13	2	5	2	0	2	3	2	0
Chemical Oceanography	19	28	12	6	7	6	2	4	5	5	2	3
Marine Geology & Geophysics	26	27	32	3	5	6	2	1	3	3	1	1
Physical Oceanography	24	19	20	4	3	7	2	1	2	2	1	1
Applied Ocean Science & Engineering	40	13	26	6	4	1	1	0	3	0	1	0
2012												
Biological Oceanography	44	56	24	16	4	3	1	2	2	1	1	0
Chemical Oceanography	22	28	16	10	1	7	0	1	0	3	0	0
Marine Geology & Geophysics	38	18	30	3	4	1	2	0	3	1	2	0
Physical Oceanography	26	25	30	4	3	4	2	0	1	3	1	0

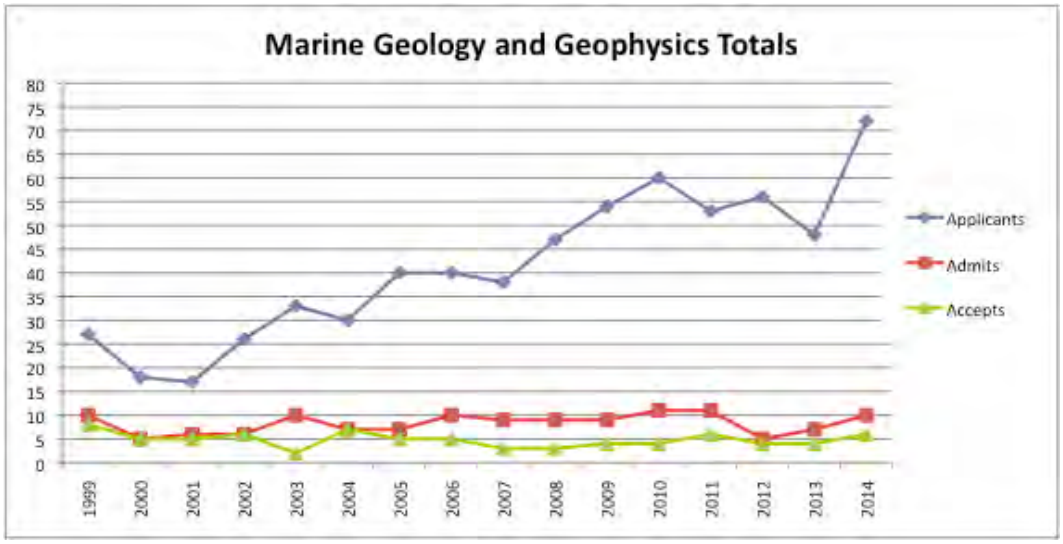
Table 34. Total Admissions Statistics 1999-2014

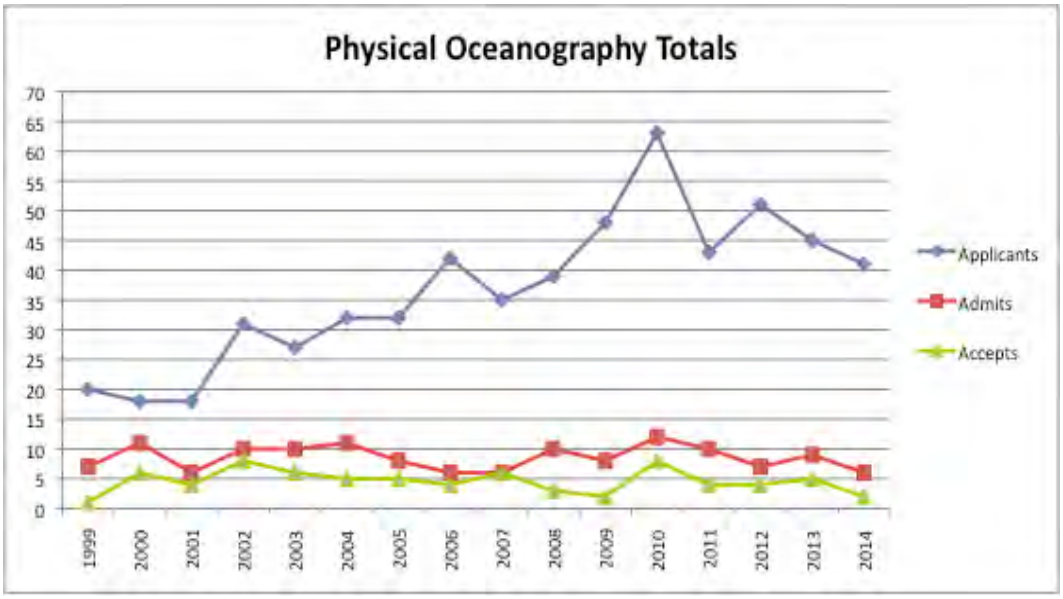
	Applicant				Admit				Accept Offer			
	Male	Female	International	Minority	Male	Female	International	Minority	Male	Female	International	Minority
Applied Ocean Science & Engineering	63	18	41	9	5	6	2	1	3	3	1	1
2013												
Biological Oceanography	34	65	24	5	2	4	0	1	2	2	0	1
Chemical Oceanography	14	27	12	4	5	4	2	1	3	4	2	1
Marine Geology & Geophysics	24	24	10	4	4	3	0	0	2	2	0	0
Physical Oceanography	26	19	23	2	5	4	3	0	4	1	2	0
Applied Ocean Science & Engineering	49	14	28	2	8	2	4	1	7	2	4	1
2014												
Biological Oceanography	25	51	20	11	2	4	0	3	0	2	0	1
Chemical Oceanography	16	30	15	6	1	3	0	0	1	1	0	0
Marine Geology & Geophysics	34	38	26	9	5	5	1	2	2	4	0	1
Physical Oceanography	25	16	21	5	4	2	1	1	2	0	0	0
Applied Ocean Science & Engineering	40	18	25	4	2	1	0	0	1	1	0	0

Figure 1. Admissions Statistics by Discipline 1999-2014






Marine Geology and Geophysics Totals
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Applicants
Admits
Accepts


Physical Oceanography Totals
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Applicants
Admits
Accepts

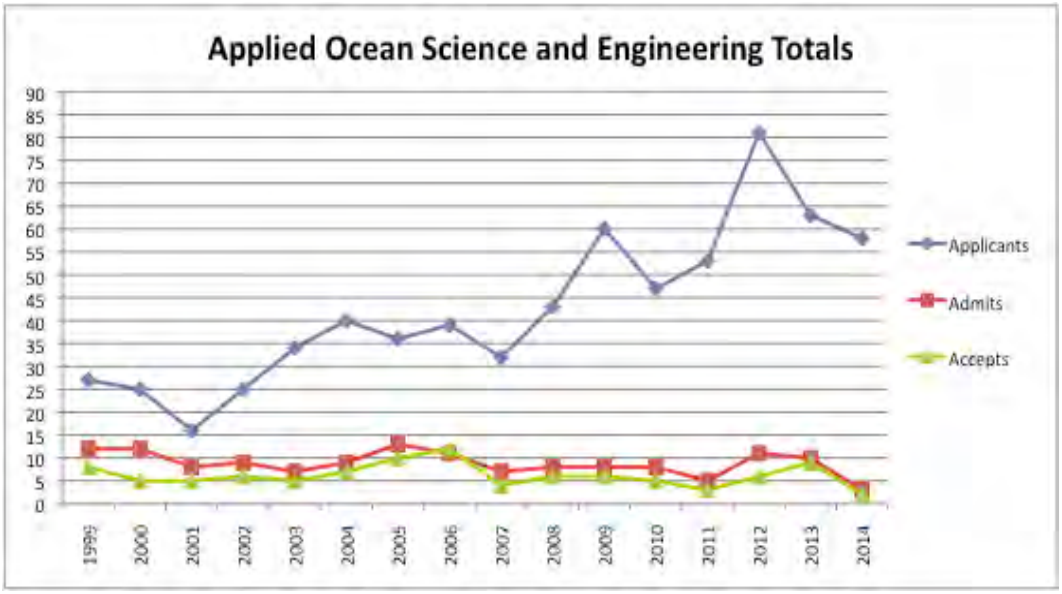

Applied Ocean Science and Engineering Totals
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Applicants
Admits
Accepts

Table 35. MIT/WHOI Joint Program Applicants 2004-2014

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Biological Oceanography	61	66	72	79	80	86	110	96	100	99	76
Chemical Oceanography	24	28	40	43	43	48	38	47	50	41	46
Marine Geology and Geophysics	30	40	40	38	47	54	60	53	56	48	72
Physical Oceanography	32	32	42	35	39	48	63	43	51	45	41
Applied Ocean Science and Engineering	40	36	39	32	43	60	47	53	81	63	58
Total	187	202	233	227	252	296	318	292	338	296	293
Female	44.0%	51.0%	60.0%	54.0%	54.0%	49.3%	52.2%	52.1%	42.9%	50.3%	52.2%
Minorities	7.0%	3.0%	6.0%	5.0%	9.0%	6.4%	8.5%	11.0%	12.4%	5.7%	11.9%
International	26.0%	34.0%	30.0%	35.0%	40.0%	37.2%	33.3%	36.6%	41.7%	32.8%	36.5%

Table 36. MIT/WHOI Joint Program Fall Enrollment

	2009	2010	2011	2012	2013	2014
Biological Oceanography	25	27	23	24	25	25
Chemical Oceanography	29	30	33	33	32	28
Marine Geology and Geophysics	22	22	24	22	22	25
Physical Oceanography	20	23	23	23	21	21
Applied Ocean Science and Engineering	25	28	24	23	26	23
# Female	73	79	76	76	71	67
% Female	60%	61%	60%	60%	56%	55%
# Minority	13	14	18	16	18	17
% Minority	11%	11%	14%	13%	14%	14%
# International	28	29	32	34	33	30
% International	23%	22%	25%	27%	26%	25%
Total Number of Enrolled Students	**121**	**130**	**127**	**125**	**126**	**122**

Table 37. MIT/WHOI JOINT PROGRAM
Degrees Received and Average Time* to Doctoral Degree

	Biology			Chemistry			Geology/Geophysics			Phys. Oceanography			Engineering		
	Ph.D/ Sc.D	SM	Avg. Yrs to Ph.D	Ph.D/ Sc.D	SM	Avg. Yrs to Ph.D	Ph.D/ Sc.D	SM	Avg. Yrs to Ph.D	Ph.D/ Sc.D	SM	Avg. Yrs to Ph.D	Ph.D/ Sc.D	SM/ Engrs	Avg. Yrs to Ph.D
2004-05															
Male	6	1	6	2	0	5.6	3	0	5.7	0	0	0	6	2	5.6
Female	2	0	6	0	0	0	0	0	0	0	0	0	0	1	0
(International)	0	0		0	0		0	0		0	0	0	2	1	
(Minority)	0	0		0	0		0	0		0	0	0	0	1	
2005-06															
Male	4	0	5.9	0	1	0	3	0	5.3	0	1	0	4	2	5.6
Female	3	0	5.5	3	0	5.6	2	0	5.8	0	0	0	0	0	0
(International)	2	0		2	0		0	0		0	0		2	0	
(Minority)	0	0		0	1		1	0		0	0		0	0	
2006-07															
Male	3	0	5.9	2	0	5.6	1	1	6	4	0	5.8	4	4	6.1
Female	5	0	5.6	1	0	6.6	1	0	5.6	0	0	0	0	2	0
(International)	3	0		0	0		0	0		1	0		2	1	
(Minority)	0	0		0	0		0	0		0	0		0	0	
2007-08															
Male	1	0	4.6	0	1	0	1	1	5.7	4	0	5.6	4	0	6
Female	3	2	5.6	2	0	5.5	3	0	5.6	2	1	5.6	1	2	7
(International)	0	0		0	0		1	0		3	0		1	0	
(Minority)	1	0		0	0		0	0		0	0		0	0	
2008-09															
Male	3	0	5.9	2	0	5.6	1	0	4.3	2	2	6.2	4	5	5.5
Female	4	0	5	2	0	5.6	2	0	5.8	2	0	5.5	1	0	5.9
(International)	0	0		2	0		0	0		3	1		2	1	
(Minority)	1	0		0	0		0	0		0	1		0	0	

	Biology			Chemistry			Geology/Geophysics			Phys. Oceanography			Engineering		
	Ph.D/ Sc.D	SM	Avg. Yrs to Ph.D	Ph.D/ Sc.D	SM	Avg. Yrs to Ph.D	Ph.D/ Sc.D	SM	Avg. Yrs to Ph.D	Ph.D/ Sc.D	SM	Avg. Yrs to Ph.D	Ph.D/ Sc.D	SM/ Engrs	Avg. Yrs to Ph.D
2009-10															
Male	0	0	0	4	0	5.2	3	0	5.5	1	0	5.5	0	1	0
Female	6	1	5.7	3	0	5.6	1	1	5.5	4	1	5.8	1	2	4.9
(International)	0	0		1	0		0	0		3	0		0	1	
(Minority)	0	0		0	0		0	1		0	0		0	0	
2010-11															
Male	2	1	6.2	1	0	5.2	0	0	0	1	0	5.5	3	1	5.5
Female	3	2	6	3	0	6.3	0	0	0	1	0	6	0	1	0
(International)	0	0		0	0		0	0		2	0		0	0	
(Minority)	1	0		0	0		0	0		0	0		1	0	
2011-12															
Male	1	0	5.5	0	0	0	3	0	5.8	0	0	0	5	1	6
Female	0	0	0	4	0	5.2	6	2	5.5	1	0	5.5	0	1	0
(International)	0	0		0	0		2	0		0	0		1	0	
(Minority)	0	0		0	0		0	0		0	0		0	0	
2012-13															
Male	1	0	5.9	0	2	0	2	0	5.6	4	1	5.5	3	3	5.8
Female	4	0	5.2	3	0	5.5	1	0	5.5	4	1	5.8	2	0	5.8
(International)	0	0		1	0		0	0		5	0		3	1	
(Minority)	1	0		0	0		1	0		0	0		0	0	
2013-14															
Male	0	0	0	3	0	5.6	1	0	5.5	0	0	0	1	2	6
Female	2	0	5.5	4	0	5	1	0	5	1	0	5.5	1	0	5.5
(International)	0	0		0	0		0	0		0	0		1	0	
(Minority)	1	0		1	0		0	0		0	0		0	0	

* Time based on date of entry into either MIT or the MIT/WHOI Joint Program.

Figure 2.

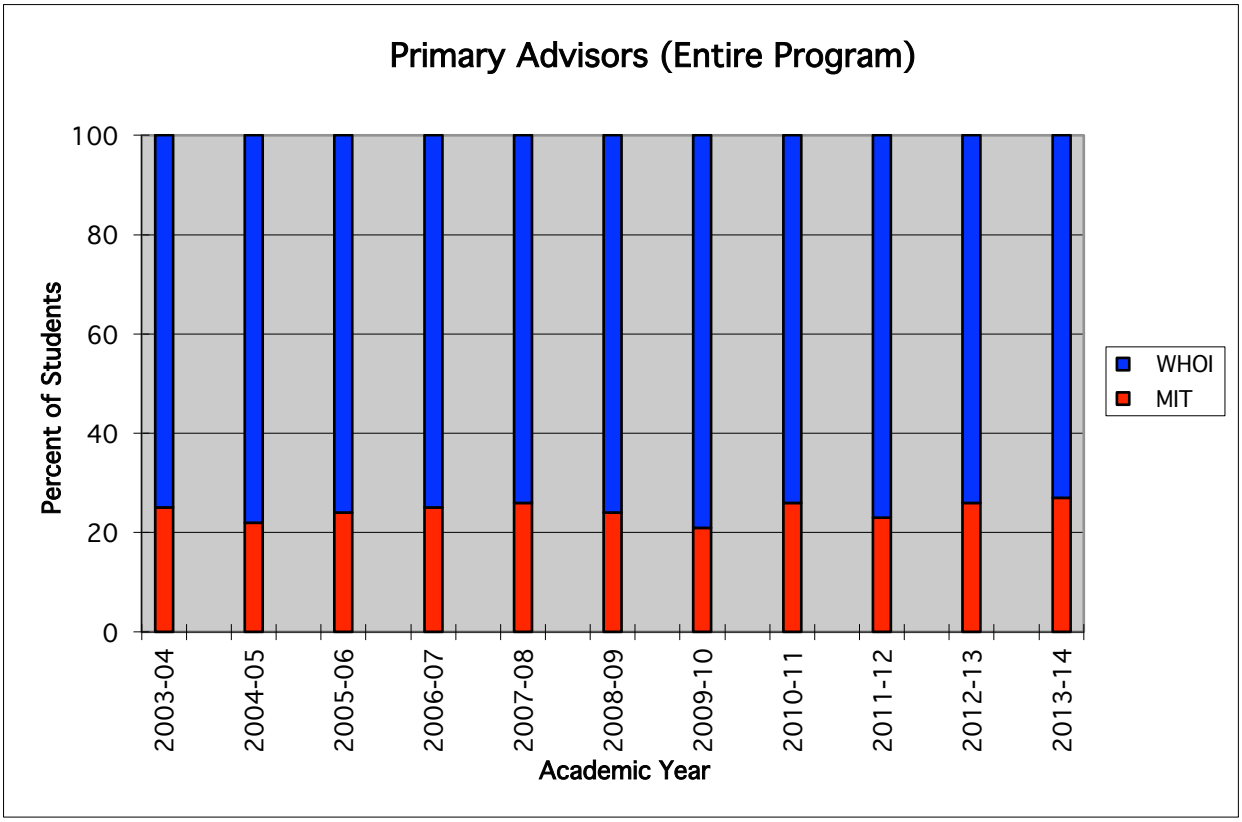
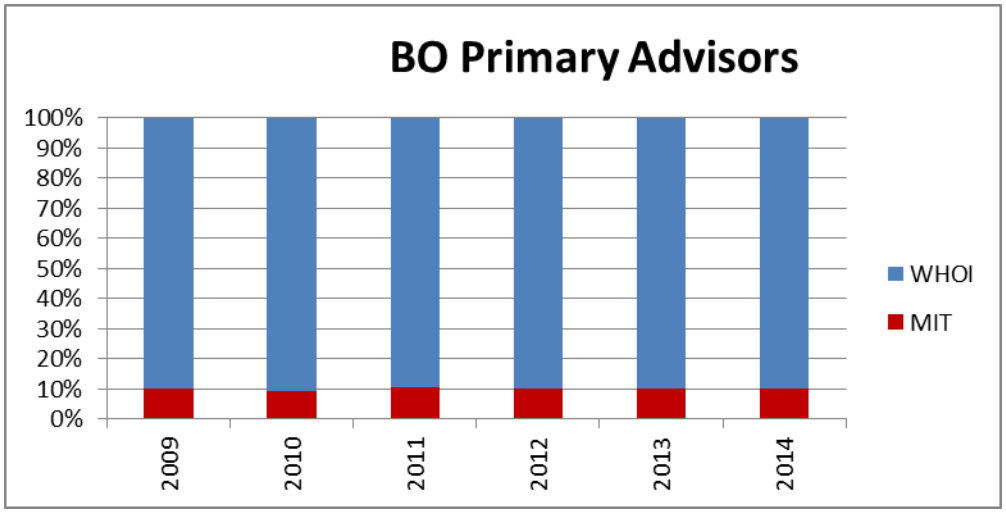
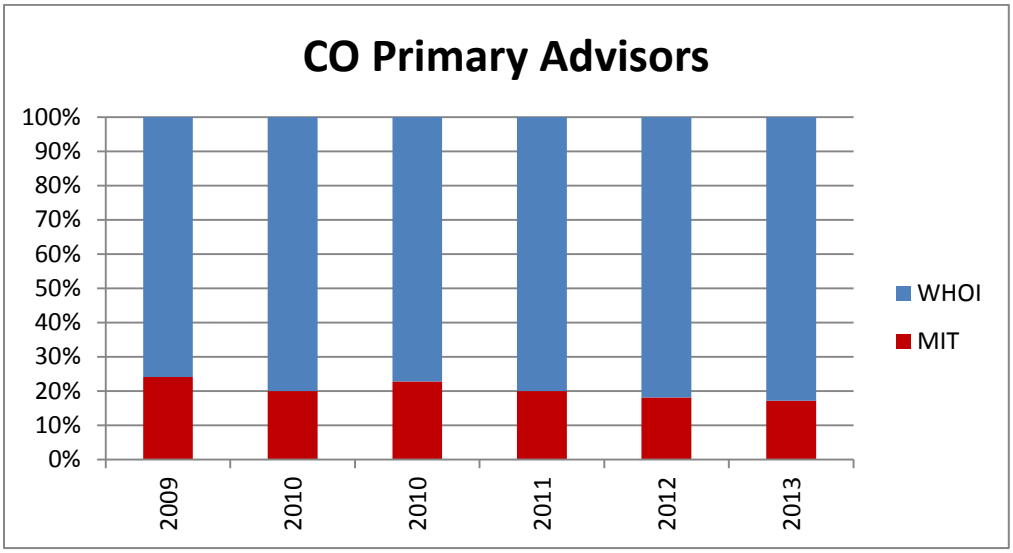
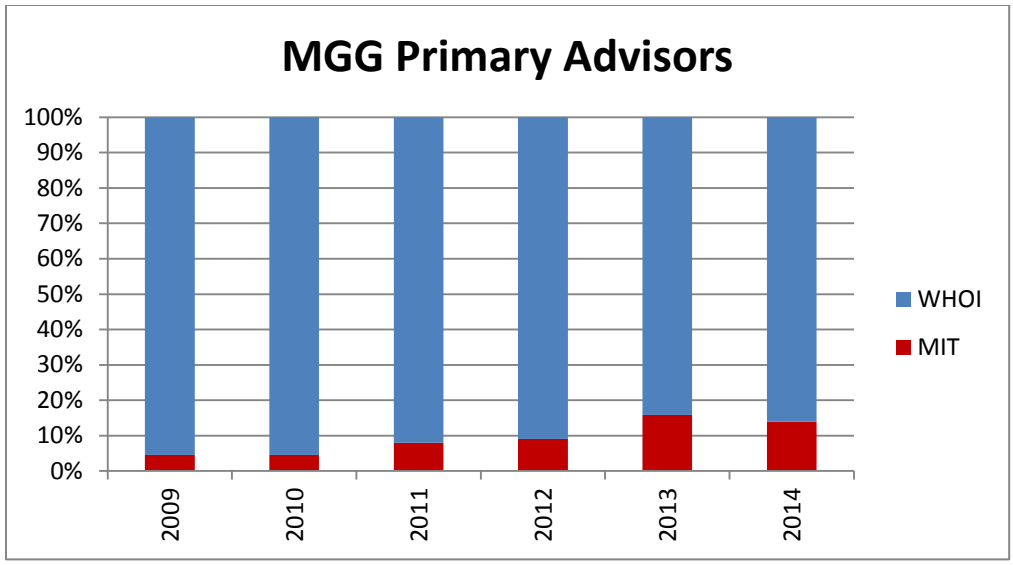
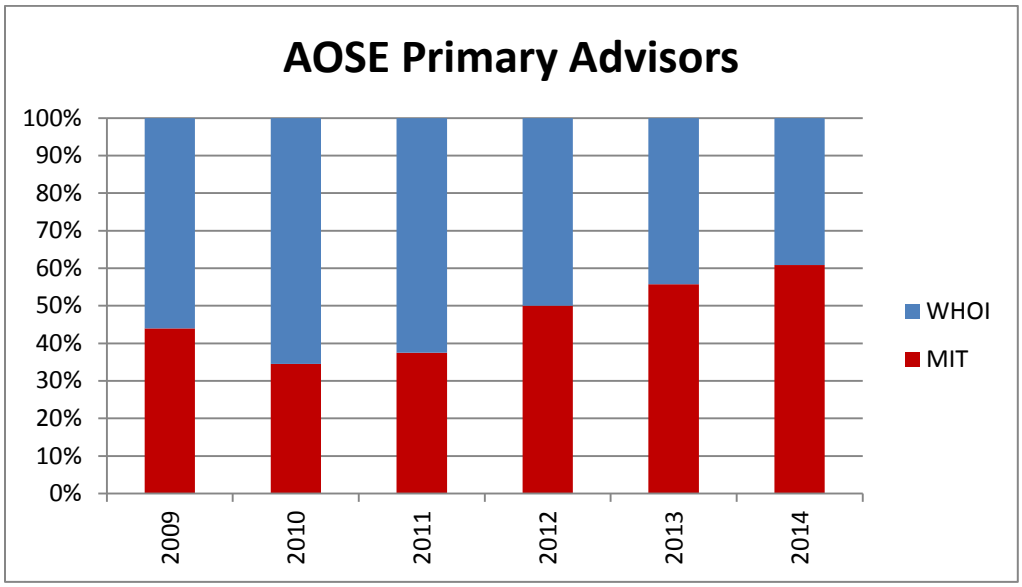

Primary Advisors (Entire Program)
Percent of Students
100
80
60
40
20
0
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
Academic Year
WHOI
MIT

Figure 3. Primary Advisor by Discipline






MGG Primary Advisors
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2009
2010
2011
2012
2013
2014
WHOI
MIT


AOSE Primary Advisors
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2009
2010
2011
2012
2013
2014
WHOI
MIT

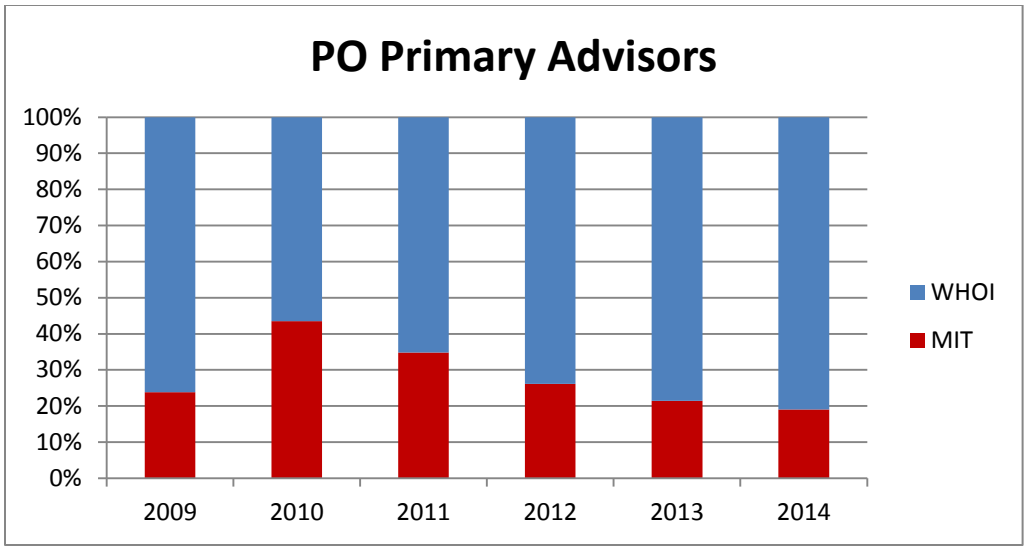

PO Primary Advisors
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2009
2010
2011
2012
2013
2014
WHOI
MIT

Figure 4.

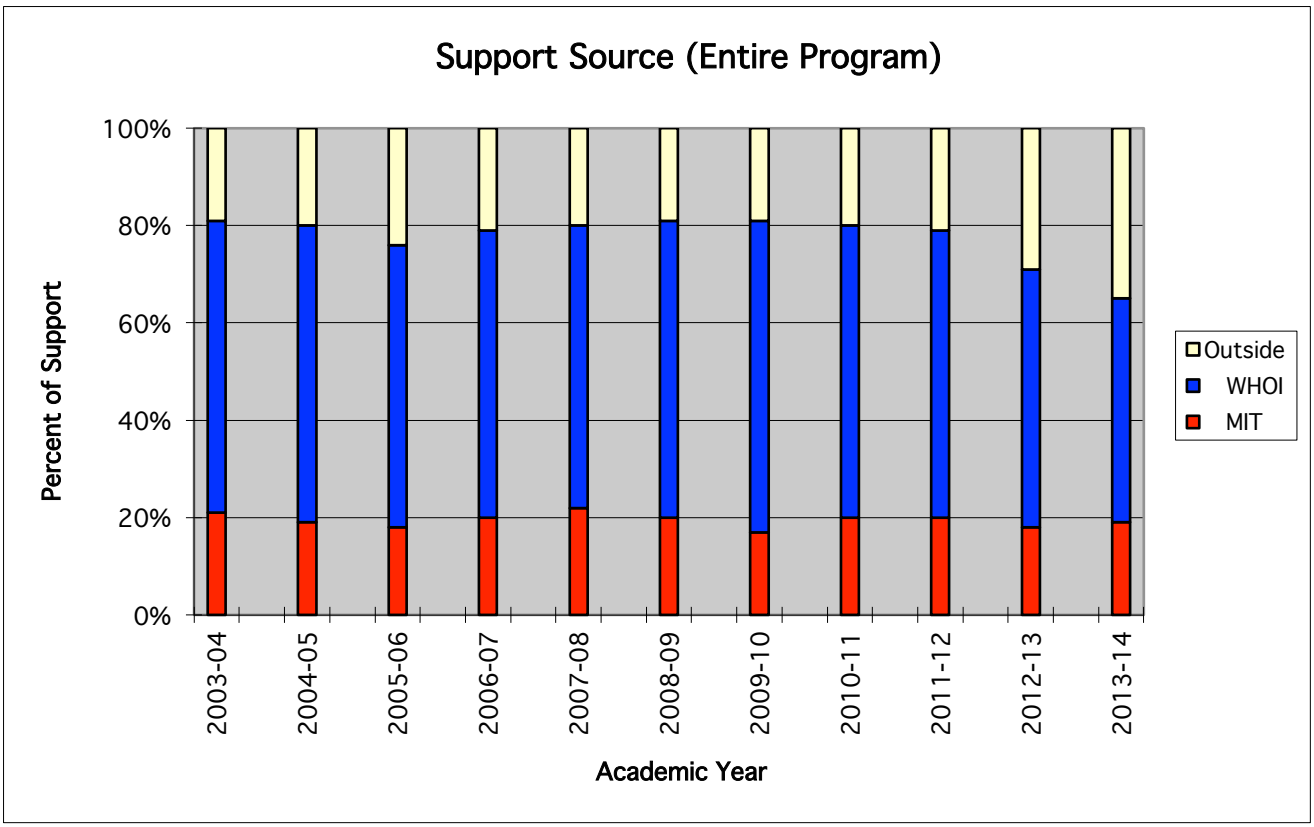
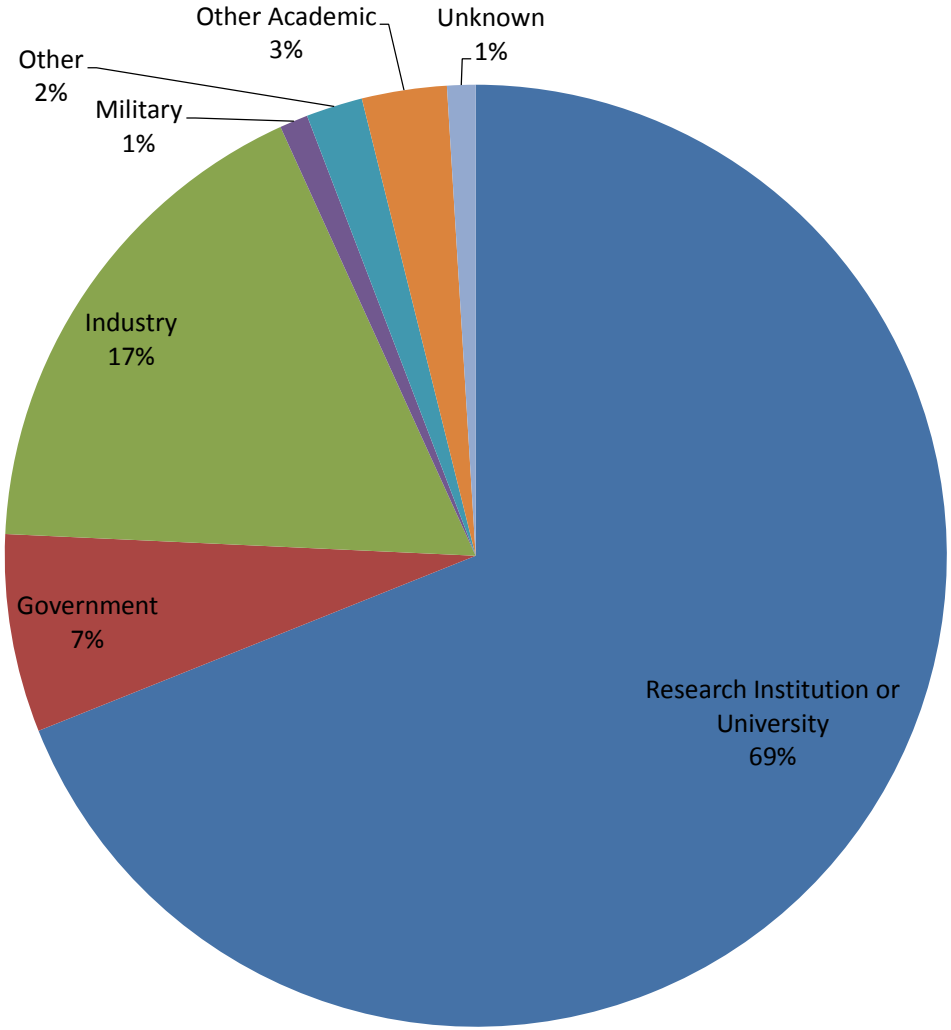
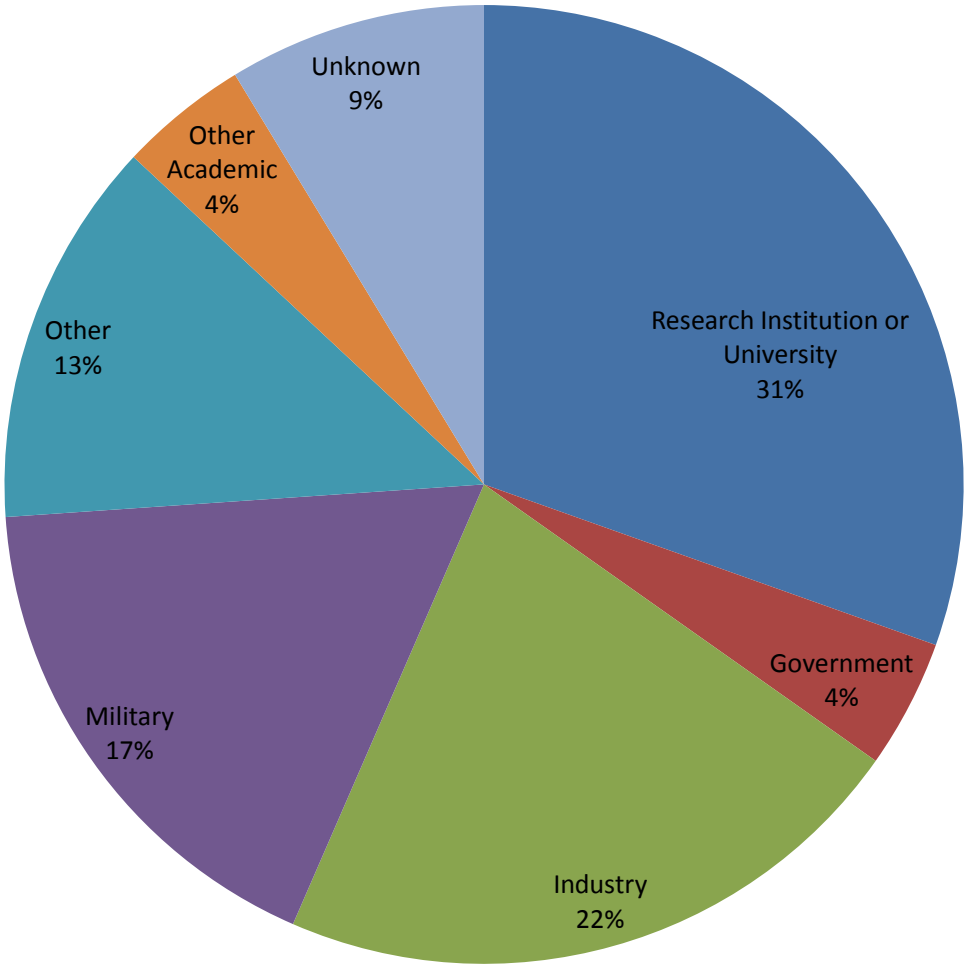

Support Source (Entire Program)
Percent of Support
100%
80%
60%
40%
20%
0%
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
Academic Year
Outside
WHOI
MIT

Figure 5. Outcomes - Doctoral Degree



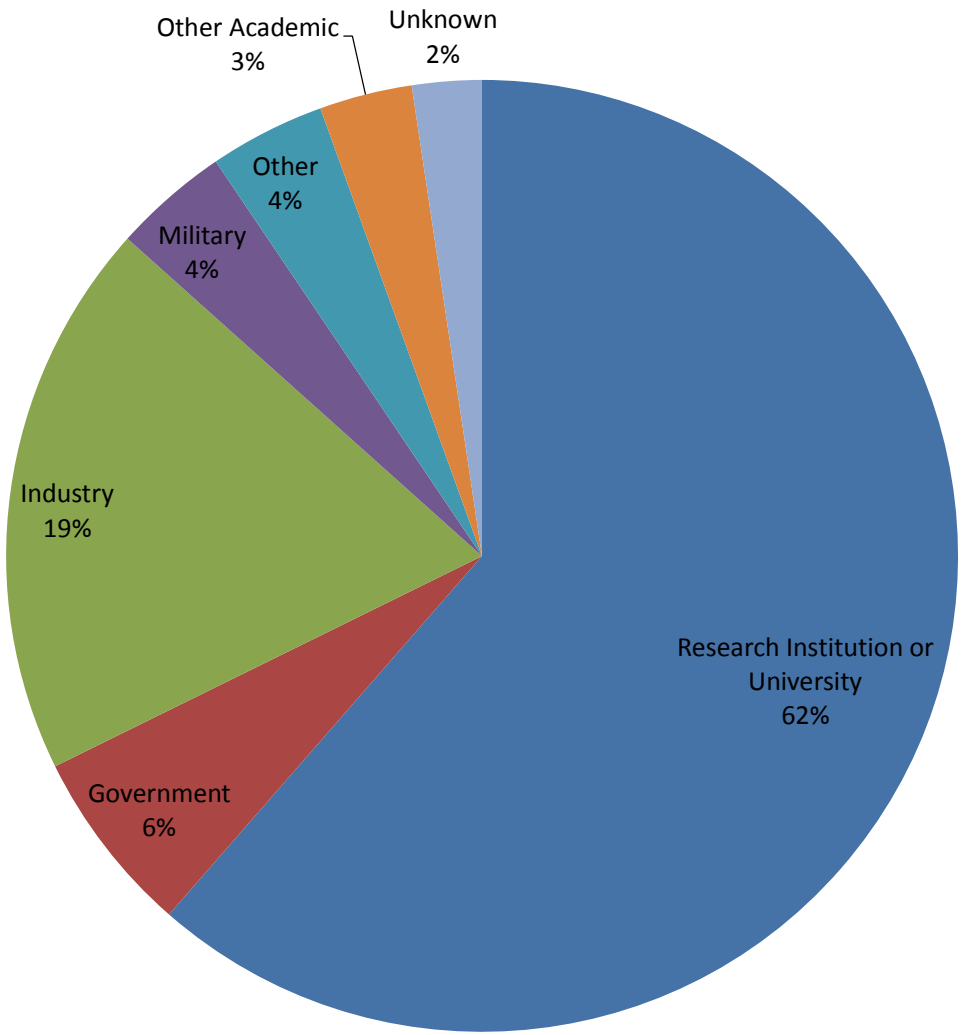
N = 103

Figure 6. Outcomes - Terminal Master's Degree



N = 23

Figure 7. Outcomes - Terminal Master's and Doctoral Degrees



N = 127