

Organismal Biology and Ecology Majors' Handbook

COLORADO COLLEGE

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INTRODUCTION

Organismal biology integrates studies of structure and function at the level of the organism and plays a central role in answering questions about ecology and evolution. This broad field encompasses cross-disciplinary approaches such as physiological ecology, evolutionary ecology, systematics, and biogeography, which all provide complementary insights into the processes of evolutionary diversification and adaptation to life on earth.

Our research foci include botany, animal ecology, comparative physiology, conservation biology, and molecular ecology. We strive to perform cutting-edge research and include students in these opportunities.

IMPORTANT DATES, EVENTS, AND ANNOUNCEMENTS

- **Declare your OBE major as soon as you decide on this major, but during your sophomore year at the latest, so that you receive OBE Department announcements.** To declare the major, you need a faculty advisor in the Department with whom you confer before declaring.
- Each fall a **REQUIRED** meeting of all prospective and declared majors will be announced.
- Each spring (block 6) we meet for **OBE-Day**: an afternoon-long series of presentations, including OBE majors presenting their senior thesis. All OBE majors are encouraged to attend, and others are welcome.
- Junior year: begin completing the senior capstone experience - plan possible research experiences, attend OBE seminars.
- Senior year: take senior capstone course and attend more OBE seminars.
- OBE majors have the option of writing a senior thesis and attempting to graduate with distinction.

THE OBE MAJOR: GUIDE TO REQUIREMENTS

SHORT GUIDE – 15 units

- I. **Two units - Introductory Organismal Biology:** BE105 Biology of Plants *and/or* BE106 Biology of Animals *and/or* BE107 Biology of Microbes
- II. **One unit - Ecology:** BE208
- III. **One unit - Intro to Molecular and Cellular Biology:** MB131
- IV. **One unit - Population Genetics or Genetics:** BE280 Population Genetics *or* MB201 Laboratory in Molecular and Cellular Biology and Genetics
- V. **Three units - Chemistry:** CH107 General Chemistry *and* CH108 General Chemistry II *and* CH250 Structures of Organic Molecules
- VI. **Two units - Mathematics:** one in calculus and one in statistics OR math modeling
- VII. **Five approved OBE Electives:** at least three must be upper-level and one of the three must be a capstone course in your last two semesters at CC; including this capstone, at least 2 upper-level electives must be OBE courses.
- VIII. **Attend and write abstracts for 3 OBE-approved seminars – first abstract is due junior year!! BEGIN EARLY!!**

FULL GUIDE – 15 units

- I. **(2) Two units in Introductory Organismal Biology:**

BE105 Biology of Plants, *AND/OR*
 BE106 Biology of Animals, *AND/OR*
 BE107 Biology of Microbes

Note: AP/IB credit cannot replace these organismal courses (but may count towards a lower level elective or as credit for MB131, see below)
- II. **(1) BE208 Ecology**
- III. **(1) MB131 Intro to Molecular and Cellular Biology**

An IB-HL score of 6-7 fulfills this requirement or may count as one lower-level elective credit; a Biology AP score of 5 does not fulfill this requirement but does count as one lower-level elective credit.
- IV. **(1) One unit in Population Genetics or Genetics:**

BE280 Population Genetics, *OR*
 MB201 Lab in Molecular & Cellular Biology & Genetics
- V. **(3) Three units in Chemistry:**

CH107 General Chemistry I, *AND*
 CH108 General Chemistry II, *AND*
 CH250 Structures of Organic Molecules

If you have Chemistry AP or IB credit on your transcript, you may obtain OBE credit by receiving a high score on your bypass exam for CH107. Ask the Chemistry Department to notify your OBE advisor about your score on the bypass exam.

Note: Graduate schools often require BOTH CH250 and CH251 Reactions of Organic Molecules.

VI. (2) Two units in Mathematics:

- One unit of calculus from:
 - MA126** Calculus I, *OR*
 - MA127** Calculus I and II accelerated, *OR*
 - MA129** Calculus II, *OR*
 - AP or IB credit** recognized by the registrar in calculus

Note: The Mathematics department website has a flowchart to assist you in deciding on the most appropriate class for you (see "Mathematics", "Resources", "deciding on your first CC math class").

- One unit of statistics or math modeling from:
 - BE220** Biostatistics and Experimental Design, *OR*
 - MA256** Mathematical Models in Biology, *OR*
 - MA117** Probability and Statistics, *OR*
 - MA217** Probability and Statistical Modeling, *OR*
 - EV228** Analysis of Environmental Data, *OR*
 - AP/IB credit** recognized by the registrar in statistics

Note: While the statistics/modeling requirement is fulfilled by AP credit in statistics, students with this AP credit will benefit from taking BE220.

VII. (5) Five approved OBE Electives:

- Of these 5, at least 3 must be upper level (300 or 400) and at least two of your upper level electives must be a BE course;
- One elective will be your senior capstone course: this requirement must be completed in the last two semesters prior to graduation. The following courses count as capstone:
 - BE409 (if it meets the "Senior Capstone" requirements - ask the faculty member supervising your research);
 - BE499 Senior thesis;
 - BE308, BE362, BE365, BE366, BE367, BE370, BE390, BE410, BE412, BE415, BE421, BE475, BE332, BE440 (check with your advisor as options vary from year to year).
- You may choose electives from the following:
 - All BE courses (EXCEPT BE100), all MB courses (the FYE MB109 only counts as 1 elective) AN207, AN306, CH382, EV422, GY205, HK204, HK304, or HK321.
 - Up to TWO research blocks (BE309/BE409/BE499) may count as electives.
 - BE280 may count as an upper-level elective IF taken after MB201 or MB231.
 - AP/IB Biology credit may count as one unit of lower level elective credit (ask your advisor).

Note: you may petition the department to consider other courses (such as new offerings) to count as electives (ask your advisor).

VIII. **Three Seminar abstracts:** attend three OBE-approved seminars as a junior/senior, summarize each in an abstract (see appendix III for example), and submit each abstract electronically to both Donna Sison and your advisor no later than the first Monday of the block following the seminar. Students must turn in at least their first abstract by the end of junior year.

ADVICE ON SCHEDULING COURSES FOR A MAJOR IN ORGANISMAL BIOLOGY AND ECOLOGY

The OBE Major requires that a student earn a C- or higher in 15 courses. Many of these courses must be taken in a prescribed order. We recommend that you try to take at least 4 courses each year that apply to the major. Furthermore, students who want to **study abroad** have to plan carefully, as many study-abroad programs do not provide credit towards the major.

Extracurricular activities, research blocks (BE309/409) and summer research experiences are also important considerations in planning for post-graduate degree programs or employment following graduation. **Summer research experience** is increasingly required for admission to graduate programs including medical school and is essential to qualify for Ph.D. programs. Furthermore, students earning high enough grades to qualify to graduate with distinction should plan to do undergraduate research during the summer between their junior and senior years, because a senior thesis (BE499) is required to graduate with distinction and extensive research and writing time is required to complete a thesis.

The department strives to offer sufficient sections of all courses to meet the needs and desires of our students; however, there is high demand for most OBE courses. OBE majors must consult with the academic advisor to wisely allocate points during registration. By department policy, OBE faculty generally hold to course limits. If you are on the wait list for a course you need/want, show up the first day of class and you may get in. Faculty are not obliged to overload any course, and you should not expect that to happen.

SENIOR CAPSTONE EXPERIENCE – ADDITIONAL INFORMATION

There are two parts of the required senior capstone experience:

1. Complete a senior capstone course during the last 2 semesters prior to graduation
2. Attend research seminars & turn in 3 abstracts

PART 1: PASS AN APPROVED SENIOR CAPSTONE COURSE

Students may fulfill the capstone course requirement by completing a senior thesis (BE499), completing a research block that requires a substantial written research report with literature background (e.g. BE409, if the supervising faculty member requires that the student meet the capstone course description and the department approves a petition – find petition form online) or successfully completing a designated capstone course that draws upon a body of knowledge, perspectives, and experiences developed over the entire course of the OBE major (see above for a list of approved capstone courses). A capstone experience must be integrative across more than one level of biological organization, e.g. genome/metabolism/organism, genome/organism/evolution, or genome/physiology. Moreover, a capstone course must include at least two of the following elements: a critique of primary literature; a seminar-style discussion of primary literature; a written proposal, oral presentation, or paper that requires synthetic thinking; substantive opportunities designed to broaden student understanding of inquiry and research methods in OBE. A course may only fulfill the capstone requirement if taken during the last two semesters before graduating; the intent is for students to bring to a given course the full complement of their biology education at Colorado College.

Following completion of a senior capstone course, students will be able to:

- Critique primary literature, providing theoretical context for the literature discussed
- Analyze a body of research including primary literature, explain application and relevance of the findings, and describe potential future directions of the research topic
- Select appropriate primary literature papers relevant for a research project, seminar, or research proposal
- Organize information from multiple sources (primary literature, review articles, original research) into a cohesive oral presentation or written report or proposal. Presentations or reports may be of any length (as decided by the supervising faculty) but should provide evidence of synthesis of information across levels of biological organization

If you have questions concerning these requirements, see your academic advisor in the OBE Department.

PART 2: BIOLOGY RESEARCH SEMINARS & ABSTRACTS

Majors must submit satisfactory abstracts from 3 OBE-approved seminars. Attend acceptable seminars (see below), summarize, and email each abstract to both Donna Sison (dsison@ColoradoCollege.edu) and your advisor *by the first day of the block following the seminar*. Abstracts submitted after this day will generally not be accepted. You must declare an OBE major and be a junior or senior before abstracts can count. Declared majors receive e-mail notices of OBE seminars, which are also on the departmental web page.

ACCEPTABLE SEMINARS

- OBE Department seminars, including the keynote address at OBE Day;
- Biology seminars at UCCS, CU, CSU, DU, CU medical school, and Penrose or Memorial Hospitals;
- Selected seminars from other science departments at CC. In your abstract clearly link the seminar to OBE.

Ask your academic advisor before you attend non-OBE seminars.

- Not eligible: student presentations, including OBE Day talks.

FORMAT FOR ABSTRACTS

- Limited to one printed page.
- See Appendix III for an example. Each abstract must be clear, concise, well-written, and complete to be accepted by your advisor and the department.
- Follow the spirit of the CC Honor Code; this obviously includes attending the seminar and writing the abstract in your own words.

UNDERGRADUATE RESEARCH / TRAINING OPPORTUNITIES

A. Supervised Research in Organismal Biology and Ecology:

1. Research Blocks (BE309/409) These blocks allow students opportunities to pursue a research project under supervision of a faculty member for credit. Faculty specialties are described on the website. Projects may be done at any time, but credit is awarded in a single block. [Students may also sign-up for BE309 or 409 extended formats for one-half unit of credit.] **Not more than 2 units** from BE309, 409 and 499 can be used toward the OBE major, and only 1 unit of research from an off-campus program may be applied to the major.

Begin talking with a faculty member in the area of your interest before you consider enrolling in BE309 or BE409. A faculty member must agree to work with you before you can register for BE309/409. If a faculty member agrees to supervise your research and is not scheduled for BE309/409 Research in OBE that block, the Registrar will create a course for you. Please note: BE309 cannot count as a capstone course. **We strongly encourage all BE309 and BE409 students to present their research on OBE Day.** Talk to your advisor about this opportunity. **A petition is required if conducting research off-campus under supervision of a non-CC faculty member.** Not more than 1 unit of research from off-campus work can be used toward the OBE major.

2. Other research opportunities in OBE (not for course credit) - Many faculty take research students during the academic year and summer. Check the [People](#) page on the OBE website for links to faculty webpages and descriptions of their research interests. If

you are interested in working with a professor, contact her or him directly. Our faculty have active and diverse ongoing research in which students can gain valuable research experience and faculty can also help students develop their own project. We encourage and financially support collaborative student-faculty research projects through OBE grants such as the Enderson, Carter, Kelso, Stabler, and Hevey Funds. These opportunities provide excellent experience for students interested in graduate school or those planning on becoming part of a research team upon graduation.

- B. **Senior Thesis (BE499):** Students planning professional careers requiring research experience are encouraged to complete a senior thesis. Select an area of concentration in the sophomore or junior year. Research performed in BE309 or 409 can be the basis of a thesis. Students may sign-up for one full block of BE499 or for an entire year of BE499 extended format (must be initiated by the beginning of block 1 for the senior year). See section on Senior Thesis for details.
- C. **Off-campus - Research Experience for Undergraduates (REU):** The National Science Foundation awards REU grants to universities and field stations, which in turn fund undergraduate research, mainly during summers. These typically provide room and board and a stipend for about 10 weeks. These are usually excellent quality programs, and a number of students have written senior theses based on REU experiences. Institutions award REU grants to students based on applications, which are due usually in January and February (some as late as May – you should consider preparing applications over winter break). Search online for NSF REU programs to find these opportunities.
- D. There are many opportunities for summer work in ecology, field biology, and environmental science on the listserv **EVINTERNSHIPS**: These listings also include a number of laboratory jobs of various sorts, including molecular approaches to questions that relate to multiple aspects of biology, and are not limited to ecological opportunities only. Students with an interest in lab-based biology are also encouraged to participate in this listserv. If you have an email account at Colorado College, you may request to subscribe or unsubscribe from this list by accessing <http://listserv.coloradocollege.edu/archives/HTML/EVINTERNSHIPS.HTML>
- E. **Department Opportunities - Not for Academic Credit:** The OBE Department offers a **tutoring program**. Junior and senior OBE majors are available to assist students in all core classes in the department. Students interested in earning some extra money, and who are interested in a teaching career or graduate school are encouraged to become a department tutor. For information on becoming a tutor please contact the OBE paraprofessional. Students wishing to participate in the program can obtain the names and phone numbers of tutors either from flyers posted in their classroom or from the OBE paraprofessional. Those students needing to be tutored should keep in mind that finding an available tutor takes time and planning. The student must find a tutor who is available, and the tutor must contact the paraprofessional in charge of the program before a tutoring session can be scheduled. Students who call a tutor the night before an exam should not expect to be tutored that evening. If you are worried about a particular class but are not positive that you will require the assistance of a tutor, call a few tutors to determine who will be available that block and will best fit your needs.

NOTE: All Students who work and receive wages from the OBE Department budget must fill out the proper form in the Financial Aid Office before they can be hired. Final selection of students for department jobs will be made by the OBE Department.

GUIDE TO OFF-CAMPUS AND STUDY ABROAD CREDITS for the OBE MAJOR

*Before you narrow your options for study abroad/off-campus semesters, be sure to talk with your **adviser in OBE** to discuss the fit of programs fit with your academic goals and your expectations for OBE credit.*

OBE faculty view semesters and courses abroad as an opportunity to gain international and cross-cultural experience, an important part of a liberal arts education, and to gain experience in ecology and organismal biology. And while some OBE students do a semester abroad, other students take blocks abroad taught by OBE faculty, which currently include study in Belize, Patagonia, and Tanzania. Since many non-CC programs have substantial non-biological components and because we value OBE courses at CC, we limit the number of credits transferred from non-CC programs to 1 or 2.

We award credit for two levels of programs. For programs with limited prerequisites, we do not require *BE208 Ecology* before participating, and you will receive 1 lower-level elective toward the major. For programs with substantial prerequisites, you must complete *BE208 Ecology* before the program; and usually 1 upper-level elective credit is possible, often with 1 lower-level elective [note: see the list below for details]. Elective credit for study abroad programs is based partly in preparation for an abroad experience as well as personal knowledge of listed programs from OBE faculty.

For field programs with independent or directed research, we have seen that students who have taken a statistics course return with much stronger projects, so we very strongly encourage you to take a statistics course before an off-campus program with a research project. Some programs allow non-biological research, e.g., physical oceanography or sociologically-oriented conservation research. While you will benefit from research in these fields, these projects do not merit OBE credit.

The process of receiving approval for a course taken on a non-CC study abroad semester program to count towards an OBE requirement is submitted and recorded through the *CC Internal Application for Off-Campus Study* process via Summit. You can see all pre-approved courses in the Course Approval Database on the Center for Global Education & Field Study website, and students can search by OBE-specific approvals. If you intend to take a course abroad that is not already listed as approved, you can submit a new course approval request via your Summit application, and the OBE chair will review and approve that course for possible OBE credit.

Off-Campus Study Programs – Important Points

- Before participating in an off-campus/study abroad program for OBE credit, you must declare as an OBE major, take at least one OBE course toward the major, and discuss with your OBE adviser how a program fits with your educational goals.
- Plan for substantial lead time with the Center for Global Education & Field Study: The *CC Internal Application for Off-Campus Study* must be completed in Summit at the beginning of the semester *before* the one you wish to study abroad (no later than March 1 for Fall semester programs, and October 1 for Spring semester programs). Summit will then request approval from your academic adviser, to verify that you've discussed your study-abroad plan with your adviser and that this plan fits with your academic path towards the OBE major.
- Students usually go abroad in their junior year, but occasionally as second-year students, or in the fall semester of their senior year.
- Note that not all CC-approved programs earn credit toward the OBE major; see the list below. Any other program requires additional approval through the Summit process for courses to potentially transfer.
- Courses with Ecology in the title do not substitute for *BE208 Ecology*.
- Grades from most approved CC partner study abroad programs generally do not transfer over to CC transcripts; only credits/number of units and course title are listed. You must receive a grade of C- or higher to receive transfer credit.
- Only very rarely does research from these programs meet requirements for a senior thesis.
- OBE generally recommends that you take both BE208 Ecology as well as a statistics course before attending an abroad program – this will help enrich your abroad learning experience, particularly if you conduct research on an abroad program.
- Courses completed prior to enrolling in college, e.g., in a gap year or semester, do not count toward the OBE major.

Field Programs Approved for OBE Credit

BE208 Ecology NOT a prerequisite for credit

- School for Field Studies (SFS) semester
 - Costa Rica – Sustainable Development Studies: 1 lower-level elective
 - Panama – Island Biodiversity: 1 lower-level elective
 - Tanzania – Wildlife Management Studies: 1 lower-level elective, or 1 lower- & 1 upper-level elective if a student has taken BE208 before studying abroad
- School for International Training (SIT): 1 lower-level elective
 - Australia – Rainforest, Reef, and Cultural Ecology
 - Ecuador – Comparative Ecology & Conservation
 - Iceland and Greenland – Climate Change and the Arctic
 - Madagascar – Biodiversity & Natural Resource Management
 - Panama and Costa Rica – Tropical Ecology, Marine Ecosystems, and Biodiversity Conservation
 - Tanzania – Wildlife Conservation & Political Ecology
 - Tanzania/Zanzibar – Coastal Ecology & Natural Resource Management
- IES/USFQ Quito Galapagos Program: for the two ecological tracks, 1 lower-level elective.
- Carleton Global Engagement: Ecology & Anthropology in Tanzania
- ACM Oak Ridge Science Semester – This research semester at the National Laboratory in Oak Ridge, TN tends to lean more towards chemistry and physics, but sometimes students have been able to do biological research projects. Check with your OBE advisor, and see the program website to review the faculty director's focus for that semester (it changes), and available research projects.

BE208 Ecology a prerequisite for credit

- SEA Semester. Of their many programs, the three directed at advanced science students currently merit OBE credit. Prerequisites for these are 3 lab science courses, including 1 at the 300-level or higher, or consent of instructor. OBE credit: 1 lower-level elective and 1 upper-level elective if your research is biological
 - Oceans and Climate: Oceans in the Global Carbon Cycle
 - Marine Biodiversity and Conservation
 - Caribbean Reef Expedition: The Ocean & Global Change.
- Organization for Tropical Studies (OTS) Semester in South Africa: 1 upper- and 1 lower-level elective.
- Semester in Environmental Science at the Marine Biological Laboratory (Woods Hole, MA). Prerequisites include introductory biology (but for OBE upper-level credit you must take BE208 Ecology before this program), 2 blocks of general chemistry, and

either calculus or statistics (both would be great). The program will give you 2 upper-level OBE electives.

Traditional Academic Institutions Abroad

In most situations, students should take the basic requirements for the OBE major at CC; we will consider exceptions by petition. For OBE credit, you will need to document the course content through syllabi, copies of exams, textbooks, and discussion with the department member who teaches the equivalent course. Normally, courses with Ecology in the title do not substitute for BE208 Ecology. Only courses that require at least 2 prerequisites in Biology may count as upper-level electives, and these must be approved as upper-level credit by the OBE chair in advance via Summit. Substituting courses in other departments, such as Chemistry, requires written approval by that particular department.

Other CC-Approved Partner Programs Offering Courses Appropriate for OBE Majors

See the website of the CC Center for Global Education & Field Study for more information.

- Boston University Science Semester in Madrid. Prerequisites: CH107, CH108, MB131 Introduction to Cell and Molecular Biology. Molecular Biology has found too much overlap between MB131 and the cell biology class in this program, CAS BI 203: Cell Biology, so OBE does not award credit for CAS BI 203. You will receive credit for CH250 Organic Chemistry I.
- DIS Denmark Program. Polar Biology and Marine Mammals and their associated labs and field trips will each receive 1 lower-level CC credit. Climate-related courses and health/medicine related courses may also receive one unit of lower-level elective credit.
- EuroScholars. A program for advanced and talented undergrads to take one course and do research in several top European universities. We will arrange credit on a case-by-case basis.
- IFSA (Institute for Study Abroad) - directly enroll in host universities around the world. Popular programs include those at James Cook University, Australia, and Otago, New Zealand; you can search by academic subject on the IFSA website. Check semester hours (4 U.S. semester credits = 1 CC unit) and prerequisites for courses. Maximum credit is 1 lower-level elective and 1 upper-level (if you have taken BE208 before going, and that course has enough prerequisites).
- Quest University, Canada. Each year, CC and Quest (also on the block plan) exchange a few students for 2 to 4 blocks. Credits vary so consult first with your departmental adviser and then with the department chair.

SENIOR THESIS AND GRADUATION WITH DISTINCTION IN ORGANISMAL BIOLOGY AND ECOLOGY

Any senior OBE major may elect to undertake a senior thesis. A senior OBE major who completes a high quality senior thesis, presents it orally at OBE Day, and has a high grade point average (for details of the GPA requirement see the section on Graduation with Distinction below) will receive Graduation with Distinction. This honor will be recorded on the student's official transcript and noted on the commencement program at graduation. If a student meets the senior thesis and presentation requirements, but does not have a high enough grade point average, s/he will not receive Graduation with Distinction, but the successful completion of the senior thesis requirements will become part of the student's official transcript under BE499 Senior Thesis.

CHECKLIST to graduate with distinction in Organismal Biology and Ecology

1. Complete an OBE senior thesis with a grade of A- or above and
2. From the courses taken for the OBE major, achieve a GPA of at least 3.7 for the 10 courses with the highest grades. If a student does not have seven or more grade track courses, e.g. is a transfer student or a student taking the MBL Semester in Ecosystem Science, a faculty member may nominate the student for consideration for distinction by a departmental vote.

SENIOR THESIS

The option of undertaking a senior thesis must be initiated by the student and approved by an OBE Department faculty member (primary research advisor), who will supervise the student's research and senior thesis. In addition, another faculty member (who may be in another CC department if the area of research falls under the other faculty member's area of expertise) must agree to act as a secondary advisor. (Faculty members may decline to be thesis advisors because of other commitments.) The primary and secondary research advisors comprise the thesis committee. The thesis committee will establish the format and requirements of the research and thesis, read and suggest revisions in the thesis, and determine whether the thesis is of sufficient quality to qualify for Graduation with Distinction. Ideally, the decision to write a senior thesis should be made in the fall of the junior year so that the spring may be devoted to a survey of the literature and planning for the research. The research itself should begin by the following summer. Work on the writing of the research must begin by the fall of the senior year. The senior thesis is based on original research done by the student. A literature review, although a necessary part of a senior thesis, is not in itself considered to be a thesis.

OFF-CAMPUS RESEARCH

Off-campus research projects done in such programs as the Oak Ridge Semester, SEA Semester, research at another institution, or other approved research experience at a laboratory or field station may be used for the research on which a senior thesis is based. Students should be aware, however, that sometimes research supervision in these programs is not very good, and that they could end their off-campus program without having obtained suitable data for a senior thesis. A student should approach a CC OBE faculty member about being the student's primary research advisor **before the student undertakes the off-campus research**. When the student returns to CC after finishing the off-campus research, the primary thesis advisor will determine whether the results of the student's off-campus research project is worthy of a senior thesis. **Students are additionally cautioned that the actual writing of the senior thesis based on off-campus research must be done by working closely with the CC OBE Department faculty member who has agreed to be the student's primary research advisor.** In this case the primary thesis advisor supervises the data analysis and writing of the thesis, rather than supervising the actual research.

REGISTRATION FOR SENIOR THESIS

Students undertaking a senior thesis must return a completed form (Appendix IV) entitled, *Registration for Senior Thesis*, by the end of block 2 of the senior year, to the coordinator of the Senior Thesis/Distinction program. Students must arrange for a thesis committee consisting of a primary research advisor, who must be an OBE Department faculty member, and a secondary advisor, who may be in another academic department. An oral presentation advisor, normally the primary research advisor, is also necessary. These advisors must sign the registration form before it is turned in to the Senior Thesis/Distinction coordinator

ENROLLING IN BE499 SENIOR THESIS

By the end of block 2, students planning to do a senior thesis should be enrolled in BE499 Senior Thesis through the Registrar's Office. Enrolling in BE499 and completing the OBE Department's requirements for a senior thesis will provide an official record of the senior thesis on the student's transcript. There is an option of enrolling in BE499 as a regular block course or enrolling in BE499 as a FULL YEAR extended format course. Students may enroll in one extended format course per semester for ½ CC unit at no extra tuition cost (in the case of BE499 students therefore **must** enroll for both semesters, thus obtaining a whole unit of credit). The instructor for BE499 should be the primary thesis advisor.

ORAL PRESENTATION OF THESIS

In addition to the written senior thesis, a student must make a high-quality oral presentation of the thesis research and results. Ordinarily, this presentation will be at the annual spring OBE Day. The presentation is prepared under the supervision of at least one OBE faculty member who is also part of the thesis committee. Normally the oral presentation advisor is also the primary research advisor for the senior thesis, unless circumstances dictate otherwise. The student's oral presentation advisor will help the student fit the presentation into the time available at OBE Day, make suggestions about organization and the preparation of slides, and help set the level of the talk appropriate for the CC audience. The talk must be a well-planned, rehearsed, understandable, and professional presentation of scholarly work. **Students who do off-campus research as a basis for their senior thesis are cautioned that they must work closely with their CC advisor to prepare their talk, even if they have orally presented the results previously as part of their off-campus research experience.** This will help ensure that the presentation will meet the OBE Department's standards of quality.

The student must inform the faculty coordinator of OBE Day of his or her intention to give an oral presentation at OBE Day and must submit an abstract of the presentation for the OBE Day program. The OBE Day coordinator will send instructions for the abstract via campus mail or e-mail to all those students who have submitted a form declaring their intention to write a senior thesis (see section on Registration for Senior Thesis); however, it is the student's responsibility to check her/his Worner box and e-mail regularly and make certain that her/his abstract is submitted in a timely manner.

Note: Any student may request to present their results from a research block (such as for BE309/409) at the OBE Department's annual OBE Day. Because of time limitations for oral presentations of students attempting to qualify for Graduation with Distinction, however, other student presentations at OBE Day will usually be in the form of a poster. The coordinator of OBE Day will make the final decision about the format of research presentations at OBE Day.

Students attempting to graduate with distinction in December must discuss their situation with their advisor and the Department Chair to arrange for fulfilling the oral presentation requirement outside of OBE Day.

TURNING IN THE FINAL COPY OF THE SENIOR THESIS

By the first Friday of Block 8, a final, clean, and professional-looking original of the thesis, signed by the thesis committee (on a title page as shown in Appendix II of this handbook) must be turned in to the OBE office. By signing, the thesis advisors have judged that the written thesis meets the standards of quality necessary for Graduation with Distinction.

The thesis must also be submitted to the library, which only accepts electronic copies. The student should use their last name and tiger number to log in to the following website: <http://discovery.coloradocollege.edu/etd/>. After logging in, they will be prompted with instructions on how to complete the submission.

For a detailed overview of the thesis submission process, covering everything from how to get departmental and personal

bound copies to submitting a thesis electronically, see <http://coloradocollege.libguides.com/content.php?pid=345211>.

DEPARTMENTAL AWARDS TO STUDENTS

The Mary Alice Hamilton Award

Each year the OBE faculty selects one or two outstanding senior biology majors as the winner of the Mary Alice Hamilton Award. Among other things, grades, research, and potential to become a professional biologist are considered in making the award to the outstanding biology major(s). Winners will be announced at Honors Convocation each spring. The award is usually a book appropriate to the professional interest of the recipient.

The Richard and Reba Beidleman Award

Each spring the OBE faculty selects a student recipient for the Richard and Reba Beidleman Award. The student must have demonstrated through courses, fieldwork, or other activities, outstanding potential for becoming a professional ecologist and/or field biologist. The award recipient, who may be in any year of study, will be announced at the annual Honors Convocation.

The James Enderson Award in Conservation Biology

The Enderson Award in Conservation Biology honors Professor Jim Enderson, who joined the Biology Department in 1962, long before it was fashionable to call oneself a "conservation biologist." Throughout his career, his research centered on the precipitous decline of birds of prey and in particular the peregrine falcon. He was first to breed the temperate North American peregrine in captivity, a line used extensively in restoration of the western population. He served on several recovery teams and working groups for endangered species. At Colorado College he inspired students through independent projects to pursue careers from botany to ornithology, in the lab and in the field. In keeping with his scholarship and breadth as a biologist, the Enderson Award will honor a junior or senior Biology major whom, in the opinion of the faculty, has shown commitment and productivity in an original research project in conservation biology. Candidates are eligible if their work has conservation implications, whether the focus was molecular, organismal, or ecosystem, lab or field.

The Laboratory Biology Award

This award is made to a senior OBE major whose interests and course work are mainly in the area of laboratory-based biology. The criteria for selecting a recipient for this award are the following: grades in biology courses with a laboratory component, engagement in lab-based research, preferably for a senior thesis, and plans for post-graduate work or study.

The Jason Wilkes Memorial Prize

Each spring the OBE faculty may select a minority student who is a declared biology major to receive this award. The recipient, like Jason, must have a strong interest in biology.

FUNDING FOR UNDERGRADUATE WORK AND RESEARCH OPPORTUNITIES

Aside from The Colorado College student aid program, there are other available funds for financial assistance in this department.

- A. **Venture Grants.** The Venture Grant Committee awards funds for research projects under the guidance of a professor. Funds may also be granted to permit students and faculty to attend scientific meetings and conferences. Application forms and further information are available in the Dean's office.
- B. **Departmental Budget** and Departmental research funds (e.g. Enderson, Stabler, Kelso, Carter, & Hevey Funds)
 - ask the OBE Department chairperson about the availability of these funds for student research opportunities.

APPENDIX I

CHECK LIST OF IMPORTANT ITEMS AND EVENTS: Use this checklist to track your progress through the requirements for the OBE major and graduation

1. Spring of Sophomore Year
 - A. Obtained an advisor in OBE []
 - B. Applied for Major in OBE..... []
 - C. If pre-health, have a file in pre-health advising office []
 - D. If pre-K-12 education, have contacted Education Department chair..... []

2. Fall of Each Year
 - OBE Majors Meeting [] [] [] []

3. Spring of Each Year
 - Attend OBE Day..... [] [] [] [] []

4. Preregistration of Junior Year
 - Check graduation requirements before scheduling senior year []

5. Spring of Junior Year
 - Make plans for senior thesis, Graduation with Distinction, if desired []
 - If considering graduate school, find 5-6 appropriate programs and learn their admissions requirements and application deadlines..... []

6. Departmental Seminars: Attend department seminars, write abstracts of three presentations to be turned in during the junior and senior years..... [] [] [] []

7. Senior Year Capstone Experience
 - A. Seminars and abstracts []
 - B. Senior capstone course []
 - C. Students who are attempting to graduate with distinction (honors) in OBE
 - Register for senior thesis by the end of Block 2 []
 - Sign up for BE499 by the end of Block 2 []
 - Sign up to present at OBE Day..... []
 - Turn in beautiful final, signed copy of thesis []

8. Items to Consider during Senior Year (if planning to go to graduate school at some time):
 - A. Register for GRE General Test (you can take it later as well) []
 - B. Secure letters of recommendation..... []

CHECKLIST to complete the **OBE** major.

1. **Two** introductory Organismal units:.....[] []
 - List courses taken to fulfill this requirement here:
2. BE208 (Ecology)..... []
3. MB131 Intro to Molecular and Cellular Biology..... []
4. BE280 (Population Genetics) OR MB201 (Genetics Lab)..... []
5. **Three** units in **Chemistry**
 - CH107 (General Chemistry I) []
 - CH108 (General Chemistry II) []
 - CH250 (Structures of Organic Molecules) []
6. Two units of **Mathematics** including:
 - One** unit of **calculus**: []
 - List course taken to fulfill this requirement here:
 - One** unit of **statistics** or mathematical modeling: []
 - List course taken to fulfill this requirement here:
7. **Five** approved OBE electives [] [] [] [] []
 - Three must be courses at the 300 level or higher (incl. at least two BE)..... [] [] []
 - List courses taken to fulfill this requirement here:
8. Senior Capstone Experience
 - **Three** seminar abstracts [] [] []
 - Complete an approved Senior Capstone Course (one of your 5 electives)..... []
 - List course taken to fulfill this requirement here:

CHECKLIST to complete undergraduate courses required by most M.D. programs

(check the specific programs to which you plan to apply!)

Access Health Professions Advising webpage at <http://www.coloradocollege.edu/healthprofessions>Meet with Health Professions Advisor, **Jane Byrnes**, MSA, each semester to discuss plans for pursuing a health profession. Maintain a 3.5 GPA to be competitive. If GPA is lower, can look at a Post-Bac or Masters Program to improve application.

Take Pre-requisite courses:

- Biology-2 intro courses: BE106, BE107, MB131..... [] []
This is a bare minimum; additional coursework in Biology is STRONGLY recommended.
- Chemistry – 4 courses: CH107, 108, 250, 251..... [] [] [] []
Summer versions of general chemistry and organic chemistry also fulfill the requirements but may have slightly different course numbers. Some students find CH382 useful before taking the MCAT. Pre-health students from high schools that did not offer AP or IB calculus should probably complete MA125-6 before enrolling in CH107.
- Physics – 2 courses: PC141, 142 or PC241, 242 (Calc. based)..... [] []
- English – 2 courses: 1 literature course and 1 writing intensive course..... [] []
- Math – 2 courses: Stats MA117, Calculus MA126, 129 [] []
Check with pre-health advising if you have AP or IB credit in math.

Recommended courses include:

- Biochemistry CH382 (highly recommended)
- Genetics MB231
- Psychology PY100
- Human Anatomy HK207
- Human Physiology HK206

Do not take prerequisite courses pass/fail.

Get on Health Professions mailing list for information about speakers, Health Professions Club, volunteer and internship opportunities.

Join the Health Professions Club and other organizations of interest.

Develop leadership skills through organizations and clubs.

Get experience in the field of health care. Can acquire licenses i.e.: CNA, EMT.

Get experiences shadowing professionals in that field (Physicians, Dentists, and Vets).

Get community service experience (i.e.; homeless shelters, habitat for humanity, soup kitchen, foundations, etc.)

Get research experience.

Take MCAT, DAT, GRE - earliest would be Summer after Junior year.

AP credits may transfer, but not at all schools. Will need to take higher level courses in that department.

Apply end of junior year (at the earliest). One to two years post-graduation is recommended.

Medical admissions favor those who apply early in the application cycle due to rolling admissions.

Veterinary schools may emphasize a science major requirement or favor graduates with a science degree. It is worth examining the admissions policy of any veterinary schools of interest.

Other health professions schools, including Veterinary Medicine, Nursing, Podiatry, Physical Therapy, Optometry, Pharmacy, and Physician Assistant programs, are likely to have other specific course requirements and are not as standardized as Medical and Dental school requirements. It is important to consult information from specific schools before completing plans for an academic program.

Students today are often waiting a year or more after graduation before applying to a health professions school. This does not put the applicant at a disadvantage; many medical schools look favorably upon applicants who have taken an extra year or two to mature, gain work experience, and thus make a better decision regarding a career in health professions.

APPENDIX II

SAMPLE FORM

"TITLE OF THESIS"

A Senior Thesis Presented to
The Faculty of the Department of Organismal Biology & Ecology,

Colorado College

By

"Your Name"

Bachelor of Arts Degree in Organismal Biology & Ecology

____ day of May, ____

Approved by:

Primary Thesis Advisor

Secondary Thesis Advisor

TITLE OF THE SEMINAR

Date of the seminar

Name and title of presenter

Location of the seminar

ABSTRACT BODY--precise and concise, but complete, summary of the presentation. Focus on the main points and conclusion(s)

EXAMPLE:

"Stress, Social Rank and Personality: Studies of Wild Baboons"

December 11, 1991

Dr. Robert Sapolsky

Department of Physiology, Stanford University

The olive baboons of the Serengeti in East Africa were chosen for this study for a number of reasons, one being that it was possible to study these baboons in the wild. Furthermore, these baboons have an organized system of socialization both behavioral and psychological, including a hierarchical ranking system similar to human beings. The initial purpose of this study was to explore the mechanisms that enable bodies to deal with stress. The original question was to determine if the baboon's health and stress levels were connected to their social rank.

Glucocorticoids are hormones that in abundance cause diabetes, hypertension and ulcers in humans, as well as increase the opportunities for other diseases. The amount of glucocorticoids in the baboons was measured by taking blood samples. The results indicated that lower ranking baboons had increases in the levels of glucocorticoids in their bloodstreams. In addition, they were sluggish in turning these compounds on and off. In contrast, the higher-ranking baboons in a troop had lower levels of glucocorticoids and were able to turn them on and off faster. Therefore, it might follow that the lower ranking baboons had a higher level of stress due to increased levels of glucocorticoids in the bloodstream.

However, another aspect of this study involved identifying different personality types among the baboons. Knowing when or when not to fight, knowing when you have won or lost a fight, being successful at making allies, having friends and displacing aggression are categories which all deal with the individual personalities of the baboons. Even while a baboon may be at the top of his troop, life could still be extremely stressful. For example, if a troop is unstable and constantly fighting within themselves to obtain a rank, surely this is more stressful than a troop that is relatively stable and peaceful. Therefore, the study concluded that personality precedes rank in determining a baboon's ability to deal with stress and thus, remain healthy.

(Actual student abstract, submitted 1991-1992.)

Your name (typed)

Honor code upheld

APPENDIX IV

REGISTRATION FOR SENIOR THESIS

Return this form to the Senior Thesis/Distinction Coordinator by the end of Block 2.

Student's name (print or type)

Planned Date of Graduation (Month/Year)

Local phone number

Local address

I plan to complete the requirements for senior thesis in Organismal Biology and Ecology. These requirements are: 1) writing a high quality thesis based on original research and presenting the thesis orally at the OBE Department's annual OBE Day in the spring semester. I have read the sections in the *OBE Majors' Handbook on Senior Thesis and Graduation with Distinction*, and by filing this form, I understand that the requirements for Senior Thesis must be completed according to the schedule given in the *OBE Majors' Handbook*. I understand that coordination, scheduling, and completion of the thesis and oral presentation are the student's responsibilities.

I further understand that if I qualify for a senior thesis **and** I meet the minimum grade point average criteria as given in the *OBE Majors' Handbook*, I will be awarded **Graduation with Distinction in** Organismal Biology and Ecology.

I certify that I have enrolled in BE499 Senior Thesis as a regular block course or as an extended format course during my senior year.

Signature

My research will be (was) done at _____

Under the supervision of _____.

Thesis committee (signatures required below):

Primary advisor (must be in the CC OBE Dept.)

Secondary advisor (may be in another dept.)

Oral presentation advisor (usually the same person as the primary advisor)

=====

STUDENTS: DO NOT WRITE BELOW THIS LINE

Date form filed:

Date of Thesis completion:

Thesis meets standards senior thesis? YES NO

Date of oral presentation:

Oral presentation meets standards for senior thesis? YES NO

Overall GPA: _____ GPA in OBE courses: _____

Graduation with Distinction in OBE granted? YES NO

APPENDIX V
DEPARTMENT OF ORGANISMAL BIOLOGY AND ECOLOGY
PETITION FOR OFF-CAMPUS RESEARCH CREDIT
BE309 OR 409

Instructions: This petition requesting Off-Campus credit for a BE309/409 research project is to be completed in full and handed to the Chair or Associate Chair of the Department of OBE, BY THE BEGINNING OF THE ACADEMIC BLOCK PRIOR TO THE INTENDED STARTING DATE OF THE PROJECT. This deadline is enforced. Please do not ask for an exception!

Research directly supervised by a member of the CC OBE faculty does not require this departmental petition. See the OBE Majors' Handbook for guidelines on off-campus studies, research and transfer credit. Print or type the information below. Only one unit of off-campus research credit (BE309 or 409) may be counted for the OBE major. A maximum of two off-campus units may be counted toward the major, only one of these may be BE309 or 409.

Name of Applicant _____ Date _____

Local Address _____ Phone _____

Credit desired: BE309 or BE409 (circle one)

Do you have (or have you requested) other off-campus credit for the major? _____

If yes, explain below:

Class standing of applicant: _____ Name of your academic advisor: _____

Is this course needed for graduation? _____ for the OBE Major? _____

Courses (numbers) completed toward the OBE major: (attach a COPY of your transcript) _____

Has the registrar approved all-college credit for this study? _____

Explain:

Attach a concise and comprehensive description of the off-campus study to be done (you should type your answer on a separate page and attach to this form - one page maximum).

Method of summarizing the results of the off-campus study (see major's handbook). You may answer below or on a separate page as above.

Location of off-campus research _____ Dates of research _____

Name, title, address, and telephone number of person at that institution who will supervise and evaluate your research (see back also):

Name & Title: _____

Address: _____

Telephone: _____ Email: _____

PETITION FOR POTENTIAL BE309 OR 409 CREDIT --continued

TO BE COMPLETED BY PERSON SUPERVISING THE RESEARCH OFF CAMPUS

Are you willing to sponsor, supervise and evaluate the student research project proposed above? _____

Are you willing to submit a written evaluation of the student's research project after its completion? _____
Please explain the nature of your intended evaluation:

Are adequate research facilities, supplies and support available for the student to undertake the project? _____
Explain briefly, as necessary:

Additional comments (please attach a letter if needed):

Off-campus supervisor signature

Date

TO BE COMPLETED BY THE STUDENT

I understand and agree to the OBE Department guidelines for off-campus research and to the requirements and evaluation methods set by the CC OBE Department and my on-campus advisor:

Student signature

Date

TO BE COMPLETED BY THE CC FACULTY SPONSOR AFTER ABOVE IS COMPLETED

As this student's on-campus advisor, I have evaluated this student's proposal and am willing to administer the study for the department. I agree to evaluate the research and submit a grade for the BE309 or 409 credit to the registrar. The student will enroll in the BE309 or 409 under my name.

CC OBE Faculty supervisor signature

Date

TO BE COMPLETED AFTER THE STUDY, BY THE CC OBE FACULTY SPONSOR

I certify the student has successfully completed all requirements and should receive a unit of credit for the study.

Credit received: BE309 or BE409 (circle one)

CC OBE Faculty supervisor signature

Date

FOR DEPARTMENT USE ONLY--DO NOT WRITE BELOW THIS LINE

Date Application Filed: _____ Request for: _____

Application: Approved Denied

Comments:

Unit of BE309 or BE409 credit granted: _____

APPENDIX VI
DEPARTMENT OF ORGANISMAL BIOLOGY AND ECOLOGY
PETITION FOR BE409 TO COUNT AS A SENIOR CAPSTONE COURSE

Instructions: This petition requesting that a BE409 course be counted as a Senior Capstone Course is to be completed in full and handed to the Chair or Associate Chair of the Department, BY THE BEGINNING OF THE ACADEMIC BLOCK PRIOR TO THE INTENDED STARTING DATE OF THE BE309/409 course. This deadline is enforced. Please do not ask for an exception!

Name of Applicant _____ Date _____

Phone _____

A course may only fulfill the capstone requirement if taken during the last two semesters before graduating.

When will you graduate? _____

When will you take the BE409 that you want to have serve as a senior capstone experience?

School Year (e.g. 2016-17) _____ Block _____

What is your research question for BE409?

How will your BE409 course require you to integrate across more than one level of biological organization (e.g. genome-metabolism-organism, genome-organism-evolution, genome-physiology-population-ecosystem, etc.)?

Mark all of the following elements that will be included in the BE409 course. A minimum of two are required for the course to count as a senior capstone.

- a critique of primary literature
- a seminar-style discussion of primary literature
- a written proposal, oral presentation, or paper that requires synthetic thinking
- substantive opportunities designed to broaden student understanding of inquiry and research methods in biology.

We strongly advise you to arrange to present your BE309/409 research at OBE Day. Discuss this possibility with your BE309/409 research mentor.

Name and signature of CC faculty member who will supervise this BE309/409 project. Signature indicates that the faculty member agrees that the BE309/409 will meet the requirements for a Senior Capstone.

Name & Signature: _____

Block & Date: _____