BIOLOGY HONORS PROGRAM
Class of 2019

I. General Description

Seniors may elect Biology 498/499, which consists of one course in the first term (BIOL-498) and two courses in the second term (BIOL-499D), and may lead, upon satisfactory completion of the program, to a degree with Honors in Biology. Honors candidates carry out an original research project and submit a written thesis under the supervision of a member of the departmental faculty and guidance of a three-member Thesis Committee. Candidates present a formal seminar to explain their research project to the Department in the fall, and a second formal seminar to the Department in the spring to present their research findings.

II. Entering the Program: Choice of Advisor

A student must obtain the approval of the department and of the faculty member who is to be the thesis advisor. A few weeks before the beginning of pre-registration, the Biology faculty will arrange an invitational meeting with students who are considering enrollment in the Honors Program. At this meeting, faculty will briefly present the parts of their research programs that are amenable to Honors research. During the following week or two, the prospective Honors student should arrange an appointment with each faculty member with whom he/she might want to work. The faculty member will supply a description (oral or written) of the work in progress in their laboratory. Areas of mutual interest and possible research projects for the student will be discussed. On or before the date listed below, the student should submit the online Registration Form listing their first four choices of advisor. The online Registration Form is available at: https://www.amherst.edu/academiclife/departments/Biology/honors_program_registration_form

The student’s final preference list may be influenced not only by interest but also by availability of positions in a given laboratory. The final placement is dependent upon Departmental discussion but no individual faculty member is under formal obligation to accept any individual student. Every effort is made to place students with their top choices, and in the past this has been accomplished for a high percentage of the candidates. A student may, of course, reconsider their position after assignments are made, and may withdraw from the program if the assignment is not acceptable.

- Honors Invitational: Wed. February 21st • 7:30 pm • MERR 4
- Honors Registration Form Due: Wed. March 7th • 12:00 pm • Online
- Course Pre-Registration for Fall 2018: Mon. April 2nd – Fri. April 6th

III. Choice of Research Project

The choices of a project that might be undertaken by the candidate should be discussed with prospective advisors before the candidate's final preference list is submitted. Honors projects are not devised by students in isolation, but rather in consultation with a faculty member who can outline a range of possibilities for projects. The reasons for this are several. Supervision of Honors work is normally limited to the faculty member's area of research competence. In most cases, the student has a better chance of completing a successful project if they can take advantage of methods, tools, and experience that have already been
developed in the faculty member's laboratory and if the faculty member judges the project to be feasible. Of course, throughout the project, the student will be expected to contribute their own ideas to its development.

IV. Educational Value: What You May Reasonably Expect From the Program

The experimental approach is the essence of the field of Biology ("experiment" includes both field observations and laboratory manipulations), and thus constitutes an important part of the student's experience. Some of the advantages you may expect to gain are:

Learning to think as a scientist: The best—perhaps the only—way to gain an understanding of the thought processes by which new scientific knowledge is gained is to participate directly in a research project. The process by which experiments are designed, tested, modified, developed, performed and evaluated is vastly more complex than can be described in a formal course where, for instance, often only the final and successful experiment is described, while the details of the process of formulating theories, testing them and discarding those disproved is often omitted. Further, learning to be objective about your own work—in which you are deeply involved—is a unique experience applicable to many pursuits outside of scientific research.

Participation in a summer research program is usually at best only supplemental to the Honors program. The greater sophistication and independence of the senior student and the greater length of time invested in an Honors project permits a better understanding of the complexities of research than can be gained during a single summer earlier in one's college career.

Practical experience: The successful application of scientific methods requires a certain "feel" for the uses and limitations of laboratory and field techniques that can be gained only by direct experience. While some of the usefulness of this experience is limited to the particular area in which it is obtained, learning a second set of techniques (be they medical or for another area of experimental science) is made easier by having learned the first. A note might be added at this point for premedical candidates. While most physicians will not be involved in basic research, medicine presumably makes practical application of the results of such research. A familiarity with the methods of basic research is therefore a very valuable asset to the physician. For the candidate considering a career as a professional biologist, prior research experience at Amherst College can be of considerable advantage in starting graduate research.

Ability to use and evaluate the literature: Gaining a thorough familiarity with a particular area of the literature (however limited) provides many of the tools for quickly reading and evaluating papers in other areas as well. The experience is particularly valuable when the course of one's own research depends on the evaluation of reports in the literature and the use to which one puts them. For example, it soon becomes apparent that a critical evaluation of methods (as well as conclusions) is necessary when considering a report of someone else's research.

Appreciation of the effort required to produce a new piece of information: There is a saying among scientists: "For an undergraduate thesis, choose a project that you think you can do in one week, and it will be done in one year; for a master's thesis, choose one which you think should take one month, and it will take two years; and for a doctoral dissertation, choose a project which should take six months, and you will get it done in four years." While this may be somewhat exaggerated, it illustrates a principle that can be learned only by experience!
The intellectual community of the laboratory: While the amount of contact between advisor and students will vary somewhat among faculty members and time of year, being part of a group of people all interested in, and working on, related biological problems in an effort to gain new knowledge can be a highly stimulating experience unlike any other offered to undergraduates. This may be the place where student-faculty interaction is at its best.

Satisfaction: Honors work is intended to be an educational experience without undue emphasis placed upon achieving a certain research goal in the allotted time. No discussion of research activities would be complete, however, without mentioning the satisfaction of contributing a new fact to the body of scientific knowledge. The Honors Program is a unique experience in that the student has the opportunity to be truly creative and to sense the excitement and fascination of first hand discovery, rather than being limited (as in course work) to learning and understanding what someone else has perceived. A perusal of the Publications of the Department of Biology may also foreshadow the rewards in the Program:

V. What May Reasonably Be Expected of You

Time: Time investments vary, but an Honors project, well executed, generally takes more time than courses of equivalent credit. A typical minimum might be 10 hours/week first term and 20 hours/week second term.

Intellectual effort: While students will have direction and instruction from advisors, they should not expect—or desire—to be instructed in detail how to perform each experiment. This would make students in effect technicians. Students might, for example, design experiments (having consulted their advisors and/or the literature for appropriate methods) and then ask their advisors to evaluate the design and suggest modifications before the experiments are performed. Students are also expected to carry out their own surveys of the pertinent literature and to think about which experiments must be performed to gain the information desired.

Commitment and perseverance: Clearly one cannot be certain of an interest in research until one has tried it; it may therefore be expected that some may conclude after a time that their research activities have not fulfilled their expectations. Because it is difficult for an inexperienced person to decide what constitute reasonable expectations and a fair trial, the following comments are offered. Starting a new project, learning the methods, and developing experiments, is a tedious process. Experienced scientists undertaking a new project typically spend a year or more simply learning techniques and developing the system on which they wish to work. Graduate students starting a research project typically go through a period where the project seems hopeless; most, however, progress through this phase and become very excited about their work. It is particularly important for Honors candidates to be prepared for frustrations because of the limited time available for their work. A heavy investment of time and effort during the first term, despite the fact that the work may not have progressed to the point of yielding gratifying information, will usually pay off in accomplishment and satisfaction later in the year.

Evaluation of 1st semester thesis progress: Together with the student’s Advisor and Thesis Committee, a discussion of the student’s research progress will take place at the end of the first thesis semester. The Committee will take into consideration the student’s progress as judged by factors which
may include written materials, experimental design work, data collected, and degree of mastery of
techniques required for successful completion of the project (these factors will vary depending on the
research project). The outcome of this meeting is a formal recommendation for the student to continue
with the Honors Thesis. This discussion is also an opportunity for the student to express their desire to
continue with their thesis project or to resume a standard four-course load in the following semester.

The decision to enter the Honors Program should be made on the basis of interest and desire for
learning established techniques and for making original observations. On entering, the student should
be committed to invest the time and effort necessary to achieve an understanding of what is required to
produce scientific information. Only then can the experience be fairly judged.

Finally, while most students cannot hope in one year to produce a piece of research which will
shake the scientific world to its roots, they can learn a small area of biology in depth and can reasonably
expect to make some observations which are new and which they find genuinely exciting.