A RESEARCH-ORIENTED HONORS PROGRAM FOR UNDERGRADUATE BIOLOGY STUDENTS
AT WESTERN ILLINOIS UNIVERSITY
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An honors program for undergraduate students originated in the College of Arts and Sciences at Western Illinois University in 1975. From a very humble beginning this program has burgeoned into a university-wide organization. All of the six colleges within the university now participate in the honors program and most departments have an advisor for honors students. In general two types of honors programs were established. One of these, called general honors, involves taking a specific number of in course honors credits where students do extra work, usually extra writing, in regularly scheduled courses. The second, called departmental honors, are programs designed by departments utilizing specialized courses only for honors students. Most of these have some research component that culminates in an honors thesis. The Department of Biological Sciences was one of the first departments to design a program to fit into the guidelines for departmental honors. The staff of the biology department opted for a research-oriented program with students being supervised by faculty mentors. This close student-faculty relationship was designed to foster an atmosphere more like the small college situation but also giving the students a greater variety of research areas because of the larger staff at a medium-sized university like WIU. This program, established in 1978, has graduated 43 honors students and now has 13 junior and senior biology honors students enrolled (Table 1). It is recognized as the most successful program in recruiting and graduating honors students of any department on campus.

The biology program is a two-year plan of study usually taken during the junior and senior year by students with a 3.5 GPA or better (Table 2). During the junior year, students select a research project, carry out background reading, write a grant proposal for support, and give a presentation to the other honors students on their project. All of this is accomplished in two, one-hour seminars.

The first seminar, taken in the fall semester, is made up of weekly presentations by biology staff who have projects available for honors students. At the present time, approximately half of the department faculty, representing a good cross section of disciplines, participate in the honors program. Toward the end of the semester the students rank the projects they would like to attempt in order of preference. As biology honors coordinator and seminar director, I match students with projects and advisors. Sometimes two students want the same project and second choices are assigned. However, in all but two or three cases students have been able to work with the project and advisor at the top of their list.

The second junior honors seminar is taken during the spring semester and involves the rest of the required work. The first few weeks of the semester are devoted to background reading on the individual projects. During this time, the students receive training in word processing for later use in writing reports and their honors thesis. In cooperation with their advisor, each student writes a grant proposal addressed to the University Honors Council for support of their research. Funding of up to $200 is provided by the Honors Council, the Department of Biological Sciences, or the Institute for Environmental Management, which is located on the WIU campus. Some of these proposals have been funded by the Honors Council of the Illinois Region over the past 5 years. During the latter part of the semester, each student presents a formal
seminar to the other honors students explaining his or her project. This presentation includes background material, experimental methods, and expected results.

With all the necessary preliminary work out of the way including background reading and acquisition of support, the project is carried out during the first term of term of the senior year. In a few cases the projects extend into the final term, but this is the exception rather than the rule. Most projects are designed to be completed in a 16-week semester. Longer projects may be attempted but they usually must be started during the summer or even during the spring semester of the junior year. In all cases 3 hours of credit are given for the research project.

The final requirement for the biology honors program is the completion of an honors thesis based on the results of the research project. The Honors Committee of the department has set up guidelines for writing this thesis, which are patterned after the graduate thesis regulations. After being read for appropriate revisions by the advisor, the honors coordinator and a member of the departmental honors committee, the student defends the thesis in an oral examination. These exams take about an hour and are conducted by two members of the honors committee plus the advisor. After successful defense of the thesis, the student is awarded 3 hours of credit.

Students enter the departmental honors program by invitation from the honors committee. Each spring the committee scans the grade sheets of all the biology majors and invites those with GPA's close to 3.5 or better to join the program. Transfer students with honors credentials are hard to identify and the honors committee depends on the academic advisors to recommend these people for the program. Usually about half of those eligible enter the program. Some students are not interested in research and others think it involves too much work. Actually the program fits in quite well with our regular curriculum for departmental majors. The research and thesis hours are taken in the place of electives and only the two hours of seminars are over and above the requirements.

The University Honors Council requires all honors students, whether they are taking general or departmental honors, to enroll in 6 hours of general honors courses. Several of these courses are offered each semester in various areas of social sciences or humanities and at all undergraduate levels. They provide a forum for honors students from various disciplines to interact in studying a subject usually uncommon to all. The students in the biological sciences use general honors courses to satisfy basic curriculum requirements and thus they are not additions to their plan of study.

The research projects undertaken by the honors students are not trivial pursuits or rehashed experimentation. In some cases the honors students work along with graduate students and many of the honors theses approach the standards expected of masters theses. In the area of ecology, several students have been included in the ongoing Long Term Ecological Research project on Illinois Rivers funded by NSF and jointly sponsored by the Illinois Natural History, Water, and Geological Surveys; Illinois State Museum; and WIU. These studies have concentrated on macrofauna of the Mississippi River benthos. Another student carried out his project in the Florida Keys, where he was serving as a scout camp counselor, on the web making characteristics of crab spiders in two different habitats. Two other projects involved studies on ecological parameters of man-made impoundments such as cooling and strip mine lakes.
In the area of genetics, projects were completed on genotoxicity and mutagenicity of various chemicals, such as air pollutants and pesticides, as determined by micronucleus assays on blood cells and mutation rates in Drosophila. One study involved an electrophoretic study of allozymes in various Drosophila populations.

Projects in physiology and cell biology have dealt with the effects of caffeine and alcohol on the fetal development of mice and cultures of mouse and chick fibroblast cells. Two projects on trophoblast-lymphocyte cross-reactive antigens in pigs and cows brought together the research talents of people from WIU and the SIU Medical School in Springfield as well as the cooperation of two local farmers.

In the area of microbiology, parasitology projects have concentrated on various aspects of the life cycle of an eyeflake that can be maintained in the laboratory in chickens. Behavioral responses of the miracidial stage including phototaxis, geotaxis, chemotaxis, and magnetotaxis were investigated. The project dealing with magnetic fields was carried out with the cooperation of the Physics Department and the results correlated well with what has been found for iron-containing bacteria - a positive north-seeking reaction. This was the first report on the influence of magnetic fields on any parasite. Bacteriology projects have centered around growth and plasmid studies on mouth-inhabiting bacteria and chemical characterization of insecticidal strain of free-living bacteria.

As documented above, our honors students have carried out a variety of projects not necessarily limited to the laboratories at WIU. Students have benefited from the cooperation of other departments and agencies within WIU and the State of Illinois. These projects have resulted in the presentation of 20 papers at scientific meetings ranging from regional to international in scope. So far results from these projects have been incorporated into three published papers.

The WIU chapter of Phi Kappa Phi, a national honor society, sponsors an annual undergraduate research paper contest. In the last seven years, biology honors students have captured nine of the possible 21 first, second and third place awards. In 1985 our students made a clean sweep of the awards.

What advantages and rewards are available for the academically talented student who participates in the honors program? Official designation on the transcript and special recognition at graduation are one type of reward. On campus honors students may live on honors floors of dorms where study hours are regulated and interaction with other honors students is available. Computer facilities purchased especially for the honors students is another advantage of the program. During the school year, several social and cultural events are hosted by the University Honors Council for the honors students. Other less tangible things may be, in the long run, more valuable. Our honors graduates have been very successful in being accepted by professional and post graduate schools (Table 3). This may be partly explained by completion of the research projects. Many of our students have benefited from the in-depth letters of recommendation written by their research advisors. In many cases during interview sessions, the topic of discussion is dominated by the student's research project. One student credited her honors thesis as an important factor in her selection for a research position over other well qualified applicants. Finally, another less obvious but very important reward may be the satisfaction of completing a meaningful research project that is viewed as a useful contribution to science.
Table 1. Participation in the Biology Honors Program

<table>
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<th>Year</th>
<th>Graduated Honors Students</th>
<th>Number</th>
<th>Honors Students in Progress</th>
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<th>Number</th>
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Table 2. Outline of the Departmental Honors Program in Biology

Junior Year

First Semester
Honors Seminar--1 hour credit
1. Presentation of projects by departmental staff
2. Selection of projects and approval by advisor

Second Semester
Honors Seminar--1 hour credit
1. Background reading
2. Instruction in word processing
3. Preparation of a grant proposal to support the project
4. Presentation of a seminar on the project

Senior Year

First Semester
Honors Research--3 hours credit
Carry out planned research

Second Semester
Honors Thesis--3 hours credit
Write a thesis on the project and defend it in an oral examination

Complete at least 6 hours of general honors courses
Maintain a 3.5 GPA or higher
Complete all the other requirements for a major in botany, microbiology, or zoology.

Table 3. Post Graduate Study or Occupations of Honors Students

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