

March 19, 2012

LINDA BISSON, Chair
Davis Division of the Academic Senate

Re: Proposal for an Undergraduate Honors Research Program in Insect Biology

Dear Linda,

The College of Agricultural and Environmental Sciences (CA&ES) Executive Committee unanimously approved the proposal for the establishment of an Undergraduate Honors Research Program in Insect Biology at its February 17, 2012 meeting. It is our understanding that this proposal should now be forwarded to the Undergraduate Council.

Sincerely,



Chris Calvert, Chair
CA&ES Executive Committee

/bn

Attachment

c: Associate Dean Ullman
Professor Rosenheim
Academic Counselor Stevenson

December 23, 2011

**To: Chris Calvert
Chair, College Executive Committee**
**RE: Proposal for an Undergraduate Honors Research Program in Insect
Biology**

Dear Chris,

The Undergraduate Majors and Courses Standing Committee has reviewed the proposal for an honors research program in insect biology (attached), and approves of this proposal. Our understanding for such proposals is that the college executive committee reviews the proposal and forwards it to the academic senate Undergraduate Council (Jon D Rossini, Chair).

Sincerely,



Ken Shackel, Chair
Undergraduate Majors & Courses
Standing Committee

cc: Diane Ullman
Jay Rosenheim
Ana Stevenson

Proposal to establish the Undergraduate Honors Research Program in Insect Biology

Goals

The goals of the proposed Undergraduate Honors Research Program in Insect Biology are as follows:

Goal 1: To provide a close-knit and challenging mentorship environment for a small number of students.

The University of California, Davis is a large research university (current undergraduate enrollment = 24,655) with a particular strength in biological sciences, but the high student:faculty ratio on our campus means that undergraduate research mentorship opportunities are scarce, and many students are intimidated by the process of establishing mentorship relationships. *This is especially true for students early in their academic careers.*

However, just because we cannot provide a closely mentored research experience for every student on campus does not mean that we should not try to provide such an experience for a small group of highly motivated undergraduates. Faculty in the Department of Entomology and several other departments on campus (Department of Evolution and Ecology; Department of Environmental Science and Policy; Department of Neurobiology, Physiology, and Behavior; Department of Medical Microbiology and Immunology; Department of Plant Biology) use insects as model systems to conduct top-flight basic research at all levels of biological organization, including functional genomics, biochemistry, cellular biology, physiology, epidemiology, behavior, evolutionary biology and ecology. *Our aim is thus to develop a close-knit, supportive, long-term research mentorship program in diverse areas of basic biology using insects as model systems, all within the context of a large research university.*

Goal 2: To identify, encourage and recruit exceptionally motivated and capable students as early as possible in order to build meaningful, long-term mentorship relationships between students and their research mentors.

We aim to identify students at the intersection of two groups: 1) students with a genuine interest in studying basic biology using insect systems, and 2) students with high academic potential. We aim to recruit participating undergraduates as freshmen or sophomores. All aspects of this program are designed to prepare motivated students for productive careers in biology, and we believe that students require time and experience to learn the process of science, and develop the confidence and technical skills to operate as truly independent researchers in their chosen field. Learning the process of science includes the ability to observe nature, understand the literature, pose creative questions, suggest testable hypotheses, use relevant methods, analyze data, anticipate and solve problems, communicate science informally and formally, and understand the responsible conduct of research. Thus, our goal is to immerse early undergraduates in the research milieu of a laboratory and engage them as full intellectual participants in the process of science. Each student will be advised by a faculty mentor during their individual progression through four stages of increasing research independence: 1) research apprenticeship and exploration; 2) guided research development; 3) self-directed research, outreach and mentorship; and 4) presentation, publication and professional development.

Student Recruitment

We will recruit students through a variety of outreach methods, including: (i) a web-site (<http://ucanr.org/sites/insecthonors/>); (ii) outreach through the network of undergraduate advising staff

working with students in the biological sciences; (iii) e-mails to current Freshman and Sophomore level students in CAES and CBS and to students currently participating in the Integrated Studies Honors Program; (iv) flyers; (v) advertisements in the Cal Aggie; and (vi) participation in campus-wide events in which prospective students visit and explore different study options on campus. We will recruit one cohort of students each year, with an annual call for applications going out during the middle of Winter Quarter and the application deadline falling at the beginning of Spring Quarter. Students in any major and any college on campus will be eligible to participate, although we expect most applicants to come from CAES and CBS.

Student Selection and Placement in Mentoring Laboratories

Students will be asked to submit a one-page letter explaining their motivation to join the program, and listing any particular areas within biology that are potentially of special interest to them. UCD transcripts (informal) will be requested for all applicants. After an initial screening, promising candidates will be invited to come for an interview with a 3-faculty member admissions committee. Top candidates will then be chosen to participate in a series of interviews with potential mentoring faculty members. Following these interviews, students will be placed in the laboratory of a mentoring faculty member, based on a high level of mutual interest in establishing the mentorship relationship.

Nature of Student Activities

This proposed program seeks to combine the strengths of 1) group activities that will engage all participants to create a sense of group identity within and between the annual cohorts of students and 2) individual long-term, year-round mentorship in the mentor laboratories. We present here a detailed schedule of activities for program participants.

I. First year: Spring Quarter

- Applications, selection and interviewing candidates (Freshman and Sophomores) during Spring Quarter
- Admissions, interviews with potential faculty mentors, and placement in labs

II. First full academic year in the honors program

- Begin research apprenticeship and exploration phase, transition towards guided research development phase.
- Academic retreat and field course: Weekend visit to the UC Natural Reserve Sagehen Creek Field Station³ in the Sierra Nevada. This biological preserve provides an ideal setting for students to work together while receiving intensive instruction in the process of science, approaches to choosing research questions, and the core elements of experimental design. This initial week will also be an ideal time to discuss the responsible conduct of research (RCR). Once we have more advanced cohorts of students in the honors program, these students will also participate in this weekend retreat by making research presentations that will provide examples for incoming students of the sorts of research projects that can be conducted.
- Participate in a 2-unit Winter Quarter study course that will function as a complement to the Department of Entomology's seminar in Insect Biology. Led by a faculty mentor, this course will develop skills in understanding scientific language, formulating questions, designing experimentation, and reading and assimilating research from the primary scientific literature. The 10-week quarter will be divided into five 2-week modules: in Week 1, students will read and

discuss a paper by the seminar speaker in preparation for the seminar speaker's visit. During Week 2, students will attend the seminar presentation, and meet with the seminar speaker for a 50-minute discussion session. The focal seminars will be chosen to highlight as wide as possible a breadth of research topics. For 2011-2012, this seminar has been approved as a Freshman Seminar (FRS 001). This is the only course that will be required for all participating students, although most students will also be taking research credits (e.g., ENT199, EVE199, ESP199) as part of the program.

- Participate in weekly lab meetings: students will be encouraged to make quarterly presentations.
- Workshop: effective scientific presentations. We will conduct a half-day workshop to introduce students to effective presentations of scientific research. Students will be taught to structure talks for maximum clarity. Prior to making formal presentations at the UC Davis Undergraduate Research Conference (URC), all talks will be practiced, feedback provided, and practiced again, iteratively, to build presentation skills and confidence.
- Present proposed research at the annual UC Davis Undergraduate Research Conference (URC).

III. Second and third (for students who start as Freshmen) full academic years:

- Transition to self-directed research.
- Participate in weekly lab meetings: students will be encouraged to make quarterly presentations.
- Attend weekly departmental seminars in Insect Biology.
- Present research-in-progress poster at the annual UC Davis Undergraduate Research Conference (URC)
- Apply for internal research funding (President's Undergraduate Fellowship Program)

IV. Prior to graduation:

- Begin presentation, publication and professional development phase.
- Complete self-directed research project.
- Workshop: applying to graduate or professional programs. As honors students approach and enter their final year in the program, we will conduct a half-day workshop to prepare them for the graduate or professional schools admissions process. Topics to be covered will include: (i) effective approaches to prepare for the GRE, MCAT, or other examinations; and (ii) strategies for identifying top-quality graduate or professional training programs and host laboratories. We will emphasize the importance of establishing early communication with prospective major professors and making in-person campus visits, and we will provide support on preparing the formal application.
- Workshop: preparing manuscripts for scientific journals. Completing, submitting, and publishing a scientific manuscript will be a key goal for each participant. While we cannot guarantee that every student will succeed in publishing a paper, we think it is an appropriate goal, and one that should be achieved by the vast majority of our participating students. Furthermore, nothing opens the doors to the laboratories of top-notch graduate schools and mentor labs like a track record of proven research success. We will conduct a workshop to introduce students to the essential elements of scientific writing, to cover the structure of a scientific paper, the keys to concise and effective communication, and the details of the review and revision process. Our goal will be to work closely with every participating student so that the paper is carefully vetted before it enters the rigors of the peer-review process.

- Participate in weekly lab meetings: students will be encouraged to make quarterly presentations.
- Attend weekly departmental seminars in Insect Biology.
- Present completed research orally at the annual UC Davis Undergraduate Research Conference (URC).
- Deliver an oral presentation at a national or international meeting of a scientific society.
- Submit a lead-authored research manuscript to a peer-reviewed journal.

Required Courses

As described above, the only required course will be a 2-unit participatory seminar, generally to be taken during Winter Quarter of the first year in the honors program. We do, however, anticipate that most, if not all, participating students will take research units during many quarters of their participation in the program (e.g., ENT199, EVE 199, ESP199) through the home department of their mentoring faculty member. We do not wish to specify an exact number of research units as a requirement, because some students may be paid for their research, rather than opting to receive units. (Some students need to work to support themselves, and a requirement for unpaid participation could exclude participation by low-income students.)

Criteria for Successful Completion of Program

The ultimate requirement for all participating students is the completion of an independent research project, rather than a specific number of course credits. Although not all research projects will succeed and result in a peer-reviewed publication, all students are expected to:

1. Participate in workshops
2. Complete the Winter Quarter 2-unit participatory seminar
3. Participate in lab meetings in their mentoring research laboratory
4. Conduct research, first collaborative and finally independent, in some area of insect biology.
5. Analyze research results and prepare reports (both oral and written). The written report will be submitted as an **Honors Thesis**, prepared in the format of a publication-ready scientific journal article, to be reviewed and approved by both (i) the mentoring faculty member and (ii) a faculty member on the Insect Honors program steering committee.

Both the mentoring faculty member and the faculty leaders of the Insect Honors Program must agree that the student has successfully completed these requirements for the student to receive transcript notation for successfully completing the program. Students will receive an annual progress report at the end of each Spring Quarter to provide constructive feedback on their progress.

Size of the Program

We currently anticipate a final enrollment of approximately 40 participating students. We are currently experimenting with a "pilot" run of the program; last spring we advertised, and received about 30 applicants, many of whom were truly outstanding. We interviewed 14 and chose 13 final candidates. All 13 are now placed in mentoring faculty labs, and 12 participated in our first workshop (a 2-day retreat to the Sagehen Creek Field Station during September). If we have annual cohorts of 10-15 students, we will reach a program with approximately 40 students enrolled. With 40 mentoring faculty, we could easily accommodate this number.

Transcript Notation

If the program is approved by CAES and the Academic Senate, we will request transcript notation for all participating undergraduates who successfully complete the full program.

Budget and Staffing

Administrative support for the program is currently provided by Ms. Elvira Hack, Undergraduate Program Coordinator/Advisor, in the Department of Entomology. The Department of Entomology has also committed to underwrite the modest expenses associated with the program, including any costs of advertisement for recruitment, the annual retreat, and any other minor expenses. Total expenses for the first year of the program were minimal (<\$2,000 total); as the program grows, we expect expenses to grow somewhat, but to remain below \$5,000 per annum. The more substantial costs of defraying the expenses associated with student research projects are being borne by the mentoring faculty members' research grants. Participating students will also be encouraged to apply for PUF grants and other sources of research support, both internal and external.

List of Mentoring Faculty

[David Begun](#) – Population genetics and molecular evolution (Department of Evolution and Ecology; see [lab research](#))
[James R. Carey](#) - Insect demography (Department of Entomology; see [lab research](#))
[Joanna Chiu](#) - Insect Molecular Genetics and Biochemistry (Department of Entomology; see [lab research](#))
[Anthony J. Cornel](#) - Medical entomology (Department of Entomology; see [lab research](#))
[Katayoon \(Katie\) Dehesh](#) – fatty acid biosynthesis in plants (Department of Plant Biology; see [lab research](#)).
[Mary Louise Flint](#) - IPM education (Department of Entomology; see [lab research](#))
[Larry D. Godfrey](#) - IPM field and vegetable crops (Department of Entomology; see [lab research](#))
[Bruce Hammock](#) - Insect biochemistry (Department of Entomology; see [lab research](#))
[Susan P. Harrison](#) – Plant ecology, diversity, and conservation (Department of Environmental Science and Policy; see [lab research](#)).
[Ann Hedrick](#) – Behavioral ecology (Department of Neurobiology, Physiology, and Behavior)
[Marcel Holyoak](#) – Spatial ecology (Department of Environmental Science and Policy; see [lab research](#)).
[Richard Karban](#) - Insect ecology (Department of Entomology; see [lab research](#))
[Artyom Kopp](#) – genetic basis of morphological evolution (Department of Evolution and Ecology; see [lab research](#)).
[Lynn Kimsey](#) - Biology and evolution of insects (Department of Entomology; see [lab research](#))
[Robert B. Kimsey](#) - Medical entomology (Department of Entomology; see [lab research](#))
[Charles H. Langley](#) - Population genetics and molecular evolution (Department of Evolution and Ecology).
[Gregory Lanzaro](#) – Genetics of vector-borne diseases (Department of Pathology, Microbiology and Immunology)
[Sharon Lawler](#) - Aquatic ecology (Department of Entomology; see [lab research](#))
[Walter Leal](#) - Insect physiology (Department of Entomology; see [lab research](#))
[Edwin Lewis](#) - Nematology (Department of Entomology; see [lab research](#))
[Shirley Luckhart](#) – Molecular biology and immunology of vector-borne diseases (Department of Medical Microbiology and Immunology)
[Fumio Matsumura](#) - Environmental toxicology (Department of Environmental Toxicology; see [lab research](#))
[Eric C. Mussen](#) - Apiculture (Department of Entomology; see [Apiculture Newsletter](#) and [Bee Briefs](#))
[Michael P. Parrella](#) - Horticultural entomology (Department of Entomology; see [lab research](#))
[William Reisen](#) – Ecology of vector-borne diseases (Department of Pathology, Microbiology and Immunology)
[Jay A. Rosenheim](#) - Ecology and evolutionary biology (Department of Entomology; see [lab research](#))
[Thomas W. Scott](#) - Ecology, evolution, and epidemiology of vector-borne diseases (Department of Entomology; see [lab research](#))
[Arthur Shapiro](#) - Ecology and evolution of butterflies (Department of Evolution and Ecology; see [lab research](#))
[Andy Sih](#)– Behavioral, conservation, and community ecology (Department of Environmental Science and Policy; see [lab research](#)).
[Maureen L. Stanton](#) – Plant evolutionary ecology (Department of Evolution and Ecology)
[Sharon Y. Strauss](#) -- Community and population ecology (Department of Evolution and Ecology; see [lab research](#))
[Donald Strong](#) -- Community and population biology (Department of Evolution and Ecology; see [lab research](#))
[Michael Turelli](#) – Theoretical population genetics (Department of Evolution and Ecology)
[Diane Ullman](#) - Insect vectors of plant pathogens (Department of Entomology; see [lab research](#))

[Philip S. Ward](#) - Systematics and evolutionary biology of ants (Department of Entomology; see [lab research](#))
[Neal M. Williams](#) - Pollination ecology (Department of Entomology; see [lab research](#))
[Louie Yang](#) - Community ecology (Department of Entomology, see [lab research](#))
[Frank G. Zalom](#) - Integrated pest management (Department of Entomology; see [lab research](#))

(Please note: the list of mentoring faculty is still growing; faculty have been very supportive)