The Consolidated Graduate Program in

“Entomology and Insect Sciences"
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1. Advantages to students, employers, and The University of Arizona achieved by combining two graduate programs into one consolidated program.

The two graduate programs to be consolidated are the Graduate Interdisciplinary Program in Insect Science (GIDP-IS) and the Graduate Program in Entomology. The GIDP-IS currently offers a Ph.D. degree in Insect Science, and in exceptional circumstances, an M.S. degree in Insect Science. The Graduate Program in Entomology currently offers Ph.D. and M.S. degrees in Entomology. The consolidated graduate program in Entomology and Insect Sciences will offer M.S. and Ph.D. degrees in "Entomology and Insect Science."

Intellectual/practical Advantages of the Consolidated Program: The merger builds on ongoing interdisciplinary research in entomology and insect sciences. By combining the two programs, students will be able to choose from two main tracks of study. One track will be Entomology, focusing on insects and their impact on humanity, which is essential to this university's role as the state's only Land-Grant institution. This track will fulfill the university's obligations to the state regarding management of pest and beneficial insects in agricultural, urban, and natural ecosystems. This track will be affiliated with the Department of Entomology. The other track will be Insect Sciences, using insects as model systems in various fields including neuroscience, ecology, engineering, and computational sciences. This track will be affiliated with the Graduate Interdisciplinary Program. If, however, both tracks must be affiliated with only one unit, the Department of Entomology is willing to be that unit because 79% of the current students are either in the Entomology graduate program or are Insect Science students supervised by Entomology core faculty. Both tracks will prepare young professionals for a new era, in which we must adapt to major environmental challenges, with solutions arising from biologically inspired technologies. Thus all trainees in both tracks of the program will benefit from the intellectual vehicle of interdisciplinary study and research. Students will be exposed both to Entomology and Insect Sciences in the broadest sense. This consolidation will enhance application of the study of insect physiology, insect molecular biology, and insect design to include biomedicine, environmental and ecological studies, neuroscience, and physical and engineering sciences.

Advantages to Faculty/Employers: In the present age, practical and intellectual hybridization of disciplines is not only an advantage to students, but is also inspiration to faculty. Furthermore, as we enter an era that demands entirely new technologies and new combinations of skills, interdisciplinary programs will best prepare graduate students for scientific exploration, industrial research, and commerce.

Advantages to the University of Arizona: The consolidated program in Entomology and Insect Sciences will have enrollment of about 30 graduate students, combining the current enrollments of 19 in Entomology and 10 in the GIDP-IS. Thus, consolidation will bring more efficient use of resources for scheduling courses, recruiting students, and other program functions. Seminars and guest lectures currently organized by the two separate graduate programs will no longer be arranged and administered separately but as a single entity. This will eliminate conflicts with timing and attendance and will streamline organization.

2. Changes or eliminations of the existing graduate programs.

A new requirement of the consolidated program will be a core course in Entomology and Insect Sciences required during the first semester for all students in the program. Consolidation of two current programs into one will likely change course selections, eventually leading to fewer courses with larger enrollment per course. By drawing students from both tracks, the best courses will experience enrollment growth. Conversely, courses that do not attract sufficient enrollment will be eliminated. We note that cross-listed courses recruit attendees not only from the insect sciences but also from a broad spectrum of other interdisciplinary graduate programs; e.g. genomics, genetics, neuroscience, biomedical engineering,

physiology, and remote sensing. Again, classes that attract students from disparate research areas are crucial interdisciplinary catalysts.

3. How the consolidation will strengthen the unit's teaching, service, and research or creative activities.

Consequences of consolidation: The consolidated program in Entomology and Insect Sciences will offer broader interdisciplinary scope and achieve greater administrative efficiency (see below). The Graduate Interdisciplinary Program in Insect Sciences was designed to offer unique training using insects as model systems for neuroscience, robotics, engineering, population studies, genetics, and biomedicine. Students in the Entomology Graduate Program pursue studies of insects across several disciplines including molecular biology, genetics, physiology, behavior, ecology, evolution, and integrated pest management. These studies include basic and applied research on insect vectors of disease, insect pests in agriculture and urban environments, insect symbionts, and insect pollinators.

Reciprocal strengths of the merged programs: As outlined above, the Entomology Graduate Program crosses traditional disciplines and the Interdisciplinary Graduate Program in Insect Science is founded on the principle of interdisciplinary research. This interdisciplinary emphasis will serve as the guiding principle for future training in the consolidated program in Entomology and Insect Science. Recognizing that both graduate programs are inherently interdisciplinary, it makes perfect sense to combine the two under one overarching programmatic title. The consolidated programs will offer two main tracks of pursuit of the graduate degree: namely the Entomology track and the Insect Sciences track. For its administration, the program will optimize the most efficient elements of both (see below). The merger will not only provide greater efficiency and fiscal sense; also of cardinal importance, is that the merger will result in pervasive interdisciplinary research collaboration. It is becoming increasingly appreciated that insects are the result of 530 million years of evolutionary experimentation and as such reveal extraordinary sophistication in their mechanical and physiological design. They also define the health and survival of the natural environment. By merging these two programs, we will recruit not only potential entomologists *sensu stricto*, but also create a unique program luring young scholars interested in exploiting the exquisite biological design of insects for research in diverse areas. The proximity within a graduate student body of applied entomology graduate students working on, for example, insect pest dispersal with graduate students working on biomechanics or neurobiology will be mutually advantageous from the point of research collaboration and intellectual hybridization of a high order.

4. How the consolidation will raise the unit's and the university's ranking or reputation.

Road Map recommendations: An investment by this university in the insect sciences was a major recommendation of the Battelle Institute's report "Arizona's Bioscience Roadmap: Toward 2012" January 2008 (PDF) (http://www.flinn.org/bio/reports.cms#bioscience). The report lists Insect Sciences as one of the top six competencies of the University of Arizona, en par with Cancer Research, Plant Sciences, and Neurosciences. The Batelle Report urges "Applying Arizona's broad and deep expertise in insect sciences, insect neurobiology, and entomology" to develop insect control products as a key sustainable bio-related technology. The Battelle Report states the key criteria for investing in these areas are: drawing on multiple core competencies and multi-institutional presence and collaborations; existing or potential industry contacts and their development potential; and opportunity for extramural funding. The proposed consolidated graduate program meets or exceeds these criteria. A major step forward in enhancing this major competency will be the merger of these two crucial graduate programs.

National Rankings: The current graduate programs in Entomology and Insect Sciences are ranked in the top five nationally, both separately and jointly, as detailed below. The merged program will be even stronger, positioning the University of Arizona as a national and international leader in entomological sciences for many years to come. In 2006, the University of Arizona ranked #2 in faculty scholarly productivity in entomology, with 53 faculty from the Center for Insect Science and the Department of

Entomology included in the index (http://chronicle.com/stats/productivity/page.php?year =2006&primary=9&seconday =69&bycat=Go). In 2007, faculty scholarly productivity rankings were #1 for Insect Science (based on 30 faculty, in the category of Agricultural Sciences, various) and #5 for Entomology (based on 27 faculty) (see http://chronicle.com/stats/productivity/page.php?year=2007&primary=2&secondary=119&bycat=Go,http://www.academicanalytics.com/TopSchools/TopPrograms.aspx#1 and http://chronicle.com/stats/productivity/page.php? year=2007&primary=9&secondary=69&bycat=Go). In the field of Entomology/Pest Control, the University of Arizona ranked #1 among U.S. universities in average citations per paper for papers published from 2001-2005 (http://in-cites.com/research/2007/january_8_2007-2.html).

Faculty Excellence: The faculty of the proposed graduate program includes top-ranked entomologists, neurobiologists, ecologists, evolutionary biologists, and molecular and cellular biologists. Over 80% of the faculty is supported by extramural grants, many earning substantial indirect costs. The faculty includes two members of the National Academy of Sciences, three MacArthur Fellows, three Regents' Professors, two Guggenheim awardees, and a Fellow of the Royal Society of London.

5. Meetings held to vet this proposal with faculty, students, staff, appointed personnel and relevant external constituents.
Several meetings were held in Entomology to enable students, staff, faculty and administrators to express their views. An "electronic town hall" was held with CIS faculty and students. Proposal drafts were circulated to faculty and students in Entomology and Insect Science to obtain feedback and votes.

Support for the initial white paper was nearly unanimous, but an impasse occurred in working out details for the full proposal. Two proposals (A and B) were developed and circulated. These are mostly similar, yet differ on a few key points. One important element of both proposals is that the merged graduate program will contain two tracks, one in Entomology and one in Insect Sciences. A second shared element is that management of finances will be handled by ARL. The key differences between the proposals are as follows:
Proposal A: 1) The program would be called "Integrative Insect Sciences" and students would receive a degree in "Insect Science and Entomology." 2) The whole program would be a GIDP.
Proposal B: 1) The program and degree would be called "Entomology and Insect Sciences." 2) The tracks would have different affiliations: Entomology in the Department of Entomology, and Insect Sciences as a GIDP.

The text of Proposal B is submitted here because it received more support than Proposal A (see tallies below). Also, the primary architect of Proposal A withdrew from the process. However, both proposals received support, and voting participation was less than complete. Thus, further discussions might produce a modified plan that has more universal support of the program members.

6. Summarize the comments from the meetings with these groups and provide a list of the names of all affected faculty and a tally of the faculty votes for, against, or abstaining on the proposed consolidation plan. Many current students expressed the desire to obtain an M.S. or Ph.D. degree in either Entomology or Insect Science, rather than in a consolidated program. We expect that this will be possible for current students. Graduate students asked whether the current freedom to choose courses would be constrained and how budget constraints and reduction of funding for graduate assistantships would affect recruiting and support of current students. Entomology faculty members and Dean Sander of CALS stated that they want to ensure that the Department of Entomology retains a graduate program.

Tally of faculty votes:
Insect Science faculty (includes 10 Entomology core faculty and 6 Entomology joint faculty): 17 voted, 10 did not vote (63% participation)
Proposal A acceptable: 9, Proposal B acceptable: 14;
Prefer A: 3, Prefer B: 11, No preference: 3

Entomology core & joint faculty: 16 voted, 5 did not vote (76% participation)
Proposal A acceptable: 7, Proposal B acceptable: 15;
Prefer A: 1, Prefer B: 13, No preference: 2

Proposal A was acceptable to 53% of the Insect Science voters and 44% of the Entomology voters. It was preferred by 18% of the Insect Science voters and 6% of the Entomology voters.

Proposal B was acceptable to 82% of the Insect Science voters and 94% of the Entomology voters. It was preferred by 65% of the Insect Science voters and 81% of the Entomology voters.

7. Budget. The consolidated program in Entomology and Insect Sciences will benefit from the Program Coordinator, Senior already administering the current GIDP in Insect Science. Consolidation will eliminate 0.60 FTE of one Administrative Assistant, resulting in a savings of $21,000 (salary) + $9,000 (ERE) = $30,000. Consolidation of costs of graduate recruiting and outside program speakers will save an estimated $10,000. Total estimated annual savings from the transformation: $40,000.

8. Administrative structure. Organization of graduate recruitment and interviews will be handled jointly by the co-Chairs and two designated faculty from each program track. Program administrative responsibilities of both tracks and all graduate students will be handled by the CIS Program Coordinator Sr. with oversight from the two co-Chairs. Candidate selection for both tracks will be adjudicated by a joint faculty recruitment committee. Candidates for both tracks will be interviewed jointly. Graduate seminars and graduate student meetings will be organized by a joint committee of graduate trainees. The Arizona Research Laboratories Business Office will provide business services for the joint program. Funds from Entomology will be used to support students in the Entomology track and funds from ARL and the GIDP will be used to support students in the Insect Sciences track.

9. Titles of the staff members, appointed personnel, and administrators in the existing units.

Graduate Interdisciplinary Program in Insect Science	***Graduate Program in Entomology***
1 Program Chair (CIS)	1 Program Chair (Ento)
1 Program Coordinator, Sr. (ARL)	1 Administrative Assistant (0.60 FTE, Ento)

10. Titles of the positions that will be needed in the consolidated unit.
Consolidated Graduate Program in "Entomology and Insect Sciences"
2 Program Co-Chairs (CIS + Entomology) 1 Program Coordinator, Sr.