

**Academic Program Review
Department of Entomology and
Entomology & Insect Science (EIS) Graduate Interdisciplinary Degree Program (GIDP)
University of Arizona, Tucson**

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Executive Summary

The Department of Entomology and the Entomology and Insect Science GIDP are outstanding units that are highly productive, collaborative, and collegial. The department's extension programs are exceptionally strong and include highly effective outreach to stakeholders in production agriculture and public health professionals serving Arizona's diverse communities. Local outreach through Insect Discovery and the Arizona Insect Festival reaches 8,000 community members annually. Research productivity and quality are impressive, with multiple grants from competitive federal agencies and publications in top journals. The graduate program trains excellent and diverse students who speak highly of the program and are gainfully employed in their field after graduation. The undergraduate minor has grown rapidly since its inception, and although there is not an undergraduate major, the department has invested strategically in general education classes that serve large numbers of students. The staff members of these units are efficient and supportive of each other, but understaffing is a challenge that should be addressed. Entomology is a discipline of growing importance, given the roles of insects as disease vectors and pests, and as components of threatened ecosystems.

Several different lines of evidence revealed that the interdisciplinary nature of GIDPs is key to attracting and retaining faculty, students and postdoctoral researchers and for fostering cutting edge, collaborative science. The Entomology & Insect Science program is no exception. Their success depends on financial support and commitment from the Provost and Graduate Dean. However, there was concern over the future support of GIDPs given the change of budget model that is likely to provide disincentives to participate in interdisciplinary programs, as well as other budget challenges.

The report is organized along the seven different topics we were asked to address, with bullets for strengths, challenges, and recommendations. While most recommendations stem from our discussions during our visit, some reflect best practices from our own institutions.

Our top five recommendations are:

1. University leaders should be transparent and vocal in their support for interdisciplinary programs. This should include concrete directives or incentives for relevant College and Unit Heads to create MOUs that will continue to support GIDPs (and thus EIS) or providing direct support via budgetary holdbacks for interdisciplinary education as a crucial component of the university's mission.

2. University leaders should find resources to hire a 0.5 FTE Outreach Coordinator, plus two teaching assistants to run Insect Discovery.
3. University leaders should find resources to hire 0.5 FTE administrative support, possibly shared with another small unit in CALES.
4. University leaders should improve prospects for philanthropic giving by identifying better Development resources. This could mean finding another development officer (not shared with Eller) or finding another way to collaborate on development with other outreach entities at the University (Flandrau, KEYS, Biosphere 2, BIOTECH, AZ State Museum, etc.).
5. The EIS GIDP should consider offering a course each fall focused on supporting students to write applications to the NSF GRFP or other fellowship opportunities, as detailed below.

The Committee had limited opportunities to meet with representatives from Entomology and the EIS GIDP, so we apologize in advance for inadvertent omissions when recognizing the contributions of individuals in Entomology and the EIS GIDP.

Faculty

- Strengths:
 - This department and degree program exhibit phenomenal collegiality. The faculty members appreciate each other across all ranks and appointment types.
 - The quality of faculty is uniformly excellent, especially in research as measured by grants, publications, and reputation. We were also impressed by the quality of recent hires in the department, which also add to diversity of the department.
 - The respect and support for Bruce Tabashnik, in his role as department head, is impressive. He sets a positive and kind tone that permeates the department.
 - There are strong links among faculty members in the Graduate Interdisciplinary Program in Entomology and Insect Science, including those housed outside the Entomology department. This creates a thriving interdisciplinary environment somewhat unique to the EIS GIDP.
 - Clear, evidence-based productivity targets for promotion are shared with junior faculty when they join the department, so they know where they should be aiming.
 - The two career-track faculty are impressive in their professionalism and skill; they are well integrated into the department.
 - The coverage of sub-disciplines of Entomology is strong despite the relatively small number of faculty.
- Challenges:
 - Finances/resources have limited the ability to hire faculty members according to the department's strategic vision, which is particularly critical given the impending retirements of senior faculty members.
 - There have been consistent challenges in the hiring process for Extension positions. ○ The two career-track faculty members maintain difficult workloads. They indicated they would rather work at less than 1.0 FTE to avoid taking on additional teaching responsibilities. The committee perceives this as a retention risk.
 - There seems to be somewhat of a disconnect between main-campus and Extension faculty members (and graduate students) who are off campus and may feel isolated.
- Recommendations:

1. Develop a more structured and transparent faculty mentoring plan. The collegiality in the department has helped people thrive without structured mentoring, but career-track, assistant and associate professors could be even more connected and productive with a well-developed mentoring program.
2. Continue to foster cross-department collaborations and interactions. One strategy to promote interactions would be a co-mentoring model for graduate students.
3. Find ways to allow the career-track faculty members to diversify their teaching, for example by developing a smaller, specialized course that would count toward their teaching loads and allow them to mentor undergraduate student researchers (through development of CUREs and VIPs).
4. The department is going in the right direction with respect to diversifying the faculty. Keep it up! Keep using opportunities such as SPFI, which provides supportive communities of diverse scholars through cohort hires.

Academic programs

- Strengths:
 - The curriculum and program learning outcomes for EIS are outstanding. They are clearly defined for both MS and PhD programs.
 - The undergraduate program can lead to both a minor (18 units) and certificate (12 units). Both are relatively new; although it is too soon to examine the impact and productivity of these programs, the undergraduates we spoke to were uniformly enthusiastic.
 - Entomology faculty members have developed impactful course-based undergraduate research projects (CUREs and VIPs) that connect students from local high-schools, Pima Community College, and University of Arizona.
 - A new learning-outcomes assessment scheme for the graduate programs was instituted in 2023 to collect data from students and committee members to give insight into program strengths and weaknesses.
 - Excellent MS and PhD completion rates; excellent time to degree for MS and good time to degree for PhD students (excellent when considering only students who were not employed fulltime).
 - The EIS GIDP was lauded as a strength in attracting and training students for a variety of career paths. Several students said they would not have come without the opportunity for interdisciplinary scholarship. (Some faculty and postdocs also indicated this was crucial to their decision.)
 - The requirement for lab rotations in the PhD program introduces students to new techniques, model systems, and potential committee members.
 - All the students we spoke to recognized and applauded the collegial and supportive academic environment in the graduate program and praised the Chair of the EIS GIDP, Molly Hunter.
- Challenges:
 - The funding model for graduate students is complicated. Because Entomology doesn't teach many high-enrollment classes, graduate students are often funded through Teaching Assistantships in other departments, and they may not be prioritized for those positions. This results in a burden on the GIDP Chair and anxiety for the students using these assistantships as a support mechanism.

- Graduate learning-outcomes assessments from 2014-2023 did not provide useful feedback on the program, so there is little information that can be used currently to suggest program improvements other than students' comments.
- Students indicated that the graduate curriculum could be stronger in applied areas– for example, including coursework on vector surveillance and control.
- The committee noted that there are relatively few laboratory courses in the graduate curriculum.
- Recommendations:
 1. Make clearer when classes in the undergraduate minor will be taught in advising documents and share these documents with new minors (or students doing the certificate) as soon as they join.
 2. Explore ideas for professional masters programs that might bring in more revenue to the department without expanding the list of courses, or a 4 + 1 accelerated masters model that could set students up to apply to graduate/professional schools.
 3. For the graduate curriculum, create more opportunities for career/professional development. This could happen by inviting guests (including alumni and non-academic entomologists) as part of the seminar series.
 4. In the graduate curriculum, create opportunities to visit and learn about off-main-campus research sites (Bee lab, Agricultural Research stations, BIO5)
 5. Explore more structured social/professional activities with related departments such as neuroscience and ecology and evolutionary biology.
 6. Consider changing the format and timing of the comprehensive exam to be more structured. For example, it could be done at the end of the second year for all PhD students (with the possibility to petition to delay).
 7. For graduate students, explore ways to be more reassuring about funding continuity past year 1 in the offer letter.
 8. Consider offering a course each fall focused on supporting students to write applications to the NSF GRFP or other fellowship opportunities. This could be one-credit, with an expectation that everyone would take it in either their first or second year. If students are not eligible for the NSF GRFP, then they could apply to another grant or fellowship calls (e.g. Western SARE, Sigma Xi, USDA predoc), or write a GRFP-format proposal as the start of their research proposal.
 9. Consider applying for interdisciplinary training grants (e.g. NSF NRT, USDA NNF) that provide fellowships to help support the graduate students in the program so they would not have to rely on teaching assistantships.

Students

- Strengths:
 - Demographic diversity among graduate students is impressive including racial, ethnic, gender, etc. diversity.
 - Employment outcomes are outstanding. Graduates from EIS are gainfully employed in their field, in diverse careers.
 - The few undergraduate students we met were very devoted to further study in entomology based on their positive experiences in this program.

- There is a strong cohesive graduate student culture with high collegiality among MS and PhD students.
- Challenges:
 - As for many graduate programs, it is difficult for the program to find screening mechanisms that give insight into students' readiness for graduate study.
 - Undergraduate students in the minor do not necessarily know the graduate students, and there is great potential to promote mentor-mentee relationships.
 - Undergraduate students need more support in identifying research and internship opportunities.
- Recommendations:
 1. Explore ways to connect undergraduate students in the minor and certificate programs to the Student Entomological Association to engage them in social and outreach connections.
 2. Graduate students would benefit from training and support in finding funding opportunities using campus databases. This could be added to the EIS GIDP curriculum.

Staff

- Strengths:
 - Staff members universally lauded the excellent working environment in the department.
 - Pre-award grant support is strong and provided by the college.
 - The administrative staff is remarkable in being quite small, but still able to provide excellent support for a large and highly productive department – it is “lean and mean.” The core administrative staff consists of Rachel Doty, Senior Business Manager (1.0 FTE), Nirka Green, Senior Office Specialist (0.75 FTE), and one part-time IT staff person (0.2 FTE), for a total of 1.95 FTE in all. (This can be compared with a staffing level of 4.0 FTE in 2009, when the department had fewer faculty and was not providing account management services for the four faculty members located at the Maricopa and Yuma Agricultural Centers.) With the large recent increase in the department's total amount of awarded research grants (more than doubling to \$7.9 million in FY 2023), more staff will be needed maintain administrative support.
 - Administrative support for the Entomology & Insect Science Graduate Interdisciplinary Program (EIS GIDP) is similarly maintained by just a single half-time staff person (Paula Nielsen, Program Coordinator; 0.5 FTE). This program coordinator has a wide array of responsibilities, including events organization, website maintenance, overseeing student support, support of EIS committees, orchestration of student-recruitment events, and providing continuity of mentorship for each of the 26 students currently enrolled.
 - Dr. Gene Hall is a highly versatile staff member, executing a broad set of important functions for the department, including serving as manager for the Forbes Building, contributing to the Insect Diagnostic Services, and manager of the University of Arizona Insect Collection.
 - In the realm of extension entomology, the Arizona Pest Management Center (APMC) has grown dramatically and now employs nine staff members, almost all of whom are supported by extramural grant support from the USDA and other sources.
- Challenges:
 - There is a shortage of dedicated support staff for outreach and business functions.
- Recommendations:

1. Hire an outreach coordinator to coordinate both the Insect Festival and Insect Discovery course, key community service events. These events are a huge benefit to the University (see next section).
2. Consider stop-gap measures such as business-office sharing or hiring student workers to fill needs in the business office.

Unit collaboration and outreach to the community (campus, Tucson, state, and nation) •

Strengths:

- The department's extension programs are truly outstanding; this includes outreach in both the realms of public health and agricultural production.
 - Integrated Pest Management (IPM) and Arizona Pest Management Center (APMC) efforts exemplify the value of structured interdisciplinary responsiveness to community needs. The financial success and sustainability of these efforts is impressive.
 - Public-health IPM efforts led by Dawn Gouge in indigenous communities are an excellent example of cooperative extension applying the strategic vision and values of the department.
- Insect Discovery has a tremendous beneficial impact in Tucson K-12 Schools. Grad students hear about the impact from undergrads who grew up in Tucson in the classes they TA, so this program is impacting the admissions of students who represent the underserved populations in southern Arizona.
- The Arizona Insect Festival brings in tens of thousands of community members to the University. It is the largest university-led outreach event at the university. Their systemic efforts to reach out to people living in underserved zip codes through fliers in Spanish and English is exemplary. By tracking attendance via zip code, the department has measured the success of these efforts, and now have much stronger participation from the Latinx community.
- Course-based undergraduate research projects (Vertically Integrated Projects) under Wendy Moore are impactful, connecting local high-school students, Pima Community College students, and University of Arizona students.
- The Insect Collection, under the curation of Wendy Moore and management of Gene Hall, is an important resource locally, regionally, and worldwide. It meets demands for education, agriculture, public health, and research at all these scales.
- Challenges:
 - There is a lack of resources for coordination and implementation of the Insect Festival and Insect Discovery. Currently, both are dependent on a few dedicated individuals and the funding they can secure for TA support.
 - The Extension and Integrated Pest Management programs don't appear to be well-known even among other CALES department heads.
 - There appears to be a perception among other department heads in CALES that the ENTO Dept is reluctant to collaborate, despite many collaborations across campus.
- Recommendations:
 1. Given the incredible benefit to university-community relations of Insect Discovery and the Arizona Insect Festival, administrators should explore ways to support an 0.5 FTE staff member for coordination and organization of these events, plus two TAs for the Insect Discovery school visits.

2. Consider publishing a peer-reviewed pedagogical assessment or a descriptive piece documenting the impact of Insect Discovery. This could serve both to increase visibility and recognition of the program and serve as a template for other programs to implement similar outreach activities to increase interest in entomology and STEM-based career interests in K-12 students.
3. Explore partnering with other CALES units, Flandrau Science Center or other outreach units for growth and logistical support for Insect Festival.
4. Outreach and education activities may be appealing to a different set of donors than your development officer typically works with. Explore partnering with other outreach units (like Flandrau) for funding support.
5. Consider ways to keep other departments in CALES informed of the strength and impact of the outreach and extension efforts.
6. Consider prioritizing support for existing and successful outreach programs with the broader impacts sections of grants where available.

Unit planning for the future •

Strengths:

- A clear value is placed on being a top-ranked department with a stellar international reputation in discipline-specific and interdisciplinary research.
- There is a strong sense of collegiality from all members (faculty, grad and undergrad students, staff, postdocs) who embody the shared values of “respect for all people.”
- The program is clearly and successfully preparing students for diverse, discipline-relevant, career paths.
- Entomology and Insect Science are likely to be a growth arena for funding and student interest in the future given increased public concerns about global declines in biodiversity and the role of insects as pollinators, disease vectors and agricultural pests.

● Challenges:

- The current development officers may be more protective of potential donors than helpful in promoting entomology for gifts and endowments.
- With recent and ongoing growth, there are increasing administrative responsibilities needed to support HR and accounting. The administrative team is efficient, and they are taking the initiative to reduce administrative burden, but they report that they are typically working overtime, which is unsustainable for the unit. The current financial crises in CALES and UA impose significant constraints on meeting the administrative needs of the department. This poses a significant risk for sustaining program excellence and meeting strategic planning goals.
- One of the Department’s signature community-service events (Insect Discovery) is at risk if Graduate Teaching Assistant support does not continue.
- Some of the inputs needed to achieve the goals outlined in the strategic plan include investments in human capital that are unlikely to be fulfilled.
- Addressing imminent retirements given the current CALES and UA financial situation will pose a challenge.

● Recommendations:

1. Explore ways to improve and adjust relationships with the CALES Development & UA Foundation, including building on the popularity of the Arizona Insect Festival, the internationally recognized insect collection, exploring endowed programs, and other

opportunities. For example, having a dedicated or shared development officer who works closely with Entomology and other CALES units—rather than Eller College—could result in more successful philanthropy.

2. Consider developing a staff position in communications/outreach who could assist with outreach events, web pages and media contacts for PIs, department, and college. The department website should be updated to make it easier to navigate, including the faculty member webpages. Centralizing this activity would help ensure that the websites are up to date and attractive to potential graduate students and other researchers, donors, and to the public.
3. Explore ways to better support the vast outreach and engagement responsibilities, perhaps by spreading duties across a larger number of people—possibly as part of faculty service loads.
4. Recognizing the current financial crises in CALES and UA, explore short-term stop-gap measures for much-needed administrative support, possibly including sharing appointments with other CALES units and/or hiring student workers.
5. Continue to capitalize on existing expertise on campus for the EIS GIDP. In addition, increased connections with other departments in CALES through research collaborations and teaching, could lead to new opportunities such as a new undergraduate major.
6. Continue attracting top quality graduate students. An increased focus on branding and an up-to-date and more sophisticated web presence could help. Faculty web pages, for example, should be easy to reach and consistent. Having a more explicit funding guarantee in offer-letter could also help with recruitment.
7. Continue laudable efforts to increase diversity. Although the small size of the unit and the lack of future planned hires precludes rapid changes, we appreciate current efforts through programs like SPFI.
8. Outline a more formalized plan for faculty development at each career stage, including mentoring of junior and mid-career professors. Existing mentoring teams could get explicit instructions / roles (e.g., research and a teaching mentor). Associate professors could also benefit from mentoring as their careers progress to ensure that they come up for promotion in a timely way.
9. Contribute to the newly created Homecoming CALES tent, for example with edible insects. This could be an entry point for collaboration with other CALES units around academic/curriculum projects.