

**/A Proposal to Alter the Department of Entomology  
under Faculty Rule 3335-37-37**

**August 8, 2008**

**(a) RATIONALE**

This is a time of enormous change at The Ohio State University. Within the College of Biological Sciences, the current six departments will be merged into two or three departments, largely along organismal vs. molecular lines. As this change is being contemplated, an *ad hoc* committee convened by Provost Alutto has recommended merging all five colleges of the Arts and Sciences into a single collegial unit.

For the last 40 years, Entomology has been split between the College of Biological Sciences and the College of Food Agriculture and Environmental Sciences. This dual-college alignment has been periodically reconsidered and, heretofore, the divided department model, and the split faculty appointments that support it, have been reaffirmed. However, after the adoption of a new budget model in 2005, which aligns fiscal resources with the units that generate them, this alignment has become increasingly problematic. In the past, it was possible to serve two masters (i.e., two deans) by ignoring the one holding the minority appointment and serving the one who held the majority appointment. However, this divided attention does not work well under the new budget model and the wisdom of attempting to serve two masters who administer colleges with vastly different missions, must again be questioned. Indeed, in a recent CSREES review of the department, the evaluation committee commented:

**“The faculty appears to be caught between the CBS’s push for higher NRC rankings and that of CFAES/OARD/OSU for more accountable coverage of mission-oriented research and extension programs. The lack of discussions pertaining to the need for balance, avoidance of making necessary realignments in faculty efforts, and the lack of a coherent vision aligned with those of the several entities the department is accountable to prevent the faculty from making the necessary adjustments to enable the entomology programs at OSU to be the best in the nation.”**

In light of the radical changes taking place in college structure alluded to above and in agreement with the observations of the CSREES review, we believe that it is time for Entomology to be located solely in the College of Food, Agriculture and Environmental Sciences so that its activities can be aligned with its mission.

Our plan will significantly reorganize the Department of Entomology in order to enhance our mission of achieving eminence. In designing this plan, nothing was considered sacred; every resource, tradition and human resource was evaluated and reconsidered. The plan which we have designed aligns goals with resources, optimizes the use of those resources and represents a commitment to future disciplinary growth and leadership.

**What are the Elements of the Alteration?**

There are two major elements to our alteration plan. Currently, there are 11 FTEs in Entomology in the College of Biological Sciences. There are 17 FTEs in Entomology in

FAES. Most faculty, regardless of college, have split appointments between the two colleges. The first part of our alteration plan is to return partial appointments to the dean who holds the majority appointment. As a result, an FTE would be equivalent to a person. The second part of the alteration plan will merge the Entomology FTEs remaining in CBS with the Department of Evolution, Ecology and Organismal Biology. The Entomology TIU will cease to exist in CBS but will continue as a departmental TIU in FAES. There will be 17-19 FTEs in Entomology in FAES after the alteration. An appendix showing how FTEs will be reconciled appears in Appendix A.

Recognizing the importance of entomological knowledge to modern life, we strongly believe that the departmental status of entomology at OSU should be maintained. This decision rests on several principles. First of all, our analysis of entomology departments across the nation (Appendix B) confirms that departments of entomology are graduate departments. Compared to departments that have large undergraduate enrollments, graduate programs depend heavily on the coherence provided by departmental structure. Our new, revised curriculum, in turn, depends heavily on the collaboration of disciplinary experts that will be found only in a department of entomology. Second, entomology provides the platform upon which a variety of other disciplines important to FAES (e.g. Plant Pathology, Horticulture and Crop Sciences) depend. Third, OSU increasingly prizes interdisciplinary work of which the Department of Entomology is an exemplar. The key to thriving interdisciplinary research is to have strong disciplines. We, therefore, need to keep entomology strong. Fourth, the state of Ohio continues to depend heavily on production agriculture to undergird its economy. Insect depredation of crop plants and food animals is an important factor in controlling that productivity. Although not every state has a department of entomology, Ohio is among the states whose economy is most dependent upon agriculture and, therefore, most in need of entomological expertise. The visibility of departmental status is an important demonstration of OSU's commitment to the citizens of the State of Ohio. Finally, entomology has been very successful in attracting donors. In addition to the 18 endowments pledged to Entomology at OSU, the Department of Entomology is the recipient of an endowed chair, the gift of Dr. John Moser. We will continue to rely on the generosity of donors and to expand that base. Our departmental status is critical to that outreach.

Can a Department of Entomology thrive if 11 out of 27 FTEs are split off and absorbed by EEOB? If we split off 11 FTEs from the current Entomology Department, we will go from an intermediate size to a small size among departments of entomology nationally. We will, however, be able to survive, and with our new curriculum, to compete successfully for graduate students. The latter will be assisted through nonsalaried appointments with entomologists who go to EEOB and a limited number of joint appointments (Denlinger, Foster, Fisher, Lanno). We will, thus, have the full range of graduate advisers needed to have a comprehensive graduate program in Entomology. Nonetheless, we recognize that the health of entomology in FAES will depend on judicious and strategic hiring going forward. The recent addition of Omprakash Mittapalli and Mary Gardiner represent the first commitment towards this goal. Our

strategic plan also includes a plan to hire and pay for additional faculty to secure the future of our department.

**(b) and (c) Enumeration of Faculty Affected and Person by Person Analysis**

Referring to Appendix A, the redistribution of FTEs needed to accomplish the splitting of Entomology and merger of part of the department with EEOB is detailed. However, in recognition of the opportunities that exist with the reconsideration of the organization of the colleges of the Arts and Sciences, Dean Platz announced that individual faculty would have the opportunity to move their lines to another college should that be their desire. After consulting with individual faculty, the distribution of faculty will be as follows if the proposal to alter Entomology under rule 3335-3-37 is approved:

Canas— 100% Entomology/FAES  
Denlinger—50% EEOB/BMAPS, 50% Entomology/FAES  
Edwards—100% Entomology/FAES  
Fisher—50% EEOB/BMAPS, 50% Entomology/FAES  
Foster—50% EEOB/BMAPS, 50% FAES  
Gardiner—100% Entomology/FAES  
Grewal—100% Entomology/FAES  
Hall—100% EEOB/BMAPS  
Hammond—100% Entomology/FAES  
Herms—100% Entomology/FAES  
Hoy—100% Entomology/FAES  
Johnson—100% EEOB/BMAPS  
Jones—100% Entomology/FAES  
Klumpen—100% EEOB/BMAPS  
Kovach—100% Entomology/FAES  
Lanno—50% EEOB/BMAPS, 50% Entomology/FAES  
Michel—100% Entomology/FAES  
Mittapalli—100% Entomology/FAES  
Needham???  
Phelan—100% Entomology/FAES  
Ravlin—100% Entomology/FAES  
Shetlar—100% Entomology/FAES  
Tew—100% Entomology/FAES  
Welty—100% Entomology/FAES  
Wenzel—100% EEOB/BMAPS  
Williams—100% Entomology/FAES  
Wilson—100% EEOB/BMAPS  
Wrensch—100% EEOB/BMAPS

For faculty members who will be transferred to EEOB, faculty rule 3335-6-06 (Transfer of Tenure Initiating Unit) is activated. The transfer of the relevant lines will be approved by the receiving unit (EEOB) in autumn quarter (Appendix C). Approval of divisional dean Matt Platz and CFAES dean Bobby Moser will be obtained in the MOU that is forthcoming if the alteration is approved.

All faculty members from the original department of Entomology have, thus, been satisfactorily accommodated in the planned alteration. The changes are being made with the assent of the faculty. In addition, four

faculty will have salaried joint appointments in the new structure in accordance with their wishes. A number of nonsalaried joint appointments will also be created at the request of individual faculty.

All nontenured faculty (Canas, Michel, Gardiner and Mittapalli) already have majority appointments in FAES and will be largely unaffected by the alteration. There will be minor alterations in teaching loads as a result of the alteration but these will be negotiated with the affected faculty individually and Entomology has a policy of assuring light teaching during the probationary period. This policy will remain in effect. As a result, the impact of the alteration on promotion and tenure will be minimal.

#### **(d) An analysis of Courses Taught and Provisions for Reassignment**

##### Existing Courses

The current Department of Entomology offers 60 individually numbered courses. Most courses are not offered every year. Often courses are scheduled and a TA assigned and then cancelled due to low enrollment. When the CBS entomologists are merged with EEOB, the fate of courses taught by the faculty who are being absorbed into EEOB must be negotiated with the chair of EEOB, Peter Curtis. The money generated by those courses should continue to flow to the College of Biological Sciences. Entomology 460 and its variants will continue to be taught by Entomology faculty in FAES following the merger with EEOB. The enrollments in 460 are sufficient to justify its continuation and the faculty currently teaching the courses are all in FAES. The money for these courses will be redirected to FAES. It is assumed that high profile courses such as the entomology summer acarology program will continue to be taught after the merger with EEOB since these courses are self-supporting.

All other entomology courses currently on the books that are unclaimed by entomologists in CBS will be taken off the books. Some of these courses belong are included in the current core curriculum. A new core curriculum which can be taught solely by FAES faculty is discussed in the next section. All underperforming courses will be eliminated. In addition, several new courses will be added with the revenue flowing to FAES in proportion to the percent appointment in FAES.

##### New Core Curriculum in Entomology

We propose enactment of the revised curriculum for entomology designed by the *ad hoc* curriculum committee chaired by Parwinder Grewal in 2006 (Appendix D). In writing the new curriculum, the committee interviewed current and former students, current and prospective employers of our graduates, external stakeholders and the committee analyzed the curricula of other departments of entomology around the country. We concluded that our curriculum was outmoded, lacking in key areas of emerging expertise such as molecular biology and did not do an adequate job of training students in writing papers and grants. This substantially modified curriculum can be taught primarily or completely by FAES faculty after the reorganization is accomplished. Implementation of the plan will maintain graduate-level instruction in entomology as an important part of our curriculum while simultaneously updating the instruction to meet the needs of students and external stakeholders alike. The shift in the teaching of the core curriculum from CBS faculty to FAES faculty will entail creating teaching (general fund) appointments for the relevant faculty in FAES. We will create general fund-teaching appointments for Entomology faculty in FAES as follows:

Cañas—15 %  
Shetlar—15%  
Gardiner—5%  
Foster—15 %  
Lanno—15%  
Michel—5%  
Phelan—5%  
Grewal—5%  
Mittipalli-15%  
Hoy—5%  
Herms—5%  
Fisher—25%  
Hammond-5%  
Jones—5%  
Welty—10%  
Denlinger 5%

In the case of courses taught by faculty with joint appointments, the revenues generated will be split between colleges according to the appointment split.

**(e) Analysis of Students Affected by Alteration**

Since the Department of Entomology and graduate program in Entomology will continue to exist after the alteration, current students will be able to complete their degrees in Entomology. The current core courses will continue to be offered until at least October 1, 2010. Some of the courses may be offered thereafter, but that will be at the discretion of EEOB. The new core curriculum in Entomology will be implemented October 1,

2009. Student who enter on or after that date will be required to take the new core in order to complete their degrees. This plan should make it possible for the currently enrolled students to complete their degrees with the standards and expectations they agreed to when they enrolled at OSU.

The only area likely to undergo significant change is the availability of the spectrum of courses of advanced courses that is currently available in Entomology. As noted above, some of those courses may continue to be taught if EEOB elects to do so. However, since many of these courses were not meeting enrollment goals, their elimination does not portend significant difficulties for current students.

### **(f) Specific Proposals for Supporting Currently Enrolled Students Until Degree Completion**

We currently have 34 students enrolled in the Entomology graduate program. Those students are supported as follows:

#### **GTAs**

3 TAs in departmental course

17 TAs in CLSE (Center for Life Sciences Education) courses

#### **GRAs**

14 students are supported on faculty research grants

The above figures represent averages for quarters during the academic year. After October 1, 2009, the GTAs available for teaching Entomology courses may end or be reduced in number. However, it is highly likely that new courses will be taught by entomologists in FAES to fill that void, e.g., the core curriculum. There may be a slight initial reduction in departmental GTAs in 2009, but we expect it to return to at least 3 per quarter thereafter. In addition, entomology students may have access to EEOB courses.

Our goal is to continue to maintain access to CLSE GTA slots after the alteration. The TAs are desperately needed and our students have done an excellent job in CLSE, including many TAs who have won awards for teaching. This will become an element of the MOU that supports the alteration.

The GRA support will be roughly the same after the alteration takes place. Since current entomology faculty can maintain their access to the graduate program through nonsalaried appointments, faculty who go to EEOB can continue to advise and support Entomology students. This will be no different than offering grant support to students in interdisciplinary programs such as Environmental Sciences or PMBB with which Entomology has a long history.

### **(g) An Analysis of the Budgetary Consequences of the Proposal**

The budgetary analysis is a little complex because of the different ways the two colleges involved have for disbursing funds that come into the college. In CBS, for instance, revenues derived from teaching go to the college and do not filter down to the departmental level. Departments are not billed for POM in CBS. In FAES, however, teaching revenues flow to departments. Departments are expected to use some of that money to pay POM charges for space. These are but two of the relevant differences between the two colleges. When one adds to these differences the fact that the five colleges of the Arts and Sciences are in a state of flux, it becomes very difficult to comment with accuracy on the budgetary consequences of the proposal.

With all of those caveats, the Department of Entomology has the potential to do very well in FAES. Considerable revenue will come to the department from teaching activities. These monies will be used to pay for POM charges but also to fund a series of strategic initiatives that will bring new faculty into the department and help our department become one of the top five entomology departments in the nation.

The Department of Entomology has 18 endowments. Most of these were given to the Department of Entomology by the donor. All were given for specific and dedicated purposes. After the splitting of the department and merger with EEOB, certain endowments, e.g. the Knull funds and the acarology funds will move from CBS to FAES but the work the funds were designed to support will continue in CBS (or BMAPS or whatever it becomes). To maintain the intent of the donor, it is our belief the Knull and acarology funds should continue to be administered by faculty at the Museum of Biological Diversity. The other endowments can be utilized appropriately by the Department of Entomology in its new incarnation and should continue to be housed in the Department of Entomology.

### **Revenue Flowing to FAES from Currently Taught Courses:**

The revenues are based on averages of adjusted credit hour rates for each course from 2006, 2007 and 2008 enrollments and the net value of the tuition + subsidy-24% tax and other fees. In other words, these are conservative estimates of likely revenue.

1. Entomology 460—BAC 2

Average credit hours:  $60 \times \$167.25$  (net revenue)=\$10,835

2. Entomology 461—BAC 2

Average credit hours:  $90 \times \$167.25 = \$13,252.50$

3. Entomology 462—BAC 3

Average credit hours:  $132 \times \$193.20 = \$25,502.40$  ASC 211 (Introduction to Forensic Science)

$$400 \times \$193.20 = \$77,280.00$$

III. Entomology 790—DOC1

$$65 \times \$302.84 = \$20,322.00$$

6. Entomology 999 DOC 1,2

Ave. credit hours = 1,188 of which 2/3 are due to OARDC, OSUE.

$$796 \text{ credit hours} \times \$345 \text{ (ave. net \$ per credit hour)} = \$274,620$$

**TOTAL FROM Current Courses: \$421,791**

**Revenues Flowing to FAES from new courses:**

1. ASC 720 (Scientific Literacy)—MAS3, Doc1,2

$$50 \times \$301.18 = \$15,059.00$$

2. Biology 103 BAC 1 (sequence to Biology 101, cluster course with Chem. 100)

$$500 \times \$160.65 = \$80,325.00$$

3. Gee Whiz Entomology Course (Revised Entomology 101)? BAC1

$$1000 \times \$160.65 = \$160,650.00$$

4. Life Sciences 350 BAC 3 (Biology of Hope and Belief)

$$250 \times \$193.20 = \$48,300.00$$

IV. Life Sciences 375 BAC 3(Molecules, Men and History: Chemicals that have changed history)

$$250 \times \$193.20 = \$48,300.00$$

7. New Entomology Core Curriculum:

$$50 \text{ credit hours/quarter} \times 3 \text{ quarters/year} \times \$302.84 \text{ net per credit hour} = \$45,426.00$$

**TOTAL FROM NEW COURSES (CONSERVATIVE):**

**\$398,060.00**

**Grand Total from Courses (new revenue to FAES): \$819,851**

We propose using the new money coming in from teaching revenues to fund the transition to a department of Entomology located in FAES as follows:

1. Cost of partial appointments for teaching faculty. Assuming \$90,000 average salary, the partial appointments add up to 1.0 FTE. The cost will, thus be \$90,000+ benefits = (approximately) \$112,000.



2. New neurobiology appointment: \$70,000 in salary of which \$45,000 is already credited to Entomology, leaving \$25,000 in salary and \$20,000 in benefits= \$45,000.
3. New insect vector of mammalian disease position: \$70,000 in salary and \$20,000 in benefits = \$90,000. However, there will be no net expense to FAES because it will be offset by the partial appointments freed up in OARDC and OSUE FTEs by the partial teaching appointments that are created and paid for in (1).
4. New insect biodiversity position: \$70,000 in salary and \$20,000 in benefits = \$90,000 total.
5. New HR and Fiscal person for Columbus: \$50,000 in salary and \$18,000 in benefits = \$78,000.
6. TAships for courses. We expect we will need 6-8 TA positions to meet the demands of the new courses. Of course, if enrollment exceeds expectations, that number will increase. If we assume that the cost of a GTA for one quarter is \$12,000 (approximately \$6,000 for stipend and \$6,000 for tuition), then this will cost \$72,000-\$96,000. We will use the higher figure for budgeting purposes. We also hope to negotiate access to CLSE GTAs although we may have to cover the cost of tuition and fees to do so. If we budget 8 CLSE GTAs @ \$6,000 per TA, that comes to \$48,000. If the university allows post candidacy Ph.D. students to enroll for only 3 credit hours, that figure will drop considerably. This should allow us to adequately support our graduate student population.

**Total Wishlist = \$469,000 compared to \$819,851 in conservatively estimated new revenue.**

A related financial issue is the fate of entomology endowments that are listed in Appendix D. We propose that, consistent with the stated wishes of the donors, the endowments pledged to Entomology will remain in Entomology after it is fully transferred to FAES. However, the endowments that have historically been used to fund entities that will remain in CBS, e.g., the Knull funds and the acarology funds, will continue to be used for those purposes.

#### **(h) Analysis of Services Lost**

As noted in previous sections, a potentially large number of under-enrolled courses may be eliminated. However, since they are underenrolled, it suggests they are no longer needed and this is not a serious loss. We believe that the reorganization will allow us to better invest resources and position our department for a productive future. We will have a more focused mission and we will be able to reallocate resources to meet important problems. The advent of colony collapse disease in honey bees is a good example. This is a nationwide problem that particularly affects agricultural states such as Ohio which relies upon honeybees to pollinate crops. Ohio State University should be a leader in

efforts to understand and ameliorate colony collapse disorder. Sadly, the internationally renowned honey bee genetics program was not supported by the previous administration and we failed to retain the faculty member who was a leading researcher in honeybee neurobiology when he was offered a job at Arizona State University. Once Entomology is located solely in agriculture, the cross-cultural conflict that led to the demise of the honeybee program will be eliminated.

**(i) Analysis of Services Lost to the Rest of the University**

None

**(j) An Analysis of Impact on Constituencies External to the University, Including Alumni**

Various elements of this proposal have been vetted with external stakeholders, emeritus faculty and alumni. In August of 2008, a copy of the first page of the proposal to alter the department along with a letter explaining the merger and requesting comment from the Chair was sent to approximately 60 alumni, emeriti and stakeholder. To date, we have received a response from one stakeholder who enthusiastically supports the alteration and 5 emeritus faculty. Among the latter group, all were in favor, although some tempered their support with acknowledgment of potential concerns. For instance, one emeritus faculty member stipulated that his support was contingent upon several contingencies:

1. That no sal appointments with EEOB entomologists could be arranged;
2. A graduate program granting both MS and PhD degrees in entomology be maintained;
3. When EEOB entomologists retire, the Department of Entomology be consulted about replacements.

While (3) is in question, the other provisos have been accommodated by this proposal. Thus, the people who have commented upon the proposal support it.

**Analysis of the Impact upon Governance**

Our department has always been founded on the principle that a system of shared governance requires the participation of the governed in order to work. Past patterns of administration were both written by and voted on by the faculty. This could change with a new chair, but if that chair comes from the current faculty, this tradition is unlikely to change. In the past, the dean of CBS approved the pattern of administration, a task which will fall to the Dean of FAES if the proposal to alter Entomology is approved. However, we don't expect a change in governance to occur as a result since, experience shows that FAES is even more democratic than CBS was.

**(k) An Analysis of Impact Upon Diversity**

Entomology has had a comparatively good record in diversity. Twenty-five percent of our faculty are women; Ten percent of faculty are minority. Among our students, the percentage of women approaches 50% and our minority students vary between 20-30%. Our data, while not as good as they might be, are better than data for the College of Biological Sciences and better than other departments of entomology across the nation. We expect our commitment to diversity to be maintained after the alteration. It is likely that our success in attracting a diverse faculty and student body will increase in FAES because of FAES's attention to diversity and its willingness to reconsider traditional paradigms in its quest to become more diverse.

**(I) An Analysis of the Impact on Academic Freedom**

The current chair of entomology is a winner of the Nemzer Award for Academic Freedom given annually by the OSU Chapter of the AAUP. Our department believes that the granting of tenure is meaningless without a corresponding commitment to academic freedom. We have nurtured these values in our faculty and will continue to do so if the proposal to alter our department is approved.

**APPENDIX A**

Preliminary Reconciliation of CBS, FAES FTEs

Name	% CBS	%FAES
Canas	15	85
Denlinger	80	20
Edwards	65	35
Fisher	60	40
Mittapalli	15	85
Horn	75	25
Lanno	85	15
Needham	75	25
Phelan	25	75
Shetlar	20	80
Neurobiology	80	20
Hammond	20	80
Foster	100	0

Total	715	585
Canas	<u>0 (-15)</u>	<u>100 (+15)</u>
	700	600
Denlinger	<u>50(-30)</u>	<u>0 (+30)</u>
	670	630
Edwards	<u>0(-65)</u>	<u>0 (+65)</u>
	605	695
Fisher	<u>50 (-10)</u>	<u>50 (+10)</u>
	595	705
Mittapalli	<u>0 (-15)</u>	<u>100 (+15)</u>
	580	720
Horn (retiring)	<u>75 (0)</u>	<u>25 (0)</u>
	580	720
Lanno	<u>50 (-35)</u>	<u>50(+35)</u>
	545	755
Needham	<u>100 (+25)</u>	<u>0 (-25)</u>
	570	730
Phelan	<u>0 (-25)</u>	<u>100 (+25)</u>
	545	755
Hammond	<u>0 (-20)</u>	<u>100 (+20)</u>
	525	775
Neurobiology	<u>100 (+20)</u>	<u>0 (-20)</u>
	545	760
Shetlar	<u>0 (-20)</u>	<u>100 (+20)</u>
	525	775
Foster	<u>50 (-50)</u>	<u>50 (+50)</u>
	475	825

**APPENDIX B**

**APPENDIX C**

**APPENDIX D**

**Report of the Entomology Adhoc Curriculum Committee**

**Luis Canas**  
**Parwinder Grewal (Chair)**  
**Hans Klompen**  
**Giancarlo Lopez-martinez (Student Representative)**  
**John Wenzel**

**August 10, 2006**

**Executive Summary**

*The Adhoc Curriculum Committee conducted a review of our graduate teaching in Entomology and has compiled this report. According to the charge stipulated by the Department Chair, Dr. Susan Fisher, the committee examined OSU course enrollment data, course syllabi, and national trends to determine whether our current course offerings are meeting the educational needs of our students. In addition, the committee conducted a comprehensive survey to assess the curriculum and non-curriculum academic needs and expectations of our graduate students. While, the committee found OSU Entomology course offerings to be attractive and comparable to most Entomology departments nationwide, it noted that improvements are needed to move OSU to the top of Entomology Graduate Programs in the nation. This report briefly presents committee's findings and outlines a new approach to graduate teaching in Entomology that has emerged from numerous discussions among the committee members and many faculty members and students on both campuses. The over-arching theme of the proposed curriculum is to provide the most comprehensive graduate training ranging from molecule to ecosystem learning opportunities and outstanding professional development skills with a goal to establish OSU Department of Entomology as the best Graduate Program in the nation in the 21<sup>st</sup> Century.*

## Major findings

1. Three major reasons students choose OSU Entomology are the professor, the graduate program, and the matching of interest between the student and research program of the professor
2. Most of our students are interested in insect management followed by ecology, non-insect topics, basic insect biology, and insects as model systems, respectively
3. There are far too many course listings
4. Some courses have not been offered in a long time
5. Several courses have low enrollments
6. Even the required core courses are not offered every year which causes problems
7. Learning outcomes are not clearly defined for all courses
8. About 40% of our students are dissatisfied with our current core courses
9. Among the core courses, students are less satisfied with Morphology and Systematics than Physiology and Ecology
10. Some students indicate they need greater depth in some core courses while the others indicate that they either do not need them at all or they must be taught at lower level.
11. Although, we are incorporating information on molecular biology in some courses, it is limited even by our students' expectations
12. An examination of national trends in entomology revealed that all the leading entomology departments are now teaching modern courses such as molecular entomology, genomics, bioinformatics, landscape ecology, population genetics, and even ecosystem management, which is supposed to be one of our strengths!, but we do not
13. Students indicated that they need better training in statistics particularly tools relevant to their own entomological data analysis, technical paper writing, grant writing, and molecular techniques

## Proposed Approach to Graduate Training in Entomology

We propose to keep a required core curriculum as it defines the end product, standardizes training, and provides fairness in graduate student examinations. We propose a **Basic Core** that encompasses 4 entomology courses (at 600 level) and 2, one year-long, series on techniques and professional development, with a total of 30 required credit hours. The techniques' series will cover general insect laboratory, molecular, cladistic, genomic, and bioinformatics methods, and field experimental techniques along with their respective statistical analysis tools and methods. The professional development series will cover technical paper (journal article) and proposal development/research synopsis writing, communication (presentation) skills, and the nature and practice of science course. In the professional development class on proposal development, students will develop proposal/synopsis on their own research and will thus be engaged in discussion with their own major advisors from the beginning. The idea is to provide all the necessary tools and skills to students before they begin their own research projects in different laboratories. Imagine a student beginning their research project with already fully developed and defended research proposal, know how to handle and rear insects, design both laboratory

and field experiments, know how to run gels, and have an idea about bioinformatics before entering your laboratory! This is bound to increase publication productivity per graduate student and will also result in increased grant success for the faculty. We recognize that some students may have garnered some of the techniques and professional development skills before entering our graduate program and thus, these students can be exempted from specific courses on a case-by-case basis.

All basic core courses should be offered annually and electronically, except for the techniques series. As at least 10-12 new students enroll in the Entomology Graduate Program annually it should not be difficult to meet the minimum course enrollment requirements in the basic core. We propose that the techniques' classes should be offered concurrent to the basic entomology classes in the respective area. For example, molecular and genomic techniques laboratory should be offered in the same quarter in which Physiology and Biochemistry class is offered. It is expected that the instructors of these courses discuss and develop parallel themes for the laboratory and theory. A budget must be established for each laboratory class. Request for a waiver from any basic core entomology course should be entertained on a case-by-case basis and must require the approval of the Graduate Studies Committee.

**Basic Core Curriculum [one year series with 30 credit hours]**

Course	Credit hours	Proposed Instructor (suggestions welcome!)
Form and Function	4.0	Shetlar
Physiology and Biochemistry	4.0	Denlinger and Needham
Ecology, Behavior, and Population Genetics	4.0	Gardener, Michel, and Phelan
Ecosystems Pest Management	4.0	Grewal and Hoy

Techniques and data analysis I (General insect laboratory)	2.0	Canas
Techniques and data analysis II (Molecular, cladistic, and genomic techniques)	2.0	New Mol. Entomologist
Techniques and data analysis III (Field experimental design & data analysis)	2.0	Hammond

Professional Development I (Journal article writing)	2.0	Jones
Professional Development II (Research grant/synopsis writing)	2.0	Grewal and Herms
Professional Development III (Communication skills – seminar)	2.0	Gardener
Professional Development IV (The Nature and Practice of Science)	2.0	Herms

## Advanced Specialization Tracks

More intensive graduate training (perhaps only Ph.D.) may be accomplished through a set of specialized tracks catering to the needs of specific students in concert with research interests of our faculty. Each track will have a set of courses at the 800 level out of which the students would be required to choose at least any two courses. This 800 level designation may attract some students from Plant Pathology and other Departments. The same advanced course may be utilized for more than one track. These courses do not have to be offered annually. However, it is possible that we may still not have enough enrollments and thus these courses may have to be offered as 795's. We challenge our faculty to develop highly attractive, preferably electronically based, advanced courses appealing to students from other departments, colleges, and institutions worldwide. We believe that there is an opportunity to develop world-renowned courses in areas of our faculty's strength. We propose the following initial set of specialized tracks based on our current faculty research interest clusters.

1. Acarology
2. Behavior and Ecology
3. Environment Biosensing and Restoration ecology
4. Genetics, Genomics and Physiology
5. Insect Pathology
6. Medical Entomology and Vector Biology
7. Ecosystems Pest Management
8. Systematics and Evolution
9. Environmental Toxicology

The courses for these tracks could come from our existing courses or from new courses. Some of the existing courses will have to be upgraded to incorporate latest concepts and techniques to increase depth. Below is a tentative list of courses that may be used for the above tracks. The same course may be used for more than one track. All other courses on our books should be carefully scrutinized, their contents may either be incorporated into the proposed courses as much as possible or they may be dropped completely from our listings.

**Acarology** [670 General Acarology, 870; Medical and Veterinary Acarology; 871 Agricultural Acarology (the last two may be combined?)]

**Aquatic entomology** [612 Aquatic Entomology (needs a permanent instructor)]

**Biological control** [650 Biological Pest control + Advanced Biological control, Grewal, Canas]

**Environment biosensing** [Grewal, Shetlar, and Lanno]

**Insect communication and chemical ecology** [840 Insect Chemical Ecology, Phalen]

**Insect microbe interactions and insect pathology** [Hogenhout, Grewal and Dean]

**Insect molecular genetics and evolutionary biology** [632 Insect Molecular Genetics; Wilson]



**Insect-plant interactions** [664 Host plant Resistance, Herms and Hammond]

**Insect systematics and Diversity** [621, Johnson]

**Medical entomology** [661 Medical Entomology, Foster]

**Population, community, and landscape ecology** [New hire pending]

**Restoration ecology** [Bradley Smith for this course or for some others?]

**Pollination ecology** [Karen Goodell, OSU-Newark]

**Toxicology** [597 Impact of pollutants; 762 Environmental Toxicology; Ecological risk assessment?]

**Adjusted credit hours by course over the past 6 years**

No.	Title	2000	2001	2002	2003	2004	2005	6-Yr Total
<b>612</b>	<b>Aquatic Entomology</b>	<b>25</b>	<b>20</b>	<b>30</b>	<b>50</b>	<b>40</b>	<b>25</b>	<b>190</b>
<b>621*</b>	<b>Systematics and Diversity</b>		<b>70</b>		<b>100</b>		<b>55</b>	<b>225</b>
<b>623*</b>	<b>Morphology</b>	<b>55</b>		<b>115</b>		<b>75</b>		<b>245</b>
626	Cladistics		21				39	60
<b>631*</b>	<b>Physiology</b>	<b>40</b>	<b>55</b>	<b>50</b>		<b>75</b>		<b>220</b>
<b>632</b>	<b>Molecular Genetics (new)</b>					<b>54</b>	<b>15</b>	<b>69</b>
<b>641*</b>	<b>Insect Ecology</b>			<b>75</b>		<b>90</b>		<b>165</b>
<b>642</b>	<b>Insect Behavior</b>	<b>40</b>			<b>40</b>		<b>32</b>	<b>112</b>
645	Simulation Modeling							Not offered
<b>650</b>	<b>Biological Control</b>		<b>44</b>		<b>40</b>		<b>36</b>	<b>120</b>
<b>655</b>	<b>Quantitative Methods</b>		<b>21</b>		<b>12</b>	<b>48</b>	<b>18</b>	<b>99</b>
<b>660</b>	<b>Advanced Economic Entomol</b>			<b>70</b>		<b>35</b>		<b>105</b>
<b>661</b>	<b>Medical Entomology</b>			<b>65</b>		<b>75</b>		<b>140</b>
<b>662</b>	<b>Principles of Insect Toxicology</b>		<b>25</b>		<b>45</b>		<b>40</b>	<b>110</b>
664	Host Plant Resistance to Insects		27		36		18	81
670	General Acarology					4		4
693	Individual Studies	50	119	108	173	132	110	692
694	Group Studies	36	21	10	51	120	?	238
697	Study at a foreign Institution							Not offered
698	Study Tour							Not offered
762	Environmental Toxicology					35		35
H783	Honors Research	13						13
<b>790</b>	<b>Nature &amp; Practice Science-new</b>					<b>18</b>	<b>?</b>	<b>18</b>
795	Special Topics in Entomology	9	34	55	38	34	8	178
796	Adv Studies and Techniques							Not offered
800	Entomology Seminar	6	10	16	11	7	6	55
831	Advanced Insect Physiology							Not offered
840	Insect Chemical Ecology							Not offered
870	Medical-Veterinary Acarology		4	8	8			20
871	Agricultural Acaraology	4		12				16
872	Soil Acarology							Not offered
880	Research and Training Seminar		18	18	18	12	20	86
891	Interdepartmental Seminar							Not offered
999	Research in Entomology	1371	1151	1329	1378	1422	1219	7870

\*Required Courses; 693, 694, 795, 999 and courses (or their contents) in bold should be retained

