Department of Biological Sciences
Program Review Committee Report

May 4, 2004

The Department of Biological Sciences prepared a self-study following program review guidelines. An external review team (Shirley Rapps and Joseph Cook) visited the campus, reviewed the self-study documents, interviewed unit personnel and university administrators and submitted an external review report. The Program Review Committee (PRC) read the self-study and the external review, and met with program faculty. This document reflects the PRC’s findings and recommendations.

SUMMARY OF THE SELF-STUDY

Mission and History

Mission. The Department has a three-part mission: (1) to provide high-quality instruction for undergraduate and graduate students; (2) to conduct research of national and international significance; and (3) to provide professional leadership to the national and international scientific communities. Its mission emphasizes the interconnection between instruction and research for both undergraduate and graduate students.

Relationship to the College and University Mission. The Department’s mission is consistent with that of the College of Arts and Sciences and the University. It focuses on achieving excellence in teaching, research, and service. It emphasizes training students at all levels (general education, major and minor, and graduate) to think critically, intuitively, broadly, and openly, while maintaining the disciplined approaches of scientific methods.

History. The history provided in the self-study report focuses on faculty hiring. Over the last 11 years, 25 faculty lines have been filled. Of these, 20 are still at the University. These lines include a professor and chair (a second professor arrives in August 2004), 16 assistant professors, and 8 lecturers and instructors. In addition, the Department added two new undergraduate majors (microbiology and neuroscience), focused its graduate program and research around three areas (molecular biology and biochemistry; ecology, evolution and conservation; and neuroscience, mind and behavior), and its faculty have begun participating in two new interdisciplinary research centers (the Center for Biomolecular Sciences and the J.P. Scott Center for Neuroscience, Mind and Behavior).

1 Data updated subsequent to submission of the self-study.
**Description of the Unit**

*Program Identification.* At the undergraduate level, the Department offers three undergraduate majors (biology, microbiology and neuroscience) and maintains more than 25 concentrations within these degrees including six in pre-professional areas. Department faculty also participate to some extent in Department of Chemistry’s NSF Research Experience for Undergraduates (REU) grant, as well the COSMOS (Center for Excellence in Science and Mathematics Education: Opportunities for Success) and the AIMS (Academic Investment in Math and Science) initiatives.

The Department offers master’s and doctoral degree work in the three areas of focus (Ecology, Evolution and Conservation; Cell and Molecular Biology: and Neuroscience, Mind and Behavior) as well as in related areas of Biochemistry and Physiology. Over 80% of students who received master’s or doctoral degrees since 1995 have secured employment directly related to their field of study. (This figure increases to 98% when those students whose whereabouts are unknown are not counted).

Department faculty and students further their work by participating in a number of institutes and centers both within and without the Department. They also participate in some collaborative initiatives with other universities such as the University of Toledo and the Medical College of Ohio.

The Chair governs the Department with the help of four main committees. One of them, the Executive Committee, serves as an advisory body to the Chair. The Chair consults with the entire faculty on major issues.

*Faculty Resources.* The faculty consists of 5 assistant professors, 11 associate professors, 15 professors, 1 lecturer, 4 instructors and 5 professors emeritus. Women and minorities make up approximately 30% of the faculty. Faculty members have received a variety of campus awards for teaching and research. There are also faculty who serve in professional capacities such as grant reviewers, journal and book editors, and organization officers. The mean overall for faculty salaries is $60,892. The Department asserts [no citation provided] that this compares to a disciplinary mean of $62,000 for midwest universities and a national mean of $65,000.

*Graduate Assistant Resources.* The Department supports 88 students on graduate assistantships (an increase of 11 since 1995). Most are institutionally supported teaching assistants although a few are supported by faculty research grants. Almost 50% (43) are female and 43% (38) are international students. The Department has achieved its preferred ratio of two doctoral students for each master’s student supported. This represents a reversal of the ratio that existed ten years ago.

*Staff Resources.* The Department has five secretarial/administrative staff (three 12-month and two 9-month) and three 12-month technical staff. The self-study reports that this represents a 20% reduction in staff support over the last decade.
Students. The number of undergraduate majors is 476. This represents a steady decline from the 600 majors 7 years ago. The number of female majors has remained essentially unchanged during this period. The significant decline in male majors appears to be consistent with national trends in the discipline. Advising is done by nine faculty selected for their suitability for this role. In addition, there are opportunities for student engagement outside of classroom through internships (an average of 23 per year), employment (as tutors, etc.), and several clubs.

Student/Faculty Ratio. Tenured and tenure-track faculty average over 300 undergraduate and 40 graduate student credit hours (SCH’s) per semester. In addition, faculty average 4.5 course sections per semester. A review of the Faculty Assignment Reports submitted by the Department indicates that between 30% and 40% of these are primarily one credit courses in the 700 series. The standard distribution of effort for faculty is 45% teaching, 45% research, and 10% service.

Instructional Service to Other Areas. The Department offers five general education courses at the 100 and 200 levels although most general education students (between 2,500 and 3,000 annually) take BIOL 101 and BIOL 104. In addition, biology courses are required in many degree programs across the university. Faculty also participate in regional outreach programs such as science fairs, in-service days for teachers, and science supplements for K-12 classrooms. The Marine Biology Laboratory and the Herpetarium combined attract 1500 to 2000 visitors annually.

Facilities and Equipment/Instrumentation. The Department occupies approximately 77,500 square feet (the top four floors of the 5-story Life Sciences building). Approximately 28,500 of this is research laboratory space. There is also a greenhouse and the Ecological and Environmental Research Station. The latter is in poor condition. The Department also makes use of several research locations in northwest Ohio and southeast Michigan as well as the Gulf Coast Research Laboratory in Louisiana.

Information Resources and Services. The Department has a wide variety of equipment to carry out its research, teaching, and service missions. There is both a range of specialized research equipment and an inventory of more standard equipment that is used for teaching and research. All faculty and staff have computers that are upgraded as funds become available; there are two computer laboratories in the building. Students and faculty have access to a large number of journals through OhioLink and many bound paper journals are available in the Science Library. These resources are supplemented by faculty lending their personal copies of journals to students.

2 The self-study report explains this as follows: “This decline is common through the USA currently, as males appear to be more likely to forego college and instead head straight to one of the relatively high-paying private sector jobs that have increased over the past decade.” However, the sociological data indicate that young males who forego college are increasingly found in low-paying jobs. Rates of college attendance have increased among both males and females, but more rapidly among females.
Financial Resources. The Department’s operating budget is $150,000 and its lab fee income is $75,000. They have both remained constant for the last decade. External grants range from $700,000 to $1,000,000+ annually. Typically, the Department’s contribution to the start-up packages for new faculty is $10,000 per year for three years. Accounts in the BGSU Foundation support 80-90 undergraduate scholarships per year and a seminar series that brings nationally recognized speakers to campus. There is also an endowment that will eventually fund a professorship in the Department.

Self-evaluation

Quality. Members of the graduate faculty have published at the average rate of 1.70 refereed publications per year over the last 10 years. This represents a significant increase over the rate for the 1970’s (1.0) and the 1980’s (1.49). Of the 27 members of the graduate faculty, 1/3 (9) publish 2/3 of the papers.

External grant funding has been in the neighborhood of $1,000,000 per year for each of the last six years.

The National Research Council Ratings 2000 lists the Department as follows in its ratings:

- Biochemistry and Molecular Biology: 150
- Cell and Developmental Biology: 164
- Ecology, Evolution and Behavior: 94
- Molecular & General Genetics: 99
- Neurosciences: not ranked (the program is too new)
- Physiology: 128

The GPA’s and ACT scores of incoming undergraduate majors remained essentially unchanged during the years 1996-2002. Average GPA’s ranged from 3.29 to 3.40 while ACT scores ranged from 23.10 to 23.88. While at the University, these students earn GPA’s that are at or above the College average.

The Department is proud of the education it provides students in all of its courses at all levels. It is especially pleased that it has been able to maintain laboratory sections for most of its classes during a period in which many universities have reduced the number of labs in their science courses because of financial constraints. It believes that the success of the undergraduates who go on to do graduate work is attributable to their undergraduate laboratory experience. However, the Department is concerned with the constraints on what can be done in the labs for its general education courses because of the large number of students having to utilize limited laboratory space.

At the graduate level, the Department identifies its strength as training students who are not among the most competitive when they graduate from college, but who go on to succeed in their chosen field upon completion of their graduate work at the University.
For the period 1997-2002, the GRE scores for students admitted into the program held steady at 58th percentile for verbal, 65th percentile for quantitative, and 67th percentile analytical. The scores for the students who enrolled are lower: 52nd percentile verbal, 58th percentile quantitative, and 61st percentile analytical. The Department sees the need to redouble its recruitment efforts so that more of the most talented students in the applicant pool choose to enroll in the program. The undergraduate GPA for admitted students was 3.29 and for those who enrolled 3.26.

Of the (218) students completing advanced degrees in the Department 1995-2002, 178 (85%) are employed in a field stemming from their graduate studies. When the “employment unknowns” are eliminated from the sample, the success rate increases to well over 90%. A handful of graduates have earned post-doctoral fellowships at other institutions and one received a prestigious NSF post-doctoral fellowship. Ten of these graduates have secured faculty positions at other institutions.

The Department has formulated learning outcomes at both the undergraduate and graduate level. However, the Department readily acknowledges that the assessment program needs greater attention and significant improvement. After several false starts, the Department has begun implementing a plan for all instructors to have an assessment strategy in place for each course they teach.

The Department is heavily involved in the teaching of service courses for both general education and students in other programs. Several members of the Department are on college and university committees, and one is the National Collegiate Athletic Association (NCAA) Representative on campus.

Demand. Despite a 20% decline in the number of majors over the last ten years, the number of students in non-major courses has remained nearly constant during this time.

The US Department of Labor Occupational Handbook indicates a variety of well-paying jobs for B.S., M.S., and Ph.D. graduates in the biological sciences.

Literally thousands of visitors (primarily school groups) tour the Greenhouse, Marine Lab, and Herpetarium each year and faculty and students from these facilities are in high demand for on-site demonstrations.

Centrality to University Mission. The Department identifies its contribution to the University’s mission as constantly improving its courses, striving to produce world-class research, and building a community atmosphere within its ranks.

There are approximately two graduate students and two undergraduates engaged in research with each faculty member. Undergraduates have published in peer-reviewed journals and most continue on to graduate [and professional] school.
The goal of the Department’s general education courses is to promote science literacy by positioning students to evaluate the scientific process when they see and read about science in the news and in their communities. To this end, the emphasis is on showing the students how scientists formulate questions and hypotheses and then design experiments that will address them.

Undergraduate students are involved in many of the Department’s research labs.

Members of the faculty provide consulting services based on their expertise both on and off campus. In this regard, they collaborate with faculty in other departments, make community presentations, and make themselves available to the media.

**Comparative Advantage/Uniqueness.** Approximately 60% of the students are female, and there is a growing number of minorities. The Department has large enrollments both in its courses for majors and in its general education courses.

The Department has strong ties to other departments, a variety of centers at the University, and to programs at other universities (primarily in northwest Ohio and southern Michigan).

The Department’s three main areas of focus (Ecology, Evolution, and Conservation Biology; Biomolecular Sciences; Neuroscience, Mind and Behavior) spawn much of its research through collaborations and idea exchanges with others working within these areas. Photochemical Sciences and Physiology and Diversity are also mentioned as areas of research focus. In all of these areas faculty are in contact, and collaborate with, their peers at other institutions.

There are a few courses that overlap with courses offered in Environmental Studies and the College of Health and Human Services. However, there is no programmatic overlap.

**Financial Considerations.** Faculty teach a relatively large number of students and course sections at a relatively low cost. Both SCH production and the number of course sections taught are significantly higher than those at peer institutions. (A review of the Faculty Assignment Reports submitted by the Department indicates that between 30% and 40% of these are primarily one credit courses in the 700 series.) At the same time, expenditures per SCH are essentially identical to the College average, and lower than both the University average and that of peer institutions.

The Department’s operating budget and lab fee income has remained essentially constant over the last 10 years while the cost of supplies and equipment has increased 30% due to inflation. The Department currently spends $50,000 more on lab courses than the fees generate. When the cost of vans, equipment maintenance, etc. is factored in, this deficit is nearly $150,000.
Planning

The Department has 17 goals that appear to be randomly listed under planning. These are perhaps best summarized as follows:

Maintain critical mass of faculty by filling key vacancies as well as other positions that have been promised to the Department.

Complete research lab renovations for recently hired new faculty as well as much needed renovations on other facilities and labs.

Complete planning and construction of the new science building.

Implement new assessment plan developed by the Department.

Continue to implement and improve undergraduate programs in neuroscience, ecology, microbiology, and B.S. partnership with Lorain County Community College; review content of 100-level and 200-level major courses as well as BIOL 101 and 104 laboratory exercises.

Continue to pursue collaborative research with the University of Toledo and Medical College of Ohio.

Continue to explore offering a collaborative Ph.D. program in Ecology and Earth Sciences with the Department of Geology at Bowling Green State University and the Department of Earth, Ecological, and Environmental Sciences at the University of Toledo.

Improve visibility and stature of graduate program and recruit better students at both the graduate and undergraduate levels.

SUMMARY OF THE EXTERNAL REPORT

The external review team expressed concern about a number of shortcomings in the self-study document which made it difficult to assess the Department at the desired level of specificity. Despite these problems, they identified areas of strength and concern, and offered recommendations in both areas.

Strengths

The external reviewers identified a number of significant strengths in their report. They also had suggestions for what should be done to capitalize on these strengths.

Respected and supportive Chair. Having done a good job in unifying the Department, he needs to make sure that all members of the faculty contribute to the Department’s mission in significant ways. “Each faculty member should feel that they are equal participants, whether by carrying a large teaching load because of low


productivity, or by having strong externally funded research programs and carrying small teaching loads.”

**Ability to recruit top-quality, junior research-active faculty.** The junior faculty are especially impressive. “We were impressed by their enthusiasm, their high caliber, their research potential and their interest in teaching.”

**Newly developed research centers (Neuroscience and Biomolecular Sciences) and graduate program in Ecology, Evolution, and Conservation Biology provide focus for interdisciplinary research, grant activity, and student mentoring.** “The Neuroscience group (primarily Biology and Psychology) appeared to be the most focused and the most productive in terms of research support and publications, with the psychologists taking the lead. . . . The biologists in the group are highly motivated, with many young researchers who are important to the success of the department.

“The BioMolecular Sciences group was more diverse. . . . Although interesting research is being carried out, extensive external funding is lacking and a plan needs to be formulated to address this situation. Building a Molecular Biology Core Facility in the new science building to house the major common equipment should be considered. A dedicated technician should also be considered to maintain the equipment and train students and faculty how to use the equipment. External funding should be sought to support this. Our experience has been that molecular core facilities can be the most productive interdisciplinary units on campus.

“The Ecology, Evolution and Conservation group appear to be well-organized and cohesive. . . . However, they need to develop a better record of grant support and publications.”

**Enthusiastic undergraduate and graduate students.** “However, some additional metrics for your doctoral graduates are needed to evaluate the program. It would have been useful to monitor the quantity and quality of publications, grants, presentations, and awards the students have co-authored or acquired by the time they graduate or shortly thereafter. All students should be required to apply to multiple funding sources during their program.”

“A significant number of American students are in the Ph.D. pool to warrant applying for training grants, especially in Neuroscience. . . . Limiting the number of students per faculty member based upon the amount of grant support for research should be considered. Faculty with little funding for an extended period should be allowed fewer students. A reasonable maximum number of students in well-funded labs should also be determined.”

“Our meeting with undergraduates involved a select group of students. Of the approximately fifteen students, all but one was interested in organismal biology. . . . The students who showed up were concerned about the potential decrease in courses of interest to them. . . . The students informed us that they specifically came to BGSU to major in biology because of this diversity.”
“The department supports a diverse undergraduate curriculum and it was unclear whether this curriculum was based upon student needs and demand. Undergraduates can specialize in one of a number of areas of biology. . . . Hard decisions are needed to focus and consolidate these areas, especially in light of the dynamic nature of new interdisciplinary fields (e.g., bioinformatics). Updating and streamlining the curriculum should be a priority especially since each specialization requires laboratory as well as lectures. Perhaps a more integrated, modern curriculum could be introduced.

“It should be noted that many of the faculty do extremely well in engaging both undergraduates and graduate students in research and this should continue to be highlighted by BGSU as an important academic initiative.”

*Departmental Open House for prospective students.* “The Open House held for prospective students and the Women in Science Program aimed at engaging young women (grades 7-12) in the sciences, are especially commendable.”

*Bi-annual newsletter to alumni and others.* “The Newsletter sent bi-annually to alumni, retired faculty, students, and others is an excellent means of potential fund-raising.”

*Annual Research Retreat.* “It should be noted that many of the faculty do extremely well in engaging both undergraduates and graduate students in research. . . . For example, the Annual Research Retreat involving faculty, undergraduates, and graduate students is an excellent event. It could be used to provide broader exposure for ongoing student mentoring and research activities in the department.”

*Outreach activities.* “The department has begun to establish a record of outreach with programs aimed at K-12 students including efforts to have these students visit and carry out projects in the campus Greenhouse, the Marine labs, and the Herpetology labs. . . . these activities should increase success in recruiting these students to BGSU in biology.

**Concerns**

The external reviewers identified two major concerns.

- **Curriculum revision.** There is a desperate need for curriculum revision given the dynamic nature of biology, changing technology (web-based instruction), and the large number of new faculty hires into the Department. Discussion of curriculum revision might be based on the National Research Council's report BIO2010: Transforming undergraduate education for future research biologists ([http://www.nap.edu/catalog/10711.html](http://www.nap.edu/catalog/10711.html)).

- **Grant funding.** Grant activity (as reported in the self-study ca. $1 million/year) is low for a research active Department of this size in the Biological Sciences. Private and federal support for research centers should be sought.

“Grant funding should be strongly encouraged so that a "culture" of external funding is established, not only for research, but for renovations, equipment, student training grants,
and science educational opportunities. In particular grants should be sought that will provide sustained support for these programs over multiple years. All research focal groups might consider regular (annual) 2 day retreats (away from campus) to brainstorm, help focus research initiatives, write grants, and generally capitalize on larger funding efforts. The lack of NIH R01 funding by the biologists, in particular, needs to be addressed.

“In addition informal science education is one of the hottest areas of funding at NSF at this time and BGSU should find ways to capitalize on previous efforts in informal science education.”

The external reviewers identified several other concerns as well.

*Unit planning.* In the area of unit planning, “it would be useful to see that the department has developed a comprehensive strategic plan for the next seven years (perhaps with mid-term milestones).”

“For example, such a plan would be invaluable for setting priorities for use of the new building such as what teaching and research programs and faculty will be housed in this new facility. This facility should enhance the integration of the department's research and teaching program, but there is some possibility that just the opposite would happen without careful planning.”

*Awards.* The Department should have a formal mechanism to encourage and facilitate submitted applications of junior faculty for prestigious awards (e.g., NSF CAREER grant).

*Competing demands.* Tension exists between the desire to decrease class size and increase research productivity without increasing the number of faculty; this needs to be reconciled.

*Faculty development.* Formalize a mentoring program for junior faculty so that they are more quickly acculturated into the Department. Such a mentoring framework might also include opportunities for less research-active mid-career and senior faculty to find new directions for their contributions.

*Facilities.* Maintenance of existing facilities is desperately needed.

**Program Review Committee Findings**

The Department of Biological Sciences makes significant contributions to the University. Its large undergraduate program teaches 2,500-3,000 general education students annually and almost 500 majors who are prepared for employment in areas where there are well-paying jobs. It has made progress at the graduate level by focusing its research and instruction in three areas and achieving its goal of supporting two doctoral students for each master’s student supported. The Department has a cadre of faculty (albeit a relatively small one) who
are leading the way in both publications and grant support. In light of these factors, and because the Department appears to be unified under the leadership of a new chair, it is positioned to take advantage of the desperately needed new building now in the planning stage. At the same time, the University has invested heavily in the Department over the last ten years, and the Committee is concerned that the progress is not commensurate with the magnitude of that investment. As the findings below document, there is much that needs to be done. The Committee believes that it is reasonable to make continued heavy investment in the Department contingent upon it making significant progress on the recommendations which conclude this report.

It must be noted that both the external review team and the PRC felt handicapped by the inadequacies of the self-study. Documentation of claims made in the self-study was spotty. Essential supporting information (e.g., faculty vitae, faculty teaching assignments, listing of grant submissions and awards) was not submitted with the self-study and had to be secured subsequently. The self-study contained little in the way of analysis of these and other important indicators and the self-evaluation section contained little in the way of evaluation. Both the Department and the review process would have been better served had the self-study report contained these vital elements. Although the PRC does not believe that this would have changed its findings and recommendations, it would have allowed for a greater level of documentation and specificity.

Findings Requiring Action

1. External Grant Funding. Both the Department and the external review team cite grant funding as an area that needs to improve significantly. Although the Department provided no analysis of grants submissions and awards, this is clearly an area that needs significant attention. For one thing, annual funding of approximately $1,000,000 for a 30-person department in the life sciences is much lower than it should be. Secondly, a review of data subsequently requested by the Department from SPAR reveals that seven members of the Department, all of whom are tenured, submitted no external grants over the last five years. There are also several faculty who have only modest funding. There is a core of reasonably well-funded faculty. The problem is that this group is not large enough to support the three areas of focus. Nor is it large enough to significantly improve the Department’s standing in the National Research Council Ratings.

The external reviewers made a number of important observations about the low level of external funding with which the Program Review Committee fully concurs: (1) the lack of NIH RO1 funding needs to be addressed; (2) the lack of sufficient levels of external funding is most noticeable with the Biomolecular Sciences group and the Ecology, Evolution and Ecology group; (3) the Department should have a formal mechanism to encourage junior faculty to apply for prestigious awards (e.g., NSF Career awards); (4) “grant funding should be strongly encouraged so that a ‘culture’ of external funding established, not only for research, but for renovations, equipment, student training grants, and science education opportunities;” and (5) all graduate students should be required to apply to multiple funding sources during their program.
2. Faculty Research Productivity. Although the average research productivity during the decade of the 1990’s (1.70 articles per faculty member per year) is a significant improvement over the previous two decades, it is too low for a doctoral department in the sciences. One-third of the 27 members of the graduate faculty have published 2/3 articles authored by its faculty. This means that there is a core of faculty who are making significant research contributions to the discipline. However, this productivity is not as broad-based as it needs to be to support three areas of focus at the graduate level. This short-coming in the area of published research is reflected in the mediocre to poor standing of the Department in the National Research Council Ratings 2000.

3. Areas of Focus. The Department has made significant progress in identifying three areas of focus. However, much more needs to be done for these areas of focus to become areas of excellence. Most likely the areas of focus were originally conceived of as umbrellas under which the work of (most of the) existing faculty could be subsumed. The next step is to define them more clearly and tightly or, in other words, to develop a significant research presence in a specific area or two within the broad areas of focus. Defining future faculty hires with an eye to building strength upon strength should result in developing a synergy among faculty research efforts that will enable the Department to move to a significantly higher level in external support while at the same time enhancing its reputation within the discipline. It should also enable the Department to improve somewhat on its record of placing Ph.D. graduates in faculty positions. (The self-study identifies only ten such placements among graduates in the 1995-2002 period.)

It appears that the Department is at best a minor player in the various science education initiatives that are underway at the University. The PRC recognizes that tensions can exist between this area and that of bench science. At the same time, science education is vitally important to the country and the University. And there are departments at the University and around the country that have found ways to bridge the tensions that can arise. The Department should develop ways of doing the same.

4. Faculty Workload. The self-study indicates that tenured and tenure-track faculty average over 300 undergraduate and 40 graduate student credit hours (SCH’s) per semester. In addition, it indicates that faculty average 4.5 course sections per semester. However, it is hard to know what to make of these data. A review of Faculty Assignment Reports secured subsequent to the submission of the self-study reveals two things. (1) There does appear to be some differentiation in instructional workload in that those who are most productive in research appear to teach less than those who are not. (2) At the same time, however, many of the teaching assignments are for one-hour courses. It may be that these assignments are simply for the supervision of lab work for which faculty in other science departments do not receive instructional credit. Or they may be for something else. There are really two questions here. One is the question of equity: Is the instructional workload in biology sufficiently similar to that in other doctoral granting departments at the University? The other is the question of research productivity: Does the level of research productivity (publications and grants) in the Department warrant the instructional workload?
5. Undergraduate Curriculum. The Department expresses a high level of satisfaction with its undergraduate curriculum. However, the external review team identifies this as one of its two major concerns. Although elements of the undergraduate curriculum have undoubtedly been “tweaked” over the years, there is no indication that the curriculum has undergone a comprehensive review. Moreover, the last decade has seen dramatic changes within the discipline, in the available instructional technology, and in the faculty who provide the instruction. Each of these by itself warrants a comprehensive review of the curriculum. Taken together they make such a review absolutely imperative. As recommended by the external review team, the National Research Council's report “BIO2010: Transforming undergraduate education for future research biologists” ([www.nap.org](http://www.nap.org)) appears to be the most appropriate starting point for the review of the curriculum.

The external review team notes that the undergraduate curriculum is very diverse and students are attracted to the program because of this diversity. Nevertheless, hard decisions are needed to focus and consolidate these areas especially in light of the emergence of new interdisciplinary fields such as bioinformatics. The PRC believes that any systematic review of the undergraduate curriculum must also find creative ways to address the tensions that arise in all programs between the areas of research focus at the doctoral level and the need to offer a balanced and up-to-date undergraduate curriculum. It is imperative that students at all levels (graduate, undergraduate major, and general education) benefit from the research expertise of the faculty.

6. Assessment of Learning Outcomes. The Department indicates that its efforts at assessment have floundered to date, but that it has instituted a new initiative in this area that it expects to bear fruit. Given the emphasis that all accreditation groups are placing on assessment, further floundering is not an option. In addition, it is imperative that whatever curricular changes result from the review of the undergraduate curriculum (item 4 above) have an accompanying effective assessment mechanism so that the Department can determine whether or not the changes are being translated into student learning.

7. Unit Planning. The Department does not appear to have a comprehensive plan for its future. It has some fairly well-developed ideas about the new science building. It sees the need to improve faculty research and grant productivity, but apparently has no plan for doing so. It has a number of curricular initiatives in various stages of development, but does not appear to have addressed questions such as: Which are most important for the Department? Which are central to the Department’s mission and which are peripheral to it? Which will need an infusion of additional resources and which can be done well with the resources in place? Etc. Although positioned last on the list of findings because of its summative nature (a comprehensive plan should include the steps that will be taken to address each of the above findings), in many ways it is the most important finding. This is especially true since the Department is positioned to build in significant ways on the progress of the past decade and a well-designed plan for the future is a vital element in doing so.
Program Review Committee Recommendations

Based on reviews of the self-study and external review report, and consistent with the major findings that resulted from these reviews, the PRC makes the following recommendations. For detail about the rationale for each recommendation, see the finding with the corresponding number, just above.

1. External grant funding. The Department should develop and implement a plan to increase significantly its external grant funding over the next several years. This plan needs to include strategies in the following areas: assisting those who are currently well-funded to increase their level of funding in the future; helping those who have limited funding at present to increase their levels of funding; encouraging those who are not currently submitting proposals to resume doing so, perhaps to different (e.g., instructional) programs; and strongly encouraging or even requiring all graduate students to apply for external research support. This plan should be developed in conjunction with SPAR and should include goals for both submissions and awards within the areas of focus so that the Department can assess its progress. The plan should be submitted to the Dean of Arts and Sciences and the Vice Provost for Research for review and approval by no later than January 2005.

2. Faculty Research Productivity. As part of the plan to increase external funding, the Department should develop and implement a plan to increase significantly its publication rate over the next several years.

3. Areas of Focus. The Department should review and refine its areas of focus in light of developments in the discipline, federal funding priorities, and existing faculty expertise and develop a plan for each to become a genuine area of excellence. It should also develop a plan for becoming a significant player in science education on campus. Since new tenure-track hires should be justified primarily in terms of the roles they will play in development of these centers of excellence, no more should be made until this plan has been developed and approved. This plan should be submitted to Dean of Arts and Sciences and the Vice Provost for Research for review and approval by no later than June 2005. Upon completion of this plan, the Department should turn its attention to the graduate curriculum, to make sure it is well suited to serve the areas of focus.

4. Faculty Workload. The Department should develop (or substantially revise) a workload policy, to be submitted to the Dean of Arts and Sciences for review and approval by no later than January 2005. Two related issues should be addressed in the policy.
   A. The instructional part of the workload policy should work out in a clear way what is appropriately counted as formally assigned instruction and what is not. Specifically, the Department should consult with the College office about what kinds of courses (e.g., readings, independent studies, special topics, etc.) and enrollments should constitute classes that count as part of formal instructional workload assignments.
B. The broader policy should address differential workload among the members of the Department. The policy should be appropriate to the discipline, comparable to that of other doctoral science departments at the University, reflective of its research and external grant productivity, and acceptable to the College. The policy needs to recognize and value differing levels of contribution to instruction based on productivity in other areas.

5. Undergraduate Curriculum. The Department should undertake a systematic and comprehensive review of the undergraduate curriculum in light of the dramatic changes that have taken place in the discipline and instructional technology. The National Research Council's report “BIO2010: Transforming undergraduate education for future research biologists” should be the starting point for this review. This review should carefully address the Department’s general education program (especially Biology 101 and 104) as well as the courses for majors and minors. It should also be especially attentive to the importance of integrating the students’ laboratory experiences into the course in a way that most effectively enhances inquiry learning. What has been learned from a department’s assessment program would normally play a significant role in such a review. However, the Department is not in a position to do this. Thus, it must be certain to embed assessment in the undergraduate curriculum that emerges from this review. The results of this review should be submitted to the Dean of Arts and Sciences no later than June 2006 with a brief interim progress report due June 2005.

6. Assessment of Learning Outcomes. The Department should move ahead with its commitment to assessment to insure that students are indeed learning the outcomes that it has identified as the goals of its curriculum. However, it must recognize that, given the programmatic focus of the University’s assessment program (i.e., the real goal focuses on learning outcomes for programs rather than courses), this is only the first step in the process. Thus, the Department should accelerate the pace of the development of its assessment program at both the graduate and undergraduate levels. Progress in this area should be reported through the Department’s annual reports to the Student Achievement Assessment Committee (SAAC).

7. Unit Planning. The Department should develop a comprehensive plan for its future. The plan should include benchmarks against which progress in the areas of publication, external grant funding, graduate student recruitment and placement, undergraduate program, etc. can be assessed. The plan should include a provision for updating on a regular basis. There should be a moratorium on all new programs until this plan has been developed so that they can be assessed in terms of their centrality to the Department’s mission and the available resources. This plan should be submitted to the Dean of Arts and Sciences and the Vice Provost for Research for review and approval no later than January 2006.

The Department of Biological Sciences should report annually to the Dean of Arts and Sciences, with a copy to the Provost, on the implementation of these recommendations.