Evaluation of

The Biology Department

Georgia State University
Atlanta, GA

An External Review Conducted
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By

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I. Introduction.

We are very pleased to have participated in the site review of the Department of Biology at Georgia State University (GSU) 10-11 January, 2006. In preparation for the review, we received a copy of the Self-Study conducted by the Department that was completed in December, 2005. The Self-Study comprised a nearly 500-page document that reviewed the Department’s goals and objectives, their curriculum for undergraduate and graduate programs, the quality and appropriateness of faculty and faculty research programs, summaries of student enrollments in the undergraduate and graduate courses, comparisons with peer institutions regarding enrollments, faculty work loads, and faculty research productivity, resources for teaching and research, and evaluations of teaching by B.S., M.S., and Ph.D. students. Additionally, we were given responses to the Self-Study from the Dean of the College of Arts and Sciences and the Chair of the Department of Biology. During the course of our two-day site visit, we received a copy of the previous external review that was conducted in 1997 for reference, information on each of the four research concentrations, and an analysis of departmental funding in comparison with that of other departments and other colleges at GSU.

We were very impressed with the teaching and research programs of the Department and with the dedication of the faculty to the varying aspects of teaching, research, and service that comprise their academic activities. The Department of Biology is a major driving force in the University for its goal to increase total research funding from $59 million in 2005 to $110 million by 2010. Although the Department of Biology has made excellent progress over the past few years in terms of attracting research funding, including the funding of interdisciplinary centers, and the conduct of its teaching mission, we are concerned that the level of University funding and support for the Department and its programs may be insufficient to sustain the excellent progress that has been made. GSU has made a commitment to transform itself from a teaching university to a major, urban research university. While teaching remains an essential component of this transformation, continued development of research programs, centers, core facilities, and support of faculty are needed to facilitate the transformation. With the focus of GSU on the Biological and Behavioral Sciences, the Department of Biology needs to be nurtured and provided will full support to help maintain its research programs, innovative and important outreach initiatives, and teaching programs.

In the external review report of 1997, nine specific recommendations were made for the continued development and prosperity of the Department of Biology. These can be grouped into three categories: (1) Faculty recruitment, (2) student support and development, and (3) research facilities and infrastructure. In each of these areas, progress has been made, and many of the specific goals have been achieved. Other needs and goals are still in the process of being achieved whereas a few have shown little progress. Although the last external review of the academic program in biology was conducted in 1997, the current external review and the accompanying Self-Study are based on information from 2002 through 2004. We feel that it is instructive, however, that current needs and concerns be put into their proper historical perspective.

II. Charge of the Committee.

The External Review Committee was asked to address the following nine questions or issues, based on both the materials provided to us in advance and our campus visit:

1. Are the goals and objectives of the department appropriate?
2. Do the goals and objectives of the department have substance? Are they clear and precise? Are they sufficiently concrete and operational so as to allow a future study of their appropriateness and their feasibility?
3. How does this department compare to departments with similar goals and objectives in other institutions including institutions similar to Georgia State University?
4. In what ways has the department succeeded in meeting its goals and objectives? Is its progress toward meeting its goals and objectives satisfactory?
5. What are the factors that have helped or hindered the department in its effort to meet its goals and objectives?
6. Comment on the quality of the department self-study reports.
7. What are the overall strengths and weaknesses of the department?
8. What changes would improve the department’s performance in meeting its goals and objectives? How should the department amend its goals and objectives? How can the department improve its performance?
9. How can Georgia State University improve its department planning and self-study process?

In the letter from Dean Adamson regarding the response to the Department of Biology Self-Study report and what she perceives as the key issues on which the external review should focus, we were asked to consider two major issues: (1) the size, composition, and support of the faculty; and (2) program development. Regarding faculty, we were asked to evaluate the need for additional research space, faculty workload, and the need to increase the size of the tenure-track faculty. In particular, recommendations are sought on ways to increase the number of underrepresented minorities in the faculty and the need to create or maintain a balance for hires across the various research and teaching areas in the department. Additional insight was sought on appropriate funding levels for graduate students to maintain competitiveness with other institutions, and needs for space and resources.

As stated in the Department of Biology Self-Study (Section H), several goals and objectives are enumerated. In the area of teaching, three goals were stated:
1. To enhance teaching effectiveness by reducing class size in the undergraduate major courses;
2. To streamline progress through the undergraduate major curriculum and enhance degree outcomes;
3. To continue to develop programs of individual student research.

In the area of scholarly activity, three major goals were stated:
1. To enhance both the level of productivity and the national and international reputation of the Department’s faculty;
2. To enhance disciplinary research at GSU;
3. To increase the level of external funding and develop the Science Park.

In the area of service two goals were stated:
1. To increase community participation through the Department’s Science Education Program;
2. To provide high quality service to both the university and the professional community.

In the area of environment, two goals were stated:
1. To effectively utilize space in the Science Park when it opens (projected for 2008) for both instructional and research needs;
2. To provide adequate infrastructure and resources to support departmental and faculty efforts in instruction, research and service.

Finally, a plan for faculty recruitment in each of the four major research disciplines of the Department and for teaching needs is described.
III. Strengths and Weaknesses.

The Department of Biology has grown in size and strengths since its last review and today is a great credit to Georgia State University. In many respects the Department is in the vanguard in its College and indeed, in the University as a whole. The Chairman is an energetic, strong, and effective leader and a committed advocate for his Department. The Department’s central staff members are similarly impressive – obviously dedicated, capable people who carry heavy responsibilities and do their jobs well.

In our assessment of the Department, we focused especially on five attributes and asked not only what is laudable about them but also what could be improved.

1. Quality of faculty.

The full-time Biology faculty currently comprises 50 FTEs: 36 tenure-track faculty, 2 Research Assistant Professors, and 12 Lecturers. It is a great credit to the Department that 40% of the faculty members (FY2004) are women. As expected, the tenure-track faculty members are fully engaged in classroom teaching, research, and service. A key indicator of the high quality and vigor of these scientists is the fact that over the past three years, >95% of the faculty have secured extramural research funding, and the $16M brought in by Biology in 2004 constituted 27% of the University’s total external support. Faculty productivity from research and scholarship (2002-2004) has been good; the average output was approximately 2.5 publications per year, produced by 89% of the faculty members.

A priori, an external reviewer might have expected that the Lecturers, who carry much responsibility for lower-division and service teaching, might be a second-class and disgruntled lot. To our amazement, however, the dozen Lecturers presented themselves as a cohesive, highly collegial, proud, and generally satisfied community within the Department. Indeed, individually and collectively, they were very impressive. Although they (understandably and justifiably) would like to be paid higher salaries, the stated position of these valuable faculty members is that they knew and accepted – welcomed – the terms of the jobs when they took them. Witnessing the effectiveness and success of the Lecturers proved to be one of the most enlightening and inspiring aspects of this reviewing experience for members of the external team. The Lecturers clearly are a great asset and an important key to the success of the Department.

The Department’s hiring of two tenure-track faculty members who are science educators is innovative and important for the continued prosperity of the Department and strength of its educational missions.

Overall, we were very positively impressed by the faculty. One deficiency that was apparent, however, is the low representation of African-Americans on the faculty in a department that serves a large population of African-American students. One of the Lecturers is Black, but that is not sufficient. We strongly urge that recruitment of highly qualified African-American faculty members be a high priority.

Finally, a significant weakness in the curriculum (see below) is the near absence of organismal biology (ecology, evolutionary biology, plant biology, etc.), and that is largely a consequence of the absence of organismal biologists among the faculty. One Lecturer is devoted to teaching in this general domain, and another reportedly does some of his teaching in organismal areas, but more is needed. We recommend that future growth of the Department include appointment of
tenure-track faculty members and lecturers in organismal biology and perhaps development of a fifth disciplinary area focused on aspects of organismal biology.

2. **Contributions of faculty to instruction, research, and service.**

The faculty members of the Department are dedicated and hard-working. Although not all faculty members are equally engaged and productive in research or committed to classroom teaching, it appears that none is failing to carry a full load of responsibilities. Certain faculty members are stellar researchers of world renown; others maintain smaller research endeavors but devote great care and energy to teaching. Especially impressive to us is the fact that essentially all of the tenure-track faculty members are very significantly involved in administration and leadership in one way or another. Thus while the levels of effort devoted to research and teaching are perhaps typical of biologists at peer and aspirational universities, the service rendered by most if not all of the tenure-track Biology faculty members at Georgia State is extraordinary.

The heavy burden of service – devoted to building, running, and securing support for a range of programs, Centers, and other enterprises – may help to explain a paradox. While we heard very little complaining from the Lecturers, we did receive considerable expression of unhappiness and frustration from some of the tenure-track faculty members. We learned that they feel overburdened, and we suspect that at least part of that feeling derives from the heavy load of service most carry on top of their research and teaching.

In comparison with other biology departments, an especially remarkable component of the portfolio of the GSU Department of Biology is its outreach endeavor. The outreach programs, including the BioBus, are innovative and highly commendable. They make significant contributions to the University and the local and regional communities.

As noted above, the faculty collectively has an enviable record of external research funding (averaging about $500,000 per year per faculty member) and good output of publications. We detected few weaknesses. Perhaps one is the size of the undergraduate research enterprise. Although the faculty is justifiably proud of its commitment to provision of research opportunities to undergraduate students, we would encourage expansion of that program. We also noted than many classes are very large, and perhaps too large. As student interest in biology increases – which seems likely – this problem is going to worsen unless the Department is enabled to grow and facilities are made available to permit instruction through more, and smaller, classes.

3. **Degree programs of the department.**

The Department offers degree programs leading to B.S., M.S., and Ph.D. degrees. Of those, the undergraduate and master’s programs are very large in comparison with those of biology departments of similar size at other universities. The M.S. program is timely, because of the growing job market for life-scientists at the M.S. level in the biotechnology and pharmaceutical industries. Moreover, the M.S. program has proved to be the most important and effective conduit for students entering the Ph.D. programs and therefore is valuable to the Department. Those departmental Ph.D. programs are innovative and targeted in areas of growing importance nationally and internationally, such as medical microbiology and virology.

One notable weakness, repeatedly cited in the Department’s self-study, is the need for improved advising for undergraduates. That need is already being addressed. Related to it is a
need for better tracking of students majoring in, or thinking of majoring in, biology. We noted that the rules at Georgia State University governing the declaration of majors by undergraduate students cause delays for many students and may contribute to the difficulty of keeping track of “biology students.” Also problematic is the low rate of persistence of undergraduates to completion of their degrees with majors in biology.

Finally, although the average time to degree for Ph.D. students reportedly is 5.9 years – which is better than the national average for most areas of biological sciences – it is desirable to reduce that time further toward a target average of 5 years.

4. **Organization of department around four disciplinary areas.**

To achieve strategic advantages such as enhanced collegiality, increased competitiveness for external research support, and greater appeal for high-quality graduate students, the Department has organized clusters focused on four disciplinary areas of contemporary biology: Applied and Environmental Microbiology (AEM); Molecular Genetics and Biochemistry (MGB); Cell and Molecular Biology and Physiology (CMBP); and Neurobiology and Behavior (NBB). Initially used for the Ph.D. program, these emphasis areas now are in effect for the B.S. and M.S. programs as well. These faculty groups came across as collegial, cooperative, and collaborative, and the model thus seems to be working well for the Department. The participation of faculty members in these clusters as well as in Centers and University Areas of Focus has generated an impressive amount of interaction and productivity.

Related to this organizational strategy is the fact that the Department has built and maintained some excellent, in fact enviable, core and specialized facilities in support of the research missions. Notable among those is the BSL4 facility, reported to be unique for a university in the USA.

To address one weakness in this organizational structure, we believe that additional faculty members are needed for the AEM and CMBP clusters, which currently are significantly smaller than MGB and NBB. Moreover, as noted above, we believe that as the Department grows, it would be desirable to develop a fifth disciplinary area – in an aspect of organismal biology.

5. **Financial resources.**

The success of the faculty in securing extramural finding for research and related programs, already cited above, is laudable and has been crucial to the success of the Department. In addition, the Department has benefited greatly from financial support from the Georgia Research Alliance, especially for acquisition of new instrumentation.

The prospects for the new Science Park, scheduled to open in 2008, are very exciting for the Department. The new physical facilities should enable much-needed growth of the faculty and its research endeavors as well as continuing innovation.

We noted a number of problems related to the University’s financial support of the Department. Most importantly, we were struck by data showing clearly that – based on the Regents’ formula for funding – the annual institutional budget of the Department of Biology currently should be about $10.4M but is only about 53% of that level (about $5.5M). Although we were able to analyze this problem only partially, it seems that the severe underfunding is due largely to decisions at the level of the College of Arts and Sciences. Because the instructional budget of the Department is not sufficient to meet its growing needs, and because of the growing costs of
maintaining suitable core facilities in support of research and laboratory instruction, the shortfall in formula-based institutional funding is very harmful. Also growing is the need for additional funds to support Ph.D. students, to provide them with competitive stipends and adequate health insurance.

As cited above, the salary levels of the Lecturers are cause for concern. Those exceptionally valuable and productive members of the permanent faculty reportedly are hired at a standard, low salary irrespective of their prior experience, and their salaries remain relatively low even as they progress in rank and seniority. We were troubled to learn that the Lecturers typically earn less than teachers in Georgia’s public schools. Clearly, additional funds are urgently needed to provide higher salaries for the Lecturers. Without these individuals, who are responsible for a large part of the undergraduate teaching and some of the graduate teaching, the Department’s research and outreach endeavors could not be possible.

It is our impression that these financial difficulties could be solved simply by correcting what appears to us to be an inequity in the distribution of institutional funds. We believe that if the Department were to receive its full share of formula funding, most of its financial challenges would be met.

IV. Historical and Current Context.

Are programs offered and program enrollments appropriate from a disciplinary perspective?

The GSU Department of Biology has had a long and successful history, beginning over half a century ago. It now offers an appropriate array of degree-granting programs that has attracted a large cadre of GSU students: 1600 in the undergraduate program, 160 in the M.S. program, and 110 in the Ph.D. program. Enrollments have been either stable or gradually increasing over the past few years. These enrollment numbers are relatively high but reasonable in that this single department encompasses the disciplines often found in separate departments, such as microbiology, immunology, cell biology, anatomy, neurobiology, and botany. B.S. degrees granted in Biology have steadily increased: 92, 111, and 121 in FY2003, 2004, and 2005, respectively. Improving this trend is, and should be, a goal for the Department.

Are the faculty number, composition, and research productivity sufficient to support the programs offered by the Department?

The 36 tenure-track faculty members are to be highly commended for their research productivity and external support ($16M in 2004), which constituted an amazing 27% of GSU’s total funding. Many members of the Biology faculty are recognized both nationally and internationally as leaders in their respective disciplines. They serve on grant review panels and in various editorial capacities for a wide range of scientific journals, all of which helps to propel their careers and the recognition of GSU as an up-and-coming research institution. To serve the demands of the extensive B.S., M.S. and Ph.D. programs, there is certainly no excess of faculty. On the contrary, the external review committee fully agreed with the internal review committee’s recommendation to increase the size of the Biology faculty significantly to promote the research enterprise and better serve the teaching mission.
Comment on the relevance of the programs, the degree to which the Department’s programs serve various needs (community, student, professional).

The Ph.D. program in the Department is doing an excellent job of supplying well-trained individuals to the pool of scientists in America and the world for careers at academic research institutions, medical schools, pharmaceutical companies, and biotechnology industries. The M.S. program provides essential training for applicants to Ph.D., medical and other professional school programs, and gives technical training to those interested in professions in laboratory science in academic/government research and Atlanta-area biotechnology, including the CDC. The GSU Biology M.S. program has especially been successful in providing excellent candidates for their own Ph.D. program. The B.S. program in Biology provides important pre-professional training for those students interested in professional (e.g., medical) schools as well as graduate schools. The outreach programs of the Biology Department (e.g., BioBus, Zoo Atlanta, Aquarium) are highly impressive and effective in reaching the public on the importance of the biological sciences in everyday life.

Evaluate the appropriateness of the peer institutions selected by the Department for comparison.

The internal report documents the examination of 15 potential peer institutions (Appendix B1). Queries were sent to 7 of them, and of the 3 that responded, all were regarded by the external committee as appropriate peer institutional programs: the University of Virginia, Florida State University, and University of North Carolina. The latter institution, with a comparable ~1300 Biology Majors, may be the best peer to GSU. The GSU Department, by comparison, excelled in the number of M.S. (143 vs. 3) and Ph.D. (111 vs. 83) students, publications (50 vs. 25 in 2004), and in NIH grants (27 vs. 13). Thus, compared to biology programs at peer institutions, GSU Biology is highly successful in the most important parameters.

V. Progress Towards Goals and Objectives.

Evaluate the ways in which the unit has succeeded in meeting its goals and objectives since its last academic program review (Section C).

The goals defined in the 1997 Program Review (described in Section C), and associated progress, were evaluated by the external committee:

**Goal 1: Recruit new faculty.** The size of the Biology faculty has doubled from 25 to 50 since 1996. Interestingly, the number of students in each category (B.S., M.S., and Ph.D.) has also approximately doubled. It is important to note that external funding has increased more than 5-fold ($3.2M to $16.3M) over the same period of time. Thus, this goal was not only fulfilled, but has shown a highly successful outcome in support of the GSU research mission.

**Goal 2: Obtain adequate graduate support.** This was partially fulfilled by increasing the number of GLAs from 60 to 110 labs/quarter.

**Goal 3: Improve research facilities through Centers and Core Facilities.** Four interdisciplinary centers existed in 1996: Biotechnology & Drug Design, Environmental Research, Neural Communication & Computation, and Brain Science & Health. By 2006, three more Centers had been established: Viral Immunology, Behavioral Neuroscience, and Collabtech Biotechnology Development. Also, three more core facilities had been established:
Advanced Biotechnology, Imaging, and Confocal Microscopy. Overall, the efforts toward accomplishing this goal have resulted in a high level of success, not only for Biology but also for the University in that these centers and cores are available widely to GSU research faculty.

**Goal 4: Develop a community partnership by increasing scientific awareness in the public schools.** Significant community participation programs have been established in recent years called: the BioBus, ZooAtlanta, and the Georgia Aquarium Project. In addition, two Science Educators were hired at the tenure-track level as part of this effort. The external review committee was highly impressed by all these events, and regarded these efforts as more than successful. This outreach program by GSU Biology could be promoted nationally as a shining example of effective outreach by a university to the public, which serves not only to educate the public, but also to enhance the public’s awareness of the University for its excellence and service beyond the traditional call of duty.

*Is progress toward meeting goals and objectives satisfactory?*

As described above, progress in meeting these four goals has been exceptional.

*What are the factors that have helped or hindered the unit in its effort to meet its goals and objectives?*

The faculty members of the Department of Biology have been remarkably resourceful in utilizing every opportunity that presents itself to obtain resources, achieve success and accomplish professional goals. Our committee was impressed with the availability of GSU initiatives to support areas of interest, and that Biology was successful in the competition. Also, the Georgia Research Alliance has been an invaluable resource for research equipment and other support. In many ways, however, the Biology faculty members have become “victims of their own success” in that fatigue was widely evident among the faculty because they work so hard to take advantage of all competitive opportunities. These “burnout” symptoms and associated effects may become an increasing problem. We were impressed that GSU Biology faculty have competed surprisingly well with faculty at medical schools for grants and in research productivity, despite their much higher teaching-load. This amazing productivity may be short-lived, though, owing to burn-out unless younger faculty members are added to contribute to the teaching and research missions. Although the faculty size has doubled, their productivity has far more than doubled. Thus, the success and prestige of the GSU Department of Biology, as well as the research-prestige of the University as a whole, would benefit by increasing the size of the faculty of Biology.

*Ways in which these goals have contributed to the College and University Strategic Plans.*

An important goal of the University is to reach $100M in external funding by 2010. The Department of Biology has been, and will continue to be, a major player in achieving this goal. It currently secures more than a quarter of the University's extramural funding. Putting more institutional resources into Biology, and also making their teaching mission more efficient (e.g., greater classroom availability), would allow these resourceful faculty members, and their highly competent chairman, to propel Georgia State University to the status of a well-respected research university, and probably even sooner than expected.
VI. Quality of the Curriculum.

1. Quality of curricula from a disciplinary perspective.

The B.S. program requires four hierarchic levels of coursework: an introductory sequence (two 4-credit courses); two “gateway” courses (total 5 credits) that determine admissibility to the major; a set of core courses (total 10 credits); and upper-level courses (totaling 24-32 credits). In addition, majors are required to minor in Chemistry. Although that latter requirement is unusual, the general outline of the B.S. curriculum is comparable to similar programs at other universities. As noted above, however, the Department lacks faculty strength and, therefore, strength in research and teaching in most areas of organismal biology. That is a serious deficiency because it deprives students of experience with a large sector of contemporary life science. In addition, plan biology is weak and should be strengthened given the advances being made in plant biotechnology today.

The large M.S. program has two tracks, leading to a thesis-M.S. and a non-thesis M.S. Both require 40 credits, but the thesis-M.S. is more demanding because it entails 14 credits of research. A large majority of the M.S. students follow the non-thesis curriculum.

The Ph.D. curriculum is similar to that at other universities in terms of the number and distribution of credits as well as the required qualifying examination, dissertation proposal, and defended dissertation.

2. Appropriateness of the learning outcomes and learning outcomes assessments for each of the programs.

Assessment of learning outcomes was introduced in the Department in 2004 and implemented for the first time in 2005. The criteria used for assessment of the undergraduate outcomes focus on scientific inquiry, communication, history and impact of biology, and content of biology. These measures are appropriate, and the results of the first exercise were perhaps not surprising: >70% of the students met or exceeded expectations.

Assessment at the graduate level has involved evaluation of a sample of M.S. and Ph.D. students by a committee on five standards: inquiry, analytical skills, communication skills, content-acquisition of knowledge, and advancement of knowledge. The sampled students all achieved scores of 3 or better out of a possible 4 points on all measures.

In addition to these mechanisms, surveys of students have also yielded important feedback to guide improvements of curricula and advising.

These assessment activities are impressive. In our experience, it is not common for large public universities to conduct such serious outcomes assessments.

3. How have learning outcomes assessments influenced curricular modifications?

The most important consequence of the assessment and surveying exercises has been a serious effort to improve student advising. In addition, it has become clear that there is a need to reduce class sizes in a number of cases, and for tenure-track faculty members to be more welcoming and available to students. We got the impression that the Department is taking this process of assessment and consequent improvements seriously.
4. **Have these modifications been effective in improving student learning outcomes?**

Owing to the tight schedule for our site visit, we did not have enough time to assess fully whether the upgraded advising or modifications to the existing program is working for the students. These improvements are recent, but the small sample of students we did meet were enthusiastic.

**VII. Quality of Students.**

Although GSU has been in the process of transforming itself from largely a commuter school with primarily a teaching focus, to a major state-supported university with both research and teaching as its missions, teaching remains a critical and central component to the mission of the Department of Biology. The importance of teaching, as recognized by the efforts expended by both the non-tenure-track and tenure-track faculty, is appropriate and necessary to achieve excellence in research. The quality of students available to both the undergraduate and graduate programs in biology is, therefore, a critical component. The Department of Biology has one of the largest academic programs in the College of Arts and Sciences, with approximately 1600 declared undergraduate majors, 160 masters’ students, and 110 Ph.D. students.

For undergraduates, the minimum requirements for declaration of a major in biology are the same as for entry in GSU, plus students must achieve a grade of at least “C” in the required, “Gateway” course, Biol 3800, to advance to upper-level courses. Students are evaluated according to a combination of their GPAs and SAT scores, to derive a so-called Freshman Index. In comparison with the rest of the incoming undergraduates, freshman biology majors have the same level of credentials. Thus, one concludes that the undergraduate biology program attracts average GSU students. One complexity in this analysis, however, is that the guidelines and/or rules for how and when GSU undergraduates declare their majors provide a lot of flexibility and little in the way of time constraints for the students. Consequently, many students do not declare their majors until they are far advanced in their undergraduate careers. Because of prerequisites and required core courses, this often causes undergraduates to extend their bachelor’s education beyond four years. One recommendation that we believe would improve the completion and/or success rate for undergraduate biology majors is to require selection of a major much earlier – in the first year. While flexibility should certainly be retained to allow students to change majors if their career goals or interests change, having them declare majors early would improve their ability to obtain academic counseling and progress through their program. This would also improve the graduation rate and shorten the time to graduation, both of which need improvement.

One of the brightest spots in the undergraduate biology program is the Department’s participation in the University Scholars program. Our committee had the pleasure of meeting with some of the University Scholars who are involved in research in the Department of Biology. This is an excellent program that appears to especially be having a strong impact on the recruitment of underrepresented minority students to the graduate programs. We recommend that this program be expanded. This will also help in improving the quality of undergraduate biology majors.

The Department of Biology has a large masters program, with a total enrollment of 160 as of Fall 2005. This program serves several important functions, both for the Department of Biology and for GSU, but also for the community at large. Approximately 25% to 30% of the students in the masters program get their degrees each year. Considering that the average time to degree
for the M.S. students is 2.5 years, this is a fairly good statistic and contrasts with the statistics for undergraduates graduating with their major in biology (approximately 7% annually) and with Ph.D. students graduating with their degrees in biology (approximately 10% annually; see below). Average GRE scores for M.S. applicants, including enrolled applicants, have modestly improved over the past few years, but could still improve further.

Regarding the significance of the Biology M.S. program, key considerations are as follows: First, the masters program in biology at GSU is the only program of its type in the Atlanta area. The growing biotechnology industry in the Atlanta area needs the type of educated workforce that can be provided by such a program. With that in mind, the biology M.S. program at GSU has found a unique niche for itself. Additionally, it is clear from analysis of where students come from, that the masters program also serves as a feeder for the Ph.D. program. The scarcity of high-quality, domestic graduate students argues that a feeder program for the Ph.D. program, which is critical for the Department’s research enterprise, needs to be supported. Finally, on a practical note, the masters program generates income for the University.

GRE statistics for Ph.D. applicants are in general higher than those for M.S. applicants, although there is a fair amount of heterogeneity when records are divided amongst the four research areas of the Department. Average GPAs for Ph.D. students in each of the four disciplinary areas of the biology program were all 3.50 or above. Most significantly, the average GPAs of accepted and enrolled students generally exceeded that of the overall applicant pool, suggesting that the department is enrolling the better students from amongst those who applied.

VIII. Quality of the Faculty.

GSU requires that all tenure-track faculty members be teaching faculty in addition to doing any research. We met all of the Biology faculty members, who shared with us their research interests and course teaching both at the undergraduate and graduate levels. In addition to the tenure-track, research-active faculty members, there are also 12 non-research teaching faculty (Lecturers) who are responsible for teaching many of the lower-division courses, including service courses, as well as a few of the upper-division required courses. It was very impressive that GSU has a model that ensures high-quality teaching by all of their faculty members and that the very obvious integration of the Lecturers with the research-active faculty is a win-win situation not only for students majoring in or taking biology courses but also for the Department as a whole. In reviewing the 32 curricula vitae of the Biology faculty members, it can be determined that they cover the breath and depth of the field of biology except for plant biology and systems biology at the whole-organism level. We were told, however, that an adjunct professor from the University of Georgia does teach plant biology and physiology courses within the GSU Biology Department.

There are six Centers within or associated with the Department of Biology and two Areas of Focus plus four graduate programs. The overall numbers of faculty members is small in comparison with biology at other universities similar in size to GSU. Nevertheless, we concluded that students majoring in biology are getting good instruction and exposure to a broad variety of research given the many areas of interest, capabilities, and experience within the Department. Nevertheless, we recommend that a plant physiologist and plant molecular biologist as well as one or more organismal biologists be hired, as new funding becomes available, to round out the instruction and research in biology.
The curricula vitae of the tenure-track faculty are impressive and include publications in many top- and second-tier research journals. The publications, in both quality and quantity, are impressive given the enormous responsibilities and activities undertaken by the faculty. Ninety-two percent of the faculty published over a three year period, which is highly productive statistically and very admirable. Eight-five percent of the faculty present their research findings at professional meetings, workshops, colloquia and seminars at other universities on a yearly basis. Over 75% of the faculty members were asked to review manuscripts for peer-reviewed journals, and 65% were requested to serve on review boards for granting agencies.

Regarding grants, the amount of non-state funding being acquired by the Biology Department faculty is above the national average. In the year 2004, the Department of Biology at GSU was awarded $16.3M. This equates to each faculty member bringing in around $500,000. Compared with the biology faculty at the University of Maryland at College Park, which has twice the number of faculty and only $22M in non-State funds acquired in 2004, this is quite remarkable.

The individual honors received by the faculty members are notable and growing as they mature in accomplishment and international recognition. In addition, our committee was most impressed with the amount of service undertaken by the majority of the faculty. Overall, we found the faculty morale high on all accounts except for the work-load issue. Even though there is some competition between the distinct research groups, there is also a lot of collaboration among the various research groups that will lead to strengthening the capabilities and position for national competitiveness for external funding.

IX. Resource Adequacy.

Faculty Resources:

When compared with other national institutions of higher education with a strong research emphasis, Biology at GSU has a higher ratio of graduate students to tenure-track faculty compared to North Carolina and Virginia and almost equal to that of Florida State University. Because there is a lack of large classrooms, the faculty members are overburdened with teaching more classes to lower-division undergraduates in comparison to peers at other equivalent institutions.

Administrative Resources:

Currently the ratio of administrative staff to full-time faculty members is 1: 3.5. Although this may appear to be adequate at this time, it is not. As more grant funding is obtained, the number of students increases, both at the undergraduate and graduate levels, and interdisciplinary research programs grow, along with increased regulatory and compliance demands from funding agencies and more on-line communication with the funding agencies, additional support staff will be needed both for the faculty and the current administrative team. We were delighted to learn that based on complaints from the undergraduate students that too few faculty members advise them, an undergraduate advisor has been hired by the Department of Biology. Our discussions with students reassured us that this new advisor has been well received and appears to have alleviated the problem for now.
Technological Resources:

Our discussions indicated that the information technology support is adequate and works for the most part. Concerns were more common with the overall university systems employed, including excessive spam. The Department has two computer technicians as well as a Webmaster. This is important because the Department's Website is its window to the outside world, and it should be updated on a regular basis. This is key for letting the outside world know about the GSU Department of Biology.

Space Resources:

Laboratory Resources for Research and Instruction:

Although sufficient and well occupied, the laboratories for research are housed on three floors of the Kell Hall and four fours of the Natural Sciences Center. If any growth is to occur, however, there is not enough space to add any additional faculty. This arrangement is also not conducive to inter-laboratory collaborations or cross-disciplinary research. Considering that the funding agencies are promoting more interdisciplinary and multidisciplinary research, our committee feels that the proposed, new research facility at the Science and Technology Park should be expanded to include as many of the Focus Areas, Centers, and graduate programs as well as computing and bioengineering and/or nanobiotechnology research capabilities as possible. We found the instructional laboratories in Kell Hall antiquated and not modern enough to support the diverse 'tools in the toolbox' technologies in biology today. Much larger classrooms are needed for instructional purpose as well as more modern teaching laboratories.

Centers, Core Facilities and Common Areas:

The Department’s Centers, core facilities, and common areas were well equipped and staffed. The Viral Immunology Center, which is housed in the Natural Science Center, is well designed as a BSL4 laboratory and should serve as a point for nucleation for many researchers interested in infectious diseases of humans and other animals as well as environmental monitoring of waters, soils, and the atmosphere. The Imaging Facility and the Confocal Microscopy Facility are equipped with contemporary equipment that should benefit all of the programs in the Department. We did not have time to visit the Center for Behavioral Neuroscience or the Collabtech, the commercial incubator, so that we cannot comment on those enterprises other than to state that they appear on paper to be admirable. Given the description of the research being carried out within the neuroscience group, we can assume that the Center is on target with equipment and support technologies to carry out research. We did hear a few comments that there was not much interaction between the Biology Department and the Collabtech. Finally the Department of Computer Science appears to collaborate on a positive basis with the Biology Department for research in computational biology.

Library Resources:

Our committee did not visit the GSU Library. During some sidebar conversations with the faculty members, it was evident that there are concerns with the ever-growing costs of journal subscriptions and the need to do more online and in an electronic format. More funding is needed to stay ahead of the curve with respect to greater demand on literature searches as the Department of Biology grows.
Foundation Resources:

Currently the Department has several endowed and operating accounts to support research, fellowship, and program development. Given the excellent human and infrastructure resources in the Department of Biology, much more philanthropic activity should be under way. It was shocking to learn that GSU only recently hired a Development Officer to serve the entire University. We feel that the Department of Biology should be given a high priority to obtain funds from foundations, the biotechnology and pharmaceutical industries, and other donor sources including alumni. Wealth-screening should be done for individuals who have supported the Department in the past as well as prospective donors who are interested in research areas that cover human health and the environment.

X. Goals and Objectives.

Teaching Goals:

The Department’s teaching goals and objectives can be met only if additional funding is acquired to hire more faculty members to teach additional sections of key courses. Currently there are 12 Lecturers devoted mainly to teaching in the Department, and they are already heavily burdened. Another strategy to approach meeting the goals outlined might be to build or find larger classrooms. This would cut down tremendously on the number of sections of freshman and sophomore biology courses being taught because of the limited seating capacity of the existing classrooms. Many of the undergraduate student evaluations, however, have made the criticism that some of the classes are too large, bringing into question the value of this strategy for teaching effectiveness.

Developing more interdisciplinary degree programs is possible and would be greatly enhanced if the disciplines of biology were in close proximity to each other. Obtaining graduate training grants from non-State sources is important. More Ph.D. students could be attracted if the stipends for those students were comparable to those at peer and aspirational institutions and not at the current $22,000 per year. More undergraduate internships could be offered if more funding were made available for the University Scholars research program.

If full funding (according to the GSU funding formula of credit hours that included counting of laboratory instruction) were given to the Department of Biology, all of the teaching goals would be attainable. All of the teaching goals are in accord with current biological disciplinary trends, and the priorities being set and implemented are reasonable. The only objective we recommend adding is development of teaching and research capacity in the additional disciplines of plant biology and organismal biology.

Scholarly Goals:

Scholarly goals include enhancing the level of productivity at the national and international reputation of the Biology faculty, enhancing interdisciplinary research, and increasing the level of external funding while developing the Science Park. These goals are typical for all research universities. Succeeding will require additional funding and space to attract more ‘rising stars’ in the bioscience arena and to provide adequate space and start-up packages to attract such talent to GSU. The objectives under each scholarly goal are well thought out and would be attainable faster if the GSU Administration would invest more human and financial resources in the Department. Bioscience and biotechnology are growing worldwide, and bioscience today waits for no one or nothing. The Department of Biology at GSU has a window of opportunity
today based on its record of productivity in research and publication. This Department is clearly a prominent star in GSU’s constellation and should be appropriately rewarded to build even a stronger foundation and expand its capabilities to remain competitive nationally and attract more visibility internationally. The Department’s scholarly goals are on target with the right priorities and are warranted to meet GSU’s overall goals in accordance with the University’s 2005-2010 Strategic Plan.

Service Goals:

Serving the greater community through involvement in K-12 programs and other outreach initiatives is good not only for the Department of Biology but also for GSU. We are very impressed with the recruitment of tenure-track Science Educators and the Bio-Bus program. Exciting young minds and alerting youngsters to possible careers in bioscience is very much needed today in the USA if we, as a nation, are to remain competitive and do research on the cutting edge. Bioscience workforce training programs also attract biotechnology companies to move into the area where there are well-trained bioscientists. Communicating to the public, to the policy and regulatory agencies of the State of Georgia, and to the legislators and Governor, who determine the operating budget for GSU should be a high priority given the location and proximity of GSU to the State capital and its legislative activities. We were delighted to learn that all of the faculty members of the Department of Biology including the Chair, are supportive and enthusiastic of such service goals. These goals and objectives are attainable, reasonable, on target, and very forward-thinking for a research university.

Environmental Goals:

Of all the goals, this is perhaps the most critical and important goal to emphasize, as all of the other goals depend upon the environment in which the Department of Biology functions. The Department realizes that in order to expand, enhance, and optimize its productivity in all areas of teaching and research, more space is needed. The Department’s Chair was hopeful that the planned, new Science Park being will yield the much-needed additional space. Our committee encourages the Department’s Chair to involve the faculty members in the design of any new space for biosciences that will foster more interdisciplinary research, growth for more teaching and research faculty, more student advising and mentoring, more student teaching laboratories and most importantly, larger classrooms for instructional purposes. The environmental goals are attainable if the new Science Park goes forward and assigns sufficient space to Biology. Many other states are investing in new bioscience buildings, new biotechnology parks that house both basic and applied research, and ‘incubators’ to foster cross-pollination of industry and academic initiatives. The Department of Biology at GSU again is on target with its goals and has set appropriate priorities within the environment goals.
XI. Recommendations.

1. The GSU funding formula should be adhered to so that the Department of Biology can achieve its goals of growth and continued development in both teaching and research. The Department is significantly underfunded by the College and has been able to excel only by virtue of its external funding through Centers and research grants. While the Department has been successful in obtaining external funding for several of its innovative projects and Centers, maintenance of these activities as well as the core facilities will require significant inputs of capital over the next decade.

2. GSU and the College of Arts and Sciences should examine different models of organization that could help empower the Biology program. For example, in order to grow the research enterprise, some other institutions have created separate colleges of science, science and technology, or schools of biological sciences and have found that strategy advantageous for the transition to research-intensiveness.

3. Faculty and staff workloads are major issues and areas of concern for the Department of Biology. The concerns center on two points: First is the perception that the Department and its faculty do not receive adequate credit for all the activities in which they engage because the metrics used to determine workload do not adequately account for their activities; second, owing to heavy teaching loads and the extensive research and outreach activities in which most of the faculty members are engaged, they feel overburdened.

Recommendations to help address the concerns of workload are as follows:

a) From our analysis of how faculty workload is judged in the College of Arts and Sciences, it appears that the metrics used across the various departments are standardized. The problem with this is that faculty responsibilities in disciplines as disparate as English and Biology are very different. For example, faculty mentoring of research students is a major part of the day-to-day activities of the tenure-track faculty in Biology. While this generates course credit for the students, it reportedly does not generate the appropriate faculty workload credit under the current formula. Thus, workload metrics that are appropriate to the discipline of biology should be used, including laboratory teaching.

b) In the context of their field nationally, all pertinent activities of the Biology faculty members should be counted in assessments of faculty workload. This should include activities such as service to the profession, manuscript reviews, service on study sections and editorial boards, etc. A formula for credit offsets for these important activities should be developed and applied.

c) Additional faculty members are needed, both for teaching (i.e., Lecturers) and for tenure-track positions.

d) Larger lecture halls are needed for teaching of several of the undergraduate courses, in which the large enrollments currently require offering multiple sections.

4. Masters program: Although one suggestion by the Dean to relieve some of the workload stress on the faculty was to reduce the size of the M.S. program, we urge that this program not be curtailed but instead be supported to an even greater extent by the Provost and Dean. Justifications for this recommendation include the following:

a) The M.S. program serves as a significant feeder for the Biology Ph.D. program, thus providing highly motivated, domestic students, who are always in short supply.

b) The M.S. program serves the community by providing appropriately trained scientists for the burgeoning biotechnology and pharmaceutical industries in the Atlanta area.
c) The M.S. program is unique among programs in the Atlanta area.
d) The M.S. program fulfills several of the strategic goals of GSU, as enunciated in the 2005–2010 strategic plan.
e) The M.S. program generates income for GSU.

5. Lecturers: Salaries should be increased significantly to be commensurate with their important contributions to the teaching mission of GSU and the Department of Biology.
   a) The Lecturers in the Department of Biology perform most of the teaching for the undergraduate program and some of the graduate program teaching.
   b) Without the key contributions of the Lecturers, the tenure-track faculty, who already feel overburdened, would not be able to accomplish their research goals.
   c) Additional Lecturers should be hired, particularly in areas not adequately or fully covered in the current curriculum (see Faculty recruitment below).

6. Faculty recruitment: Additional faculty members are needed, particularly in areas where there is a perceived gap in education – for example: ecology, plant biology, evolutionary biology, and population biology. GSU should increase efforts to recruit minority faculty in Biology.

7. Faculty of the four focus areas of the Department should be consulted in the design and planning of new space being constructed in the Science Park to enable different groups to be in close proximity. This will enable them to share resources, more easily collaborate, and has other scientific advantages.
Strengths and Weaknesses of the Department of Biology at GSU:

A. Faculty:
   STRENGTHS:
   1. The Chair, Dr. Tai, is a major strength. He is energetic, functions very ably as a true advocate for the Department and has been a very strong leader.
   2. The relatively high number of female faculty in the Department is a strength.
   3. The Lecturers are a major strength for the Department. They are highly dedicated and enthusiastic and are well integrated into the Department. Their presence permits the tenure-track faculty to be as successful as they have been in obtaining external funding and conducting productive research programs.
   4. The hiring of two tenure-track faculty members who are science educators is innovative and important for the continued prosperity of the Department.
   WEAKNESSES:
   1. The low number of faculty who are from underrepresented minorities is a weakness that needs to be addressed in future recruiting plans.
   2. The need for additional faculty in some underrepresented areas of biology, including ecology, plant biology, evolutionary biology, and population biology.

B. Faculty contributions to instruction, research, service:
   STRENGTHS:
   1. Virtually every tenure-track faculty member is heavily involved in all aspects of the Department’s activities.
   2. The faculty members have developed several innovative programs for teaching and outreach and have successfully obtained external funding for many of these.
   3. The development of several Centers at GSU has been spearheaded by the Department of Biology. These Centers draw attention to GSU and the Department and provide a venue for interdisciplinary and multidisciplinary research.
   4. Outreach efforts of the Department are innovative and highly commendable. They make significant contributions to the University, local and regional community, and the overall scientific community.
   5. Faculty research programs are well funded, with an average of approximately $500,000 per tenure-track faculty member.
   WEAKNESSES:
   1. Need to increase the small undergraduate research program.
   2. A number of advanced courses are too large.
   3. The workload of the tenure-track faculty members is burdensome and threatens their future ability to compete successfully for external funding.

C. Programs of the department:
   STRENGTHS:
   1. The B.S. program is very large, thus playing a very prominent role in the College of Arts and Sciences.
   2. The M.S. program fills a unique niche and has many strengths that provide benefits to the Department and GSU.
   3. Outreach programs are innovative and laudable.
   4. The Ph.D. programs in the four disciplines are robust and well designed.
   WEAKNESSES:
   1. B.S. program needs improved advising (a challenge that the Department has begun to address).
2. Rules at GSU for how undergraduate students declare major cause delays for many students.
3. Completion rate for undergraduates with a major in biology is low.
4. Efforts should focus on shortening the average time needed to complete the Ph.D. degree to 5 years

D. Organization of department around four disciplines:
   STRENGTHS:
   1. The four disciplines of biology emphasized in the Department -- Applied and Environmental Microbiology (AEM), Molecular Genetics and Biochemistry (MGB), Cell and Molecular Biology and Physiology (CMBP), and Neurobiology and Behavior (NBB) -- are highly collaborative.
   2. Each discipline fulfills important roles in the various endeavors of the Department.
   WEAKNESSES:
   1. Additional faculty members are needed, particularly for the AEM and CMBP areas, which are the smaller two of the four areas of focus.

E. Financial resources:
   STRENGTHS:
   1. Prospects for the new Science Park, to open in 2008, are very exciting for the Department and should enable growth and continued innovation.
   2. The Department has benefited greatly from the Georgia Research Alliance.
   WEAKNESSES:
   1. Significant underfunding of the Department by the College of Arts and Sciences and GSU.
   2. Potential lack of funds to support core facilities in the future is a concern.
   3. Need for additional funds for support of Ph.D. students to provide them with competitive stipends and health insurance.
   4. Additional funds are urgently needed to provide higher salaries for the Lecturers. Without these individuals, who perform most of the undergraduate teaching and some of the graduate teaching, the various research and outreach endeavors of the Department could not be possible.