Decadal Review Report

Biology Department

University of Washington

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Committee Membership

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Summary

The Committee received an extensive and well-summarized self-study from the Department of Biology prior to the site visit on 19-20 May 2008. During the site visit we met with representatives of all the major constituencies in the department including the leadership, faculty, staff, graduate students and undergraduates.

The Department of Biology at the University of Washington has an excellent national reputation. It competes effectively for the best graduate students and faculty. Its graduate students are well prepared for competitive jobs such as faculty positions at quality institutions. Undergraduate majors are well prepared for a variety of careers, professional schools and graduate school.

The merger of Botany, Zoology and the Undergraduate Biology program into a new department of Biology seems to be working very well. Governance and staffing seem well organized and competent. Collegiality and morale are strong.

The demand for biology courses and the current size of the faculty of Biology has led to a situation where class sizes are large and access to foundational courses in biology is limited. Steady growth of the faculty count in Biology is recommended at a level of 2-3 new hires per year for the next five years. The age distribution of the faculty is peaked at junior and senior levels. Retention of rising junior faculty and hiring some mid-career faculty are needed to provide future leadership for the department.

The department is in need of additional quality space for research and teaching. The construction of a new building is critical to the continuing success and future health of the department.

The strategy for hiring has been to advertise broadly and to hire the best available faculty. This has worked well during the transitional period after the merger, but in the future the department should develop a strategic plan for faculty hiring in areas of perceived opportunity and need.

1. General Structure and Organization of the Department

The merger between Zoology and Botany, which occurred five years ago (2002-03), has been a clear success. Both groups of faculty and the University at large stand to benefit from this merger. The Department of Biology is now and will in the future be stronger as a result of the merger. The committee was impressed by the unusual collegiality of the faculty. This was apparent at all ranks. Although faculty mergers often can precipitate disaffection, distrust or territorial disciplinary concerns, there was little evidence that such issues exist. The success of the merger and the collegial climate of the department have clearly been reinforced by the outstanding leadership and dynamism of the outgoing chair, Professor Tom Daniel. Much of the credit for the merger's success reflects Daniel's ability to work productively with both groups of faculty. It was readily apparent that Daniel's guidance and leadership of the department is appreciated and recognized by faculty, students and staff. The confidence and level of support for his leadership was unusually strong. Daniel also credited the cooperation and collegiality of the faculty as crucial for the success of the merger.

The committee was particularly impressed by the Department Chair's decision to create an Executive Committee composed of senior faculty who oversee the following committees: 1) faculty appointments (Huey), 2) promotions and tenure (Perkel), 3) graduate program (Bradshaw), 4) curriculum (Boersma) and 5) seminars (Olmstead). Through its interaction with the Executive Committee and the Department's self-study, the committee found that this group provides broad representation for the faculty and students as whole, as well as strong support for the Department Chair. This administrative structure is strongly endorsed and encouraged to continue. The transition to a new Department Chair (Professor R. Huey) will be greatly facilitated by the strength of the Executive Committee and the responsibilities that this group of faculty handles.

Since the merger several outstanding junior faculty appointments have been made by the newly formed Biology Department across both zoological and botanical disciplines. In addition, the graduate program continues to admit a stellar group of graduate student trainees. These are hallmarks of a successful and nationally competitive program. As such, they provide key evidence that the merger into a unified Biology Department has been a success. In addition, the size of the undergraduate majors in Biology and enrollment of undergraduate courses, for which the Biology faculty provide instruction, have grown over recent years, and are now at problematic levels as enrollments have outstripped faculty recruiting and retention. We discuss faculty recruitment/retention, the graduate program, and undergraduate curriculum in greater detail below, but the success of the Biology Department in these three areas is a major reason that the University and the State of Washington should do its very best to provide the resources this exceptional department requires. Otherwise, it risks losing its best junior and mid-career faculty to other institutions. This has been a problem for the department in the past and, if allowed to continue, will represent a significant negative impact on its future ability to remain one of the leading Biology programs in the United States and the world.

2. Faculty Quality, Mentoring, Recruitment, and Retention

Faculty Quality. As noted above, during and subsequent to its merger, the Biology Department has made several outstanding junior faculty appointments. These are very promising individuals, who have received recognition for their research scholarship as well as their teaching. The senior Biology faculty also includes major leaders in their respective fields. However, the Biology Department, and before as separate Zoology and Botany Departments, has lost key mid-career and senior faculty due to 1) an unusually heavy undergraduate enrollment teaching burden, 2) weakly competitive salary structure, and 3) the lure of substantial start-up research investment when recruited away from the University of Washington to a new institution. This last concern is relatively new for US academic institutions and, in part, reflects the increasingly competitive landscape that exists for obtaining extramural funding to support faculty research. This is particularly felt at federal levels. The University must work to establish endowment funds to assist departments in providing competitive start-up packages and to compete to retain their very best faculty. It should also look for opportunities to support major-facility proposals involving Biology, as superior infrastructure will help keep faculty rooted here. We note that agency funding is trending toward more grants for centers and instrumentation. Such steps should be key objectives of University administration. Stronger answers to the question "Why come to the UW?" will be important to the success of the ambitious faculty recruitment plan that Biology has laid out over the next five years. During this period, it hopes to recruit an average of three new faculty per year (15 total). This will require substantial faculty effort, high-level University administrative support, the promise and realization of critical new research laboratory and office space, and curricular mechanisms to reduce the undergraduate enrollment burden in upper level courses.

Despite the quality and strength of the junior faculty and many of the senior faculty, the Biology Department's age and professional rank distribution is somewhat problematic with relatively few faculty tenured at the Associate rank, compared to the number of tenured Full Professors (who are heavily weighted to 30-45 years post PhD) and newer junior faculty. As a result, the committee has concern that a limited number of rising associate to more senior full professor faculty will be available to move into leadership positions over the next five to ten years. Because of the relatively thin Associate professor ranks, the committee encourages the Biology Department to consider targeting younger tenured Associate professor appointments, particularly in regard to women and under-represented minorities, as candidates to recruit to its faculty. Although mid-career appointments typically require larger commitments in start-up funding and infrastructure, Biology needs more faculty who can soon assume campus leadership roles.

Faculty Mentoring. Although the Biology Department has no formal mentoring program, it was apparent to the committee that junior faculty receive excellent mentoring from the Department Chair and other senior faculty. No concerns were expressed by any of the junior faculty who were interviewed. All had high praise for Professor Daniel and the department, as a whole, for making them feel supported and well advised with respect to their teaching and research activities. On the other hand, it seemed that recently tenured

Associate professors were less clear on the level of continuing mentorship that they would expect from Full professor colleagues. The committee encourages the department to explore how best to mentor mid-career Associate professor faculty, to best help them continue to advance in their research and teaching careers, particularly given the increasingly competitive situation that exists for sustaining extramural funding.

Faculty Recruitment/Retention

Faculty recruitment at the junior Assistant professor level remains one of the department's key strengths. The committee was impressed with the quality and enthusiasm of the junior faculty it met, as well as the vitae and teaching materials that it was provided for the faculty as a whole. The investment in junior faculty to grow the ranks of the department is a good strategy and one that should be continued. Retention of the junior faculty remains an ongoing concern, however. The investment that the department and University makes in talented young junior faculty should not be risked by inordinately large teaching enrollments and modest salary advancement. Although the quality and amount of laboratory space was not noted to be a major concern of the junior faculty, the committee believes this remains a long-term concern, particularly with respect to retention. As noted previously, the chilly federal funding climate makes the risk for losing talented junior and mid-career faculty particularly of concern, as the best faculty may be lured away to attractive research start-up packages elsewhere.

In addition to pursuing junior Assistant professor faculty, the department should opportunistically pursue the recruitment of talented mid-career tenured Associate and Full Professor faculty. This is essential not only for increasing the overall size of the Biology faculty and for bringing exciting new areas of research and teaching to the University (see Faculty Recruiting Strategy below), but also for recruiting potential new academic leaders of the department and the University. One senior-level search in progress illustrates the kind of targeted search that might yield a top-flight academician. The Department's seminar/symposium series "Transformations in Biology: Uncommon Leaders" is an outstanding vehicle for identifying leading senior women and underrepresented minority faculty who might themselves be future candidates for recruitment. The University should do what it can to support this innovative and promising program.

A key concern for retention of faculty at all ranks is the increasing popularity of the Biology major, as well as various science programs that rely heavily on Biology foundation courses, which has led to extraordinarily high enrollments. It is clear that the University must do what it can to support the planned growth of the faculty (15 additional over 5 years). Retention of faculty at all levels is placed at risk by the currently high enrollment levels, particularly in upper level courses.

A second key concern is that the salary scale for Biology faculty is not competitive with peer institutions; indeed, it does not appear competitive within the University of Washington itself. This is remarkable given the quality of the faculty, the quality of their graduate program, and the success and size of their undergraduate majors and service to other undergraduate science degree programs.

Finally, in order to successfully meet its goals for faculty growth, which is critical to providing access to undergraduate students across the University's science programs to the superb range of courses that its faculty teaches, the Biology Department must have new space. As we discuss in greater detail below, the proposed new Biology building is critical to achieving this. The University should partner with the Biology Department to leverage the substantial funds necessary for achieving the vision of a modern state-of-art laboratory biological sciences facility that the department sorely needs. This is critically important for sustaining the quality and growth of the Biology faculty at the University of Washington.

3. Undergraduate Majors Programs

The department has a large and flourishing undergraduate BA and BS majors program. The majors program is fully subscribed and competitive. The entry-level sequence of 180/200/220 is offered in its entirety every quarter and is nearly fully enrolled. About 15-20% of the students who take these classes do not perform well enough to advance to the next level. Concern was expressed that the students who fail to advance through these classes come disproportionately from students who might be otherwise economically or socially disadvantaged. Eliminating chemistry as a prerequisite to these classes may allow students to access these classes earlier in their academic careers, but may also increase the fraction that do not advance through these classes on the first attempt. The department is attempting to provide assistance to students who may not succeed in these classes because of their backgrounds, in order to provide broader access to the biology major.

The highly motivated students we met seem very happy with the academic opportunities of the department and especially the research opportunities that are afforded to majors in the program. They are very complimentary about the advising services offered by the departmental staff. Several issues were raised related to the availability of courses that were on the books but rarely offered, and the lack of a sufficient number and variety of physiology and anatomy classes. Upper division courses have rather large enrollments (90), but this was an issue raised more by the instructors than the students, as the students with whom we spoke had found a small community among themselves and the research groups in which they have worked.

4. Instructional program and teaching load.

The Department of Biology trains a large number of undergraduate students in the basic science of biology through its introductory series for science majors. The basic introductory biology sequence is taken by most undergraduates who intend to pursue a degree in a biological or biomedical subject and, as noted above, is offered every quarter, including summer, to hundreds of students per class. This represents a large teaching effort, particularly since these classes include laboratories. In order to ensure continued undergraduate access to its introductory sequences, as well as mid- and upper-level courses, particularly in the face of increasing student demand, the department must increase its faculty size along the lines of its strategic vision. The department has a significant number of instructors, lab coordinators and TA positions to assist in offering these courses. Although the number of students processed is high, the number of hours of lecturing that faculty engaged in scientific research must do is mitigated by team-teaching these classes and by the preparation of well-tested laboratory exercises provided by staff professionals. The number of lectures that must be prepared by individual faculty each quarter is not excessive by the standards of the broader UW community. This enables them to compete effectively in research. The professors, lecturers and instructors seem devoted to good teaching and his is reflected in large class sizes and good student evaluations of teaching.

Because of the number of Biology majors, the upper division classes for biology majors tend to have large enrollments of 90 students. The current size of the faculty does not allow for smaller class sizes or for more variety in the kind of courses that can be offered, shortcomings that several students noted. An increase in the number of faculty would help alleviate these problems, providing more access to biology courses and enhancing the undergraduate experience. In addition TA or even grader support is rarely provided for more advanced courses, which means that faculty bear a large load in grading assignments, particularly as these courses are extremely large. This has tended to limit the types of assignments. Even in upper division courses faculty are reluctant to assign certain types of exercises (papers, essays). The department should endeavor to provide grader or TA support for all courses with large enrollment.

5. The Graduate Program

Overall the graduate program is among the best, nationally, attracting students of high quality, and producing high quality graduates who are sought as postdocs and junior faculty by the top departments elsewhere. The median time to degree of just over six years is typical of good research programs involving experimental and/or fieldwork components.

The graduate students are a cohesive and collegial group, with the same culture of mutual respect and broad interests transcending the traditional sub-disciplinary boundaries that is shown by Department faculty. The breadth, balance, and inter-disciplinary nature of the program has benefited from the merger of the former departments, and, just recently, of the two former graduate programs.

A general concern in any Basic Sciences Biology Program, particularly in a University with a strong Medical School, is to maintain a strong research program and attract excellent students in Molecular & Cell Biology. This Graduate Program's strategic emphasis on plant molecular biology enables it to provide a niche in this area attracting students who prefer the academic environment of a Basic Sciences department rather than a Medical School. Additionally, maintaining access to rotation students who are in the interschool Molecular & Cell Biology Graduate Program, is important to strengthening this component, although inevitably the majority of students in that program will decide to do their thesis research in a Medical School department.

Curriculum

Due to the huge pressure of providing access to the current numbers of students at the undergraduate non-majors, pre-majors, pre-med, and majors levels, graded graduate lecture courses have all but disappeared. To fulfill graded credit requirements, students either take 400-level Biology classes, putting additional pressures on those already oversubscribed classes, or take 500-level classes in other departments. While both these avenues can meet some needs, there seems also a need (and a desire by students and by many faculty) for a little more structure at the curriculum level of the graduate program, and for at least some offerings within the Department of Biology.

As the Department rebuilds its faculty numbers, attention should be paid to this aspect. One possibility is a broad, yearlong, course providing the basics of each major area, to be taken by all students. With flexibility, this need not restrict students' lab rotations or field work, and would provide a more uniform cohesive experience for entering students, which may become increasingly important with growth of this diverse student body. This is not the only possible model; our message is only that there should be some course offerings, and some attention paid to developing a graduate curriculum appropriate to the broad new merged Department of Biology.

Funding and growth

The current size of the graduate program is 100 students. If this were to scale in proportion to the anticipated increase in the faculty number, the program would grow to about 150 students. While some newly established faculty may bring their research funding and students, it may not be realistic in the current funding climate to expect so much expansion. Many faculty and students expressed the view that the department currently does an excellent job in ensuring equitable access of faculty to graduate students, and equitable access of graduate students to faculty as rotation and research advisors. This is a major factor in the collegiality and cohesiveness of the program. With faculty expansion, and decreasing funding opportunities, ensuring continuation of this equitable access will be a challenge the graduate program must address.

Tuition limits in training grants, and the increasing reluctance of some funding agencies to fund graduate student operating fees as a line item on research grants, is a major issue that faces all graduate research programs. Additionally, the increasing need to supplement TA stipends and even TA numbers is not sustainable. The Biology Department has made excellent use of its endowment income in this regard, but to continue to compete for the top entering graduate applicants, and to maintain the high quality of UW graduate programs such as this one, will be an increasing challenge.

6. Staff Issues

The staff seem very competent, well motivated and committed to the mission of the department. The staff are important contributors to the success of the department, and deal with a wide range of key issues, including financial management, student advising, development and outreach, IT, buildings and laboratories, including the greenhouse. We did not identify any problems in this area. Staff competence and motivation seem to be strengths of the department.

7. Strategic Planning

The Department of Biology at the University of Washington is a well-balanced, broadly based biology department, and is among the best such departments in the country. It historically (as separate Zoology and Botany Departments) and currently has well-recognized strengths in fields such as invertebrate biology, neurobiology, ecology and evolution, and mathematical biology and theory. In addition it has excellent faculty in a wide range of fields, adding breadth to its intellectual and educational reach. Recent hires in evolutionary developmental biology and paleontology, for example, have added strength in new important areas. There are no obvious major gaps in faculty expertise. We note that a few areas such as evolutionary genetics and genomics, vertebrate structure function and microbial sciences are not well represented, and might serve as areas for important linking hires, would add important expertise to the teaching array in the department, and perhaps develop local strength in areas of growing significance.

The department is cognizant of the difficulties of recruiting faculty in the areas of cell and molecular biology into an Arts and Sciences context and has taken an excellent strategy towards such hires. This strategy consists of targeting individuals in areas less likely to be a focus for medical schools, and individuals that are positively attracted to broad based departments in an arts and sciences context. Recent hires include plant cell and molecular biology, evo-devo and also neurobiology, and have resulted in excellent young faculty members. We applaud this highly successful strategy and urge the department to continue.

As the department will be hiring several faculty members each year in the foreseeable future, we believe it is important to place these hires in the context of a well thought out strategic plan. However, thus far “strategic planning” has largely consisted of advertising very broadly and hiring “the best people”. This strategy was enthusiastically supported by the majority of faculty, and was, we believe a useful strategy in the early years of the department. It helped to avoid turf wars and disagreements over which subunits should receive priority for hires. In the context of the necessity to work towards shared resources and core facilities to possibly minimize set up costs, we believe that searches that are more targeted towards specific areas would be useful.

Further the strategic areas listed in the self-study “1) complex dynamical biological systems 2) determinants of biological diversity from molecular to evolutionary and ecological scales and 3) information processing and content in biological systems" are so broad as to be of minimal use in directing future development.

While we urge the department continue its strategy of relatively broad searches, and of hiring the best that appear we suggest they consider:

- Defining areas for hire that are more specific than the above and will allow the department to fill teaching needs, build clusters of strength in new directions, and link profitably with other units, as part of a major strategic planning process

- Balancing more senior and more junior hires, particularly given the somewhat problematic age structure of the department

- Pursuing clustered hires in any given year, with the intention of hiring 2 or more individuals in the same general field (minimizing search fatigue and maximizing ability to provide shared resources as parts of start up packages.

8. Space and a New Biology Building

A new building for Biology is a top priority for UW Capital Construction. The committee strongly endorses this effort, which comes at just the right time to help the department move forward with its re-staffing plans.

Biology is an important "doorway" department for the University, through which many UW students pass on their way to a variety of professional careers. History and the recent merger have produced a nominally integrated department, but one split among several buildings, including Hitchcock, Johnson, Kincaid, the Burke Museum, and the basement of Physics/Astronomy. This physical separation must inhibit the kind of research and educational interactions among faculty and students that the merger was intended to promote. The space is not only fractured but of generally poor quality. There have been efforts to remodel space and to address shortcomings affecting HVAC needs of experiments, laboratories poorly designed for current usages, server and other IT needs, graduate office space, etc., but generally the steps have been stopgap and inefficient. Biology staff members are spending significant time and expense simply making do.

There are special circumstances the make this the right time to provide a new building. Given the success of merger to date, there is the opportunity to design a building around an integrated department. The design of such a building can be part of a plan to strengthen interactions among the faculty and students, provide the infrastructure that will help the department compete for major centers, and increase the efficiency of support services for the combined department. It can take into account major instrumentation needs of Biology and other collaborating departments.

The department is also entering a period of renewal and faculty growth. The UW will be at a disadvantage in competing with its peers for the best faculty, if the space it can offer is substandard and outdated. It clearly makes sense to use the new building as part of the recruitment strategy – to time things properly. Even a firm promise of a new building will be helpful in assuring prospective faculty that their needs can be met, and in persuading current faculty to make due with less space during a transition period.

The planning of a new building is a major undertaking for a department, even with the best possible support from the College and University. The faculty must define their requirements early and correctly, a task that generally requires a faculty "quarterback" to make sure all the pieces are in hand and properly coordinated. We would urge the new chair to identify a strong candidate for this role, a person who could make sure that plans reflect the needs and vision of the faculty.

The committee understands that the building will be designed to a cost envelope that is currently undefined. We hope that envelope will be adequate to provide the kind of space needed to keep Biology at the forefront as an integrated department, in future decades.