

□ **Biochemistry and Molecular Biology**

A department in the College of Natural Sciences and Mathematics offering the B.A. and B.S. in Biochemistry and Molecular Biology, and the M.S. in Biochemistry. Doctoral students in Biochemistry earn degrees through one of several interdisciplinary graduate programs.

□ **The Review Process**

This was a standard AQAD review. The review team made overall comments on graduate education; the interdisciplinary graduate programs in which the department participates will be separately reviewed in 2007-08. Reviewers were:

Susan R. Wentz, chair (Vanderbilt University School of Medicine)
Sean Decatur (Mount Holyoke College)
Jonathan King (Massachusetts Institute of Technology)
Richard I. Morimoto (Northwestern University)

□ **Main Issues**

The visiting team found that Biochemistry at UMass Amherst is “a core department that will be central to the transformation and integration of multi-disciplinary research and education,” and “the centerpiece of the biomedical science initiative” in the College of Natural Sciences and Mathematics. The faculty’s research programs were found to be “highly respected,” and the team was “impressed by the obvious dedication and pride of the faculty in the teaching missions of the department.” Special note was made of the department’s research and teaching relationships with Chemistry, which were described as “unusual” and “enviable,” and which place the department “at the nexus of future developments between the life sciences with physics, engineering, polymer sciences, math, and computer science.”

- **Faculty.** The team noted that the department had “successfully emerged” from the “nearly catastrophic retirement and loss of five senior faculty members” due to budget cuts, and now has an “unusually well distributed” faculty across ranks. This “very fragile” balance could easily change, however, and the team urged that the department be allocated an additional three faculty lines over the next six years, with consideration given to open-rank hiring to build the mid-level ranks. The team found the department’s hiring priorities in systems networks, RNA biology, and stem cells to fit well with College plans, but also suggested that they “perhaps could be rethought ... to achieve maximal synergy with other departments and programs.” Two other concerns related to faculty hiring were a need for the campus to provide adequate start-up funding, and the “conundrum” that the institution seeks greater research productivity from a faculty already heavily engaged in teaching. With respect to the latter, the team encouraged a “non-egalitarian” teaching load distribution resulting in smaller teaching loads for faculty with high funded research.
- **Undergraduate program.** The undergraduate program was found to be “remarkably strong,” and “very successful and popular.” Special mention was made of the department’s leadership in innovative and interdisciplinary course development which places UMass Amherst “at the leading edge of undergraduate education in biochemistry across the nation.” The new “My DNA” course was described as “a model for educating general population of students on science and technology.” The involvement of department faculty in introductory chemistry and biology courses was praised, as was the department’s effort to improve upper division coursework.

Despite these strengths, the team found several “defined areas of need:” 1) better balance between faculty research and teaching efforts, especially given the demands of the “cutting

edge” pedagogy being pursued; 2) insufficient TA support in terms of both quantity and quality, with special concern over the practice of assigning graduate students to teaching roles in their first year; 3) the need for resources to equip the teaching labs in the new Integrated Sciences Building; and 4) a need for greater recognition of faculty involvement with undergraduates in independent research.

- **Graduate program.** Although the team noted that it was “not specifically charged with reviewing the graduate programs,” it did offer a number of comments. In general, the team found that Molecular and Cellular Biology (MCB), Neuroscience and Behavior (NSB), and Plant Biology interdisciplinary programs, and the Chemistry department, were “barely meeting the needs of the faculty.” The two greatest deficiencies were in the quality and quantity of graduate students recruited through these programs, and the “training of graduate students as educators in the current TA format.” The team noted that, “given the strength of the faculty, the strength of the research training, and the excellent general scientific environment for young people at UMass Amherst, the weaknesses in graduate recruitment constitute a missed opportunity.” The team urged broad efforts to increase the quality and diversity of applicants, and more equitable funding arrangements between Biochemistry and Biology, the two departments supporting graduate students in the MCB program. With respect to graduate student training, the team found actual research training to be “excellent,” but that “other components of the program, including oversight of their passage through the early evaluation stages, and training in instruction and communication, need upgrading.” The team again noted the “surprising” practice of asking incoming graduate students to teach in their first year, and recommended that other mechanisms for funding first-year students be found.

The team found the current model for leadership of the graduate training in MCB to be “quite diffuse,” and recommended “clearer lines of responsibility and accountability” between MCB and the department and College. Two organizational issues were identified as serving to “preclude the department and institution from fully capitalizing on its graduate programs”: 1) departments that do not contribute financially to MCB are nonetheless able to draw graduate students from it; and 2) inequitable and inconsistent efforts to lower barriers between department, necessary to the success of interdisciplinary programs.

- **Department Infrastructure and Governance.** The current leadership of the department was praised, but looking to the future, the team expressed the view that “there are very few others who would be in a position to assume such responsibility.” This factor was cited as one argument for some open-rank hiring. Faculty mentoring was found to be informal, with a need for “mentoring plans to be developed and implemented.” Finally, the team observed that there is “no clear institutional plan for infrastructure support,” and that “state-of-the-art facilities are essential in areas of highly quantitative biological sciences at the interface with the physical sciences.”

□ **Results of the Review**

The department expressed satisfaction with the team’s findings, including the challenge — “largely practical” (i.e. requiring major new investment) — of achieving the department’s goals. In response to specific findings of the team, the department reported that it would be developing a “fair and equitable distribution of workloads” among faculty; that it planned to phase in its curricular reforms to avoid impacts on research productivity; and that it would pursue “more aggressive” graduate student recruitment and greater support for graduate students beyond teaching assistantships. The department also applauded “the committee’s call for ‘clearer lines of responsibility and accountability’ between the MCB director and the NSM Dean,” and noted that this and other longstanding issues can be addressed during the AQAD reviews of the interdisciplinary life sciences graduate programs in 2007-08. The Dean endorsed the department’s response.