Bio2010: Unintended Consequences?

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In the fall of 2000, the National Institutes of Health (NIH) and the Howard Hughes Medical Institute (HHMI) funded a review of undergraduate education by the National Research Council (NRC), with an eye to modernizing biomedical education. Last year, NRC released the report Bio2010: Transforming Undergraduate Education for Future Research Biologists (CUBE 2003). The report calls for greater integration of math and physical science into the biology curriculum; for reduction of administrative and financial barriers to cross-departmental collaboration; for interdisciplinary laboratory experiences; for experiential learning paradigms, including mentored undergraduate research; and for faculty development programs to effect curricular change.

Certainly these are goals that all biologists should support. But the devil is in the details. The report provides four sample curricula; all are highly prescriptive, focused at the cellular level and below. Does the report marginalize non-biomedical areas of biology? Many people think so. I, for one, cautioned the committee at the NRC meeting where the report was released, saying, “Bio2010 may lead to the abandonment of environmental biology at smaller colleges in favor of a biomedical curriculum—and the fracture of biology departments at larger schools, with biomedical departments in colleges of arts and sciences, and ecology/evolution relegate to applied schools of forestry and agriculture.” The committee chair responded that the recommendations were intended for all biologists. Between the time of the rollout and final publication, the title of the report was changed; the working title had been “Undergraduate Education to Prepare Biomedical Research Scientists” (emphasis added).

The passage of time since the report was issued has allowed colleges to react to it—and react they have. The report has had a much wider impact than other recent NRC reports on education. Introductory “service courses” in physics and chemistry are being rethought, and new biomathematical and biophysics courses are being added to the curriculum. A recent letter in Science by Bruce Alberts (2003), president of the National Academy of Sciences and chair of NRC, expressed concern over “misinterpretation” of Bio2010. He decried the fact that some colleges are using the report to “justify the diminution—or even the elimination—of ecology, population and evolutionary biology...in undergraduate...curricula. This is certainly not an appropriate response to the committee’s conclusions” (p. 1504). But it was a predictable response, nonetheless.

Donald Kennedy, editor of Science, has laid the blame for the “misinterpretation” this way: “To begin with, the title talks about training ‘research biologists’... The terms ‘biology’ and ‘biologist’ are used exclusively throughout the recommendations section.... There are various efforts to remind the reader that the plant sciences and even ecology are not meant to be excluded, but somehow these come off as afterthoughts, leaving little doubt about what is really important” (2003, p. 224).

Is there evidence that Bio2010 is causing a decline in environmental and whole-organism biology? In December 2003, I informally surveyed members of the Council on Undergraduate Research, who come from primarily undergraduate institutions (baccalaureate colleges and comprehensive universities). The results can be found at www.cur.org/survey/bio2010.asp. More than 170 people responded; 82 said that their schools had discussed Bio2010. Fourteen schools had already altered their curriculum as a result of the report, and another 17 planned to do so; 20 others were still considering changes. Only seven had opted for the status quo. Fourteen schools said that changes made in response to Bio2010 caused a relative increase in the proportion of biomedical to environmental course offerings. None reported a decrease.

More interestingly, a dozen of the baccalaureate colleges that were planning curricular change had submitted proposals to HHMI for funding to reform their curriculum in favor of biomedical education. Bio2010 is the recognized road map for these proposals. The report, coupled with HHMI funding, is thus a powerful driver of curricular change. Since the major source of funding for undergraduate biology curriculum reform has a biomedical bias, the clear impression is that modern biology departments, even at small colleges, should be medically oriented departments with a focus on molecular and cell biology.

One respondent, Dale Kennedy of Albion College, encapsulates these concerns: “We have recently submitted a proposal to HHMI based on Bio2010. If funded, we will be adding more medically related components in several areas.... One question that has not adequately been addressed is what will come out of our existing courses to add this new material. [The report] gives the impression that future researchers are needed mainly in biomedical fields...but we need future researchers as much, if not more, in environmental and ecological fields. The biggest problems the world faces are environmental....