CHARGE TO THE UNDERGRADUATE BIOLOGY CURRICULUM TASK FORCE

December 8, 2006

Rationale

Given Cornell's strategic emphasis on the life sciences, it is imperative that the teaching program in Undergraduate Biology remain among the very top programs of its kind in the country. A faculty task force will be established for the purposes of assessing our current curriculum and overall program in Undergraduate Biology, benchmarking it against our major competitors and making strategic recommendations for its continuing excellence. This assessment is especially timely because of our invigorated hiring in Life Sciences, and because it has been some time since a comprehensive assessment of the Undergraduate Biology Curriculum has occurred at Cornell. The Undergraduate Biology Curriculum Task Force will operate under the joint supervision of the Deans of the College of Agriculture and Life Sciences (CALS) and the College of Arts and Sciences (CAS). Advice will also be sought periodically during the course of the assessment from the Internal Life Sciences Advisory Council and the Vice Provost for Life Sciences.

Charge to the Task Force

1. The Task Force is asked to focus initially on the first-year Biology curriculum; specifically Introductory Biology (Intro Bio), and the portion of the curriculum that falls outside the purview of the curriculum committees that oversee departmentally-based concentrations within the Biology major. The Task Force is asked to assess the introductory courses in Biology for both majors and non-majors. (On the issue of courses for non-majors, the Task Force is asked to be aware that a separate group has been organized in CALS to redefine the life sciences distribution requirements for non-life science majors. At an appropriate time following organization of both Task Forces, a line of communication will be facilitated by the Dean of CALS.) The Task Force is asked to assess introductory courses in Biology along the following guidelines:

- Are current introductory courses meeting the needs of all students regardless of their prior exposure to Biology? Does the material covered in the introductory courses explore the breadth and depth of subjects and concepts optimal for students planning to major in Biology, as well as for those for whom this will be their last formal biology course? Would additional introductory courses aimed specifically at students with a 4 or 5 in AP Bio be useful?
- How does the content (depth and breadth) and organization of Cornell's introductory courses compare to those offered by our peers?
- Are our courses innovative in content, approach, structure, and presentation? Do the major's Intro Bio courses serve as an effective introduction for each of the subsequent concentrations? Do our courses promote interdisciplinary approaches, optimizing the connection of Biology to Physical Sciences, Mathematics, Computer Science, and Engineering?
- Are there new pedagogical approaches which have been tested at other institutions and/or pioneered with support of the Howard Hughes Medical Institute that we might investigate

and experiment with? Do any of the new approaches and innovations that have been proposed recently by Cornell faculty present viable options?

- Do our Intro Bio lecture and lab sequences emphasize the needed quantitative skills for tomorrow's biologists? Are the methods for acquisition of new knowledge, its analysis and interpretation properly introduced along with the major concepts of biology?
- Are students challenged to consider ethical issues and other societal concerns arising from biological research?

One immediate goal of the initial phase of the planning process should be to discuss the possibility of new and innovative courses and approaches in Intro Bio to be encouraged as pilot experiments in 2007-2008, if possible. A related possibility is the development of several enhanced and/or specialized "flavors" and/or alternatives to Intro Bio to be targeted at students entering with AP credit, permitting them to make use of their AP credit while simultaneously being able to take a version of "Cornell Biology" for credit as a freshman.

2. The Task Force is asked to review the core requirements for the Biological Sciences major. When the Division of Biological Sciences was dissolved in 1998, the decision was made to retain the undergraduate major in Biological Sciences in a relatively intact form. The "core requirements" (including several core courses in biology, physics, chemistry and mathematics) were left unchanged, and the major innovations since then have been the generation of new concentrations for students to choose for advanced training. At this time, it is necessary to reconsider whether a single "core curriculum" is the best choice for our students. In addition, the task force should address the possibility that more than one course could fulfill the requirements for material now covered by each of the "core" courses. Finally, the task force should explore the possibility of cooperating with ancillary departments to develop courses that would use more examples from biology in their core teaching.

- Are all the "core requirements" still relevant for all of the concentrations in biology? Are they sufficient for modern biology, or is there a need for additional quantitative training (for example, in mathematics and physics) for those students planning to go to graduate school? Is the selection of upper division "core courses" (currently Biochemistry, Genetics and Evolution) still appropriate for all our majors? Is it reasonable to consider multiple tracks for the "core curriculum", including, for example, a more quantitative and a less quantitative track, or a "Biology" and a "Pre-med" track?
- For each of the "core biology courses" (Biochemistry, Genetics, Evolution), is it possible to consider multiple alternative courses that would cover the basic material with distinctive flavors to each course? Is it possible to generate a list of the essential principles of the core course that could be addressed in alternative courses offered by different departments from the one now presenting the "core course"?
- Would ancillary non-biology departments (specifically Chemistry and Chemical Biology, Mathematics and Physics) consider offering courses aimed more specifically at biology students, in parallel with the current specialty courses offered for Engineering students? Would this be advantageous to our students, or would it be limiting in their understanding of these ancillary subjects? Could faculty in biology departments with appropriate expertise share in the joint teaching of such courses?

3. The Task Force is asked to propose a strategy and/or process for achieving the full involvement and utilization in teaching of faculty across the Life Sciences in all departments

regardless of Life Science disciplines. The Task Force is asked to consider this question, in particular, with reference to recent hires over the past five to six years through the Genomics and New Life Sciences Initiatives. The credentials, willingness, and availability of such faculty to participate in Undergraduate Biology teaching should be assessed. The Committee is asked specifically to consider whether some of these new hires might be used effectively in teaching new "flavors" of Intro Bio to reduce class size, or whether they might teach specialized or enhanced courses for Freshmen, thus increasing the teacher/student ratio.

- How can we ensure full participation in teaching in the Undergraduate Biology curriculum by qualified faculty both outside and inside the departments which evolved from the former Division of Biological Sciences?
- Are recently hired faculty in core departments of the former Division being fully engaged in the full range of essential and existing teaching opportunities as opposed to developing new specialty courses?
- How can we assure that planning for future hiring across the Life Sciences takes into account full participation in teaching, as well as research?

4. The Task Force is asked to discuss and recommend the development of a process by which the Undergraduate Biology Program can undergo continuous assessment and innovation. Currently, responsibility for the introductory component of the curriculum resides with the Office of Undergraduate Biology and its Curriculum Committee. The concentrations within the major are generally controlled by specialized curriculum committees operating at the departmental level. In order for there to be ongoing evolution of the curriculum, a mechanism needs to be established that will ensure continuous, faculty-driven participatory evolution of the Undergraduate Biology curriculum as an integrated whole. This process needs to be coordinated and robust enough to continue with full faculty participation after the Task Force has completed its work. This process must also ensure full integration of Biology instruction with interdisciplinary approaches to the teaching of other sciences and mathematical disciplines crucial to Biology.

- Is the current structure, authority, and charge to the Office of Undergraduate Biology sufficient to permit it to lead ongoing curricular innovation in Intro Bio?
- Is the current structure and operation of the current Undergraduate Biology Curriculum Committee(s) optimal for promoting innovation in teaching and curriculum?
- Is there an adequate mechanism for coordination of in-depth discussions occurring in departmentally-based curriculum committees with those occurring in the curriculum committee overseen by the Office of Undergraduate Biology?
- Is there a sufficient mechanism to ensure coordination of content between Intro Bio and subsequent courses and specific concentrations within the major?
- How might we better engage all Life Sciences faculty in ongoing discussions of the full range of issues relating to the Biology curriculum? Do Biology faculty feel that there is a mechanism for them to participate in evolution of the curriculum, including Intro Bio?
- Is there a mechanism for engagement of faculty across the Life Sciences with faculty in Physical Sciences, Mathematics, Computer Science, Engineering and relevant Social Sciences in order to promote interdisciplinary collaboration in teaching within the biology curriculum?

Time Table

The initial focus of the Task Force should be on the teaching of Introductory Biology. An interim report relating to Intro Bio should be presented by the end of the Spring 2007 semester. An interim report on the overall Biology curriculum and multi-departmental staffing of Biology courses should be presented at the end of the Fall, 2007 semester. The complete report on all four major charges to the Task Force should be submitted by the end of the Spring 2008 semester. These reports will be presented to the Deans of CAS and CALS and forwarded with their approval for comment by the Internal Life Sciences Advisory Council. The Vice Provost for Life Sciences will be asked to lead a discussion of these reports with the other Life Sciences Deans. It is also hoped that "experiments" with new "flavors" of Intro Bio can be piloted in academic year 2007-2008.