PROCESSES -- Introduction

There is a wide variety of wonderful projects described in the Models section of this book. However, as the authors of those projects will tell you, successful curriculum development in mathematics for biology requires more than an exciting course built on sound pedagogical ideas. An academic system based on standard courses distributed among standard departments is resistant to innovation and interdisciplinary teaching. The enthusiasm that accompanies new pedagogical ideas are often dampened by difficulties encountered in the implementation. In the hope of encouraging readers who are interested in emulating the projects in this volume or developing different ones, our goal in this section is to focus on the processes of creating, implementing, and institutionalizing undergraduate mathematics curricula for life science students. The authors have described the strategies and approaches they have used in pursuit of the goals of serving students and institutionalizing courses, highlighting unique features of their particular situation, constraints that affected their project, special support or collaboration they enjoyed, and their suggestions for others interested in pursuing similar projects and recommendations for the future. Not all of the authors are able to report successes, but all of them have thought carefully about why their projects did or did not work. The papers represent a broad spectrum in almost every category – type and size of institution; background and level of student population; curricular level; and size, scope and age of project.

The first four papers in this section represent long-term projects, some of which have remained successful over the long-term and others that have not. *Science One: Integrating Mathematical Biology into a First-Year Program* by Mark MacLean from the University of British Columbia (UBC) details the year-long interdisciplinary math/science course at that institution. UBC is a large institution that attracts strong students. The project has been well supported by the university and has remained very successful. It stands as a testament to the possibility of long-term curricular reform. *Planning for the Long Term* by Meredith Greer from Bates College discusses a long-term project that met with initial success, but has declined over time and is now being revised by utilizing faculty and resources at other nearby small institutions. Drawing on her experience, Greer has some good suggestions for those starting out in pedagogical development. Lou Gross from the University of Tennessee reflects on a well-established two-course entry-level mathematics sequence for bioscience majors in *Some Lessons from Fifteen Years of Educational Initiatives at the Interface between Mathematics and Biology: the Entry-Level Course*. This sequence has been taught by over eighty different faculty, an unusually high degree of institutionalization for an innovative course. Gross recommends the inclusion of a sound assessment plan from the outset. The last long-term project in this section, *A "Wet-Lab" Calculus for the Life Sciences: Processes*, is by Jim Cornette and colleagues, an interdisciplinary team of faculty from Iowa State and Michigan State. The authors share some valuable lessons learned on course development from their experience with a project that has declined over time and not been maintained.

The remaining projects represent a wide variety of mostly newer projects that span the spectrum of institutions and student populations.

In *Creating an Interdisciplinary Research Course in Mathematical Biology,* Glenn Ledder and Brigitte Tenhumberg from the University of Nebraska-Lincoln discuss the creation of their summer course for early undergraduates (described in a companion paper in the Models section). This paper focuses on overall design principles for an interdisciplinary research-based course and offers suggestions for creating interdisciplinary partnerships in teaching. For another perspective on creating an interdisciplinary mathematical biology course, this time with a computer science twist and at a smaller master's-granting institution, see *Bioinformatics: An Example of a Cooperative Learning Course* by Namyong Lee and Ernest Boyd of Minnesota State University, Mankato.

A particularly innovative project at the community-college level, where a large number of students start their higher education career, is described in *Integrating Statistics and General Biology I in a Learning Community* by Bill Ardis and Sukanya Subramanian at Collin County Community College in Texas. They discuss the use of learning communities and strategies for working with limitations caused by the need for community college courses to match up with courses at institutions to which their students will transfer. Readers interested in precalculus courses should also see the paper by Gordon and Gordon in the Directions section.

The final two papers describe projects at large public universities, which have their own set of challenges and opportunities. In *Constructing an Undergraduate BioMath Curriculum at a Large University: Developing First Year Biomath Courses at The Ohio State University,* Tony Nance and Laura Kubato discuss the genesis of their three course calculus and statistics sequence for life science majors, which is described in a companion piece in the Models section of this volume. In *Initial Steps Toward an Integration of Quantitative Thinking into the Teaching of Biology at a Large Public University*, Carole Hom, Eric Leaver, and Martin Wilson of the University of California, Davis, discuss a program of one-credit mathematics courses that students may choose to add as a quantitative accompaniment to an associated biology course. These innovative courses offer a possible solution to the problem of how to add mathematical content to biology courses, but with difficulties in timing the mathematics to fit the biology course. This paper presents some useful assessment data in addition to the discussion of processes.