

Mathematical Biology Final Project

Math 119 - Mathematical Biology
Spring Semester 2006

Due Date: Presentations scheduled for April 19 and 24.
Professors de Pillis, Milton, Schwartz

In this assignment, you will choose and read one scientific paper from the mathematical biology literature. You will

- Carry out this assignment in teams of two (you choose your own team).
- Computationally implement the model in the paper you chose.
- Extend the results in the paper.
- Prepare and deliver a 20 minute presentation.

Here are the guidelines:

1. Many different journals, in a variety of fields of biology and medicine, include some modeling papers. See the list on the next page for some of the journals we often look at ourselves.
2. Browse through the journal until you find an interesting paper. Your papers should present a model of some biological process as its main focus. It may also present data or experimental results, but this should be secondary. Check with one of us if you're not sure. Papers *not* to choose:
 - papers involving statistical analyses of data (these can be interesting, but we'd like you to focus on modeling)
 - book reviews or other review papers (these review other people's studies, rather than presenting their own).
3. In your presentation, be sure to include answers to the following questions:
 - (a) What is the question being asked?
 - (b) What modeling approach is being used (dynamic, optimization, probabilistic, or a combination)?
 - (c) How is the model formulated?
 - (d) How is the problem solved (analysis, computation, verification)?
 - (e) How did you implement the model?
 - (f) How did you extend the model?

Feel free to ask us for suggestions, help interpreting papers, etc.

Here are some journals that publish at least some modeling papers:

American Naturalist	Seeley G. Mudd, and online via JSTOR or Blais
Bulletin of Mathematical Biology	Sprague, and online via Blais
Ecology	Seeley G. Mudd, and online via JSTOR or Blais
Evolution	Seeley G. Mudd, and online via JSTOR or Blais
Evolutionary Ecology Research	Seeley G. Mudd, and online via Blais
Journal of Mathematical Biology	Sprague, and online via Blais
Journal of Theoretical Biology	Seeley G. Mudd, and online via Blais
Mathematical Biosciences	Online via Blais
Mathematical Medicine and Biology	www3.oup.co.uk/imamb/
Proc. Nat'l. Acad. Sci.	www.pnas.org
SIAM Journal of Applied Math.	Sprague, and online via Blais
Theoretical Population Biology	Seeley G. Mudd, and online via Blais

Print copies of most of these journals are available either at Sprague or Seeley G. Mudd Science Library (AKA “Pomona Science Library”, on the corner of 7th and College). Most of the journals are now also available online. The first place to check is the libraries’ catalog (Blais), which usually has links to online sites if a journal is available (in addition to giving the location of paper copies). Some journals have free sites, or are accessible if you connect from a computer via the campus network. A Google search will usually find the journal’s online site pretty easily.

In addition, the following site has links to a variety of modeling journals: www.bio.vu.nl/nvtb/JournalsTB.html

(some of these journals require subscriptions, but you can look at sample copies for free!)

Some additional notes

A few notes on style:

- The standard citation style in scientific writing (at least in biology) is to cite the author and year in the text, but not the page number. (The full citation should appear at the end of the paper.) In general, use the same style as the paper you are reviewing, and you’ll be fine.
- Avoid using quotes from the paper. There shouldn’t be any reason to quote an author’s exact words, unless he or she says something unusually contentious (unlikely in the papers you’ll be reading).

Some notes on the mechanics of scientific publication:

Scientists doing ecological research ultimately present their work to colleagues through scientific publications. These are submitted to a journal, then sent by the editor to two or more anonymous (to the author) reviewers, who are other scientists in the same research area. The reviewers evaluate the science and the writing, then send comments back to the editor, who makes a decision about the paper: publish or reject. The editor then sends the paper along with the reviewers’ comments back to the author. If the paper was accepted for publication, the author(s) usually have to make a number of editorial changes. If it was rejected, they usually revise the paper according to the reviewers’ comments, then submit it to a different journal. A paper can only be submitted to one journal at a time.

It may surprise you to hear that authors have to pay a fee (per page) to have their papers published in most journals. This is because subscriptions do not completely cover the costs of publication. Similarly, reviewers do not get paid for their work; it is just part of being a contributing professional scientist. With most journals, it takes 1-1.5 years between the time a paper is submitted and when it appears in print.

A few notes on plagiarism

In my experience, most instances of small-scale plagiarism are unintentional. When you’re taking notes on the articles, be careful to distinguish between your own comments and direct quotes from the articles. That will help you remember several days later which are your words, and which are the author’s. Here’s an actual example of plagiarism, from a previous version of this assignment:

Original authors:

“Food storage is an important adaptation of many animals to temporally variable or unpredictable food supplies. ”

Student:

“Food storage is a very important adaptation of many animals to variable and unpredictable food supplies.”

A non-plagiarized version might look like this:

“Many animals collect and store food. This can be an important strategy in an environment where food resources can be highly variable or unpredictable.”