Biomathematics Seminar

(BIOL 380/MATH 383)

Spring 2023

Item	Details
Meetings	Wed., 3:30 - 4:20 in ISC 136
Dr. H's info	Office = ISC 360 Email = hartvig@geneseo.edu Office hrs: Mon 4:00pm - 6:00pm (Zoom only) Tues. 2:30pm - 4:00pm, Wed. 2:00pm - 3:00pm (ISC 360)
Dr. L's info	Office = South 324D Office phone = 245.5383 Email = leary@geneseo.edu Office hrs: Tu 11:00-12:00, Wed 12:30-1:30, Fri 11:30-12:30, or by appointment.
Textbook (required)	Stewart. 2011. The Mathematics of Life. Basic Books.

1 Expected Learning Outcomes

After successfully completing this course you should be able to

1. discuss a wide array of applications of mathematics and computational approaches to questions involving biological phenomena;
2. explain the contributions of scientific papers to the field of biomathematics; and
3. effectively lead a discussion on a book chapter and a primary literature paper. This will include the preparation and dissemination of questions that will guide participant reading.

2 Overview

The primary goal of this seminar is to bring together people interested in learning more about topics that span the disciplines of biology, mathematics, and computation. Your job is to actively participate. Our hope is that you learn a lot and enjoy being able to apply what you learn to potential research topics for yourself. There will be some complicated material discussed. You might feel lost with some of the primary literature papers. This is fine — we're having an experience together! We hope you become engaged with the material. We hope you might build and share **some of the models yourself** as discussion leader. Most of the models are accessible (simple?) and pertinent to better understanding biological systems.

The readings are from the textbook and the primary literature (original findings that describe methods used to make the discovery). Everyone is expected to completely understand the chapters from the book - it's an easy read. Papers will be provided on Canvas by Saturday 5pm before they are discussed (unless the discussion leaders and/or faculty let us down!).

This class fulfills a requirement of the biomathematics minor (see https://bulletin.geneseo.edu/preview_program.php?catoid=14&poid=1173).

3 Responsibilities

1. **Faculty**. Our jobs are to organize the class, especially topics and wrangle discussion leadership, make sure additional readings are chosen and made available in a timely fashion on Canvas, and to assess participation and discussion leadership. Our job is not to yammer on incessantly about the good ol' days.
2. **Discussion leaders**. You will work in groups of 2-3 to lead **three** interesting, interactive discussions on different days. For each discussion you provide questions for both the day's chapter from the textbook and for the primary literature paper you chose. You will need to provide a pdf of the paper to the instructors for approval **one week before** discussion is to take place. Additionally, you need to email your discussion questions to both professors for approval. These need to be approved by **Saturday (5pm)** before the Wednesday discussion. Your job is to lead the discussion and call on students to participate, being mindful to allow everyone the chance to earn participation points.
3. **Discussion participants**. Participate in discussions by making useful additions to discussions each week. This is more than just reading the week's chapter and paper. You are expected to contribute in ways that add knowledge to the discussions, based on the readings and any additional knowledge you share which advances the discussion. Asking insightful, informed questions based on the reading can be helpful to further discussion. Also, consider being able to discuss the framework for modeling the system under discussion. What would you need? Or can you bring a leading question to get the discussion moving on how we would actually model this? Use Google searches. Everything we will discuss can, for instance, be modeled using R. Questions asked on matters that were, for example, defined in the required reading or could have easily been looked up, are welcomed but do not count.

4 Characteristics of a good discussion

A good discussion occurs when everyone has done the reading and participates to highlight and extend the important points from the chapters and papers. Sometimes discussions are downright painful because few have done the reading and/or the leading questions do not evoke participation. For example, the question, "What was the third paragraph on page 98 about?" will invariably produce awkward periods of silence. It is good to ask, however, "Can anyone explain how figure 4 supports the paper's findings?"

Keep in mind that your colleagues earn points by making insightful contributions to the discussion. They don't get points for answering your question, "Can anyone provide the name of the book?" Here are some characteristics of discussion leadership that get and/or keep things going well.

1. Everything you do revolves around asking students questions. Avoid the temptation to explain anything about the book or paper first! It's always tempting to review the major points of the chapter or paper. This is NOT the job of the discussion leader! You are stealing points from your fellow students and losing your own points, too!
2. Leading a dynamic, interactive, and interesting discussion on the chapter is done by asking leading questions that are core to the book chapter and paper. You need to stimulate discussions and give all students the chance to get participation points. Good questions may lay a foundation for an idea and then ask participants to extend the idea, often including examples

other than those found in the reading. It certainly should include asking others to explain any figures or possibly equations (if not too gnarly). Failing to make participation points available for the earning denies your colleagues opportunities to share their thoughts (and get a good grade). Be sure to offer the opportunity for shy people to speak up. This is done by asking:

> "Is there anyone who hasn't had a chance to speak who would like to add something?"

You then have to wait to give them a chance. If you're a shy person we understand, but this will be your chance to participate. Please try not to let such opportunities go by.

3. Consider asking the following question and have, in reserve, an answer to "Can someone describe how you might model this?"
4. Avoid making fun of an answer to a question. An answer might not be relevant to the question you *thought* you were asking! This is common in this course. If that happens say "good" or "thanks." Then try restating the question as though it's a new question. We want to encourage participation, and sometimes an answer that seems tangential to the question that you asked will lead to a good discussion.

5 Providing the paper and questions

It's your job to get an appropriate paper for discussion that aligns with the chapter you are overseeing. We can help you and make suggestions if you like (ask us!). Here are some sources for you to consider for papers:

1. `https://journals.plos.org/ploscompbiol/`
2. `http://www.pnas.org/`
3. `https://www.sciencemag.org/`
4. `http://www.nature.com/`
5. `http://www.journals.elsevier.com/physica-d-nonlinear-phenomena/`

You need to have approval from us on the paper and questions for your discussion by class time one week prior to your day of leadership. Supply the instructors with a document containing the leading questions you will ask about the chapter and paper, as a pdf.

6 Grading

Grading for this class is based on the following:

Activity	Points Available
Discussion Leadership	3×10 pts ea.
Participation	70
Total	100

Each unexcused absence as a participant results in the loss of 10% of your grade. Unexcused absences as discussion leader results in the loss of 20% of your grade.

Your final grade will be converted from a proportion of points earned of the total to a letter grade using the following ranges.

Score		Letter Grade		Score
0.933	$\leq$	A	$\leq$	∞
0.900	$\leq$	A-	$<$	0.933
0.867	$\leq$	B+	$<$	0.900
0.833	$\leq$	B	$<$	0.867
0.800	$\leq$	B-	$<$	0.833
etc.				

Will I get a bad grade because I'm shy?

No. Shy people are most welcome. If you ask Dr. H. where he'd rather be he might show you one of his favorite places (central Nevada, on a road off of "America's Loneliest Road"):

If you'd like to be there, too, then you're in the right place!

7 Accessibility

We will do our best to make reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities. In addition, we will do our best to accommodate challenges brought about through pregnancy and/or parenting. Students should contact the Office of Accessibility Services (585-245-5112) and the instructors to discuss needed accommodations as early as possible in the semester.

8 Schedule

Data	Topic	Read
1/25/2023	Introductions - Discussion Leader Assignment	
2/1/2023	Mathematics and biology, Small creatures	1,2
2/8/2023	List of life and floral fibonacci	3,4
2/15/2023	Origin of species	5
2/22/2023	Munk garden	6
3/1/2023	Molecules of life	7
3/8/2023	Book of life and taxonomy	8,9
3/15/2023	Spring Break	
3/22/2023	Virus from the 4th dimension	10
3/29/2023	Hidden writing	11
4/5/2023	Knots, folds, spots, stripes	12,13
4/12/2023	Lizard games	14
4/19/2023	Networking opportunities	15
4/26/2023	GREAT Day - Attend Talks!	
5/3/2023	Paradox of plankton and what is life?	16,17
5/10/2023	Is anybody out there and sixth revolution	18,19
5/12/2023	Final - 3:30 - 6:00pm	