Journal Club Guidelines

I. General Comments/ Why have Journal Club?

Very few universities offer math biology journal clubs for their students. We believe that journal club provides and excellent and unique opportunity for you to develop your skills as mathematical biologists early in your careers. Accordingly, the journal club is offered to all first and second year math biology students. Here is a brief summary of what students might gain through their participation:

- Experience reading research material
- Practice with presentation skills
- Practice discussing math and science in a group forum
- The opportunity to critique the presentations and results of research papers
- Practice posing relevant questions
- Exposure to a wide variety of disciplines within math biology
- Exposure to classical and influential theories of math biology

We realize that as a first or second year graduate student, lectures and homework can often dominate one's time. It is important to concentrate on this material, as it provides the basis for your training as a mathematics student. However, in the mid to later parts of your study, you will be required to be proficient at independent study and deciphering research papers. Journal club is one means to make this transition from the classic undergraduate style of study (lecture, homework, lecture, ...) into more advanced graduate work. Furthermore, research is ultimately what you will be doing for the rest of your career. It is important to start thinking about potential projects by learning what research is out there as soon as possible.

Most first and second year students enter graduate school with little or no experience reading research papers. This skill is acquired in only one way: practice! We realize that some of the papers you will be reading might be outdated, poorly written, and/or difficult to understand. These issues are frequently encountered when reading scientific research papers. Such problems are especially true of multidisciplinary papers where the author might not fully grasp the extent of the problem themselves. Everyone has their own way working through such papers, and you will need to figure out your own way to get through them, too. Reading each paper before journal club, discussing your own interpretation with other students, and talking with faculty and postdocs will make this process MUCH easier.

An important, often overlooked skill of science and mathematics is the ability to communicate your research ideas to the broad scientific community. This point is made particularly clear by Tracy Wilkins in a recent article in Science magazine:

> Several well-qualified life scientists who make it to the short list put themselves out of contention as soon as they stand up to speak. "They don't know how to interview," complains Wilkins. "Their presentations and slides are atrocious.
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> How can applicants improve their chances of getting a job? "Approach it a lot more from a business point of view," advises Wilkins. "Business applicants read about the job and learn how to do interviews, presentations, and seminars. I train postdocs that way, and they get jobs." The training isn't easy, though. "Initially they were so boring that it was ridiculous," Wilkins recalls. "I made them tell a story rather than the hard science and only the hard science. I taught them to make presentations for the whole audience rather than just one or two members."

In journal club, there are many students from different backgrounds and of various exposure to science and mathematics. By presenting in journal club, you are developing the ability to read, comprehend, and explain an entire research paper. In this aspect, you are learning how to present, and you can never get enough practice talking about scientific and mathematical ideas. By participating in a group discussion you are developing your ability to articulate ideas. When you are working on your own research, you'll eventually have to talk to your advisor, committee and outside faculty. Since Journal Club is a faculty-free environment, it is a very safe place to practice and develop this skill.

II. Why should I read papers outside my area of interest?

Many of the papers we will be reading in journal club may not directly apply to your own research interests. We will be reading papers in the areas of biofluids, neurobiology, evolution and ecology, physiology, genetics, and other areas of math biology. Regardless of your interests, however, all of these papers will be worthwhile to you. Here are some reasons why...

- Gain a basic understanding of all areas of biology.
- What you learn in other areas will be useful when you teach a general course in math biology.
- Components of organisms do not operate in isolation, most likely other areas of biology are significant to your system of interest.
- The techniques used in one area of research can often be applied to other areas (this is how many breakthroughs happen!)
- After reading a paper outside your area, your interests might shift now or in the future.
- Broaden your knowledge (Universities want to hire flexible faculty)
- Exposure to classical and influential theories of math biology

If you study math biology, your collaborators will want you to have a basic understanding of biology. For instance, more than one math biologist has been caught unaware of the fact that plant cells have cell walls in addition to cell membranes. This is a sure way to lose credibility with your collaborators in the biological sciences. Think of it this way, if you met a biologist who simulated markov chains and random walks, but did not know the definition of an eigenvalue, you would probably question their credibility. The same is true the other way around. Journal club is your best route towards gaining a general background in biology.

Even though a paper is outside of your research area or interests, the techniques used may turn out to be very useful to you at some point. This is in fact one of the powerful motivations for studying mathematics. Perhaps a method commonly used in one area could lead to a great discovery in another. If you plan to stay in academics (i.e. math biology) you will be expected to collaborate with other faculty members whose interests may not exactly match your own. At any university you will be expected to have broad scientific interests and the ability to interact with visitors, students, and others on campus from various fields. Moreover, you will probably be asked to teach a general course in math biology, covering many areas of research. By reading these general papers you are being exposed to research areas that you may work on in the future.

III. Group Participation

Everyone is encouraged to ask any questions that they have, no matter how simple or basic they may seem. Often there are several people with the same question, but it never gets asked as people are afraid to slow the presentation. Even the most simple question can lead to a very enlightening discussion. Again, as you progress in graduate school and your career you will be in various seminars and group meetings where you will want to be able to ask good questions. If you get in the habit of asking questions now, it will become easier as time goes on.

In general, you should spend a few hours reading the paper prior to the discussion. During this time, you should make notes about anything you did not understand or may want to discuss with the group. Often, the paper will be outside of your direct research area, so it might be a good idea to ask questions about the relevance of any biological assumptions made in the paper. And if you do not feel comfortable asking basic questions in front of the group, come for help prior to the journal club. The journal club advisors, graduate students and faculty are all great sources of information. In addition, don't be afraid to look-up unfamiliar terms on the internet or in your book collection for more information. Make an effort to interact with the group on a regular basis. You may want to make a goal of asking several questions per week. Remember, no one is evaluating you in journal club, so it is a safe place to make mistakes. In addition, by actively participating in journal club, you are showing support for your classmates and friends.

IV. Presentation Skills

The purpose of a journal club presentation is not only to present the material, but to give the presenter practice putting together a complete and coherent presentation. One cannot expect a spontaneous discussion of a paper to arise, so no matter what type of presentation, the presenter should come prepared with enough material to present for the entire time slot, allowing for discussion and questions. The exact form of the presentation is up to the presenter. The presenter is encouraged to follow their own interests and personalize the presentation. All that we ask is that when it is your turn to present, you come prepared with a well thought out presentation accessible to everyone in the group. If there are details in the paper that you are not familiar with, please seek help from the journal club advisors or faculty prior to your presentation. Also, you should be flexible and allow for discussion.

One important presentation skill that can be developed in journal club is learning to gauge the level of understanding of your audience and aim your presentation to that level (sometimes adding and removing material as you go). When you've spent a lot of time studying something it may seem obvious to you, but not to those who are only seeing it for the first or second time. As your graduate career goes on, no matter what your future plans, the ability to communicate ideas and scientific results to both groups of peers and non-peers is vitally important. It's much easier to make mistakes when you are in front of a group of friends than when in front of a group of professors or other professionals who will ultimately decide whether or not to give you a PhD or job.

Presentation Outline

You are encouraged to develop your own presentation style. To help you with this effort, there are a number of excellent websites that discuss the basics of scientific presentations and can help you polish your style. A sample of some of these sites are listed below.

Dazzle 'em with Style: The Art of Oral Scientific Presentation
http://www.physics.ohio-state.edu/~wilkins/writing/Supp/dazzle.html

Tips For Giving a Scientific Presentation
http://www.cm.utexas.edu/vandenbout/presentation_1%5B1%5D.0.pdf

Ten Secrets to Giving a Good Scientific Talk
http://www.cgd.ucar.edu/cms/agu/scientific_talk.html

In addition, the following general outline may help to serve as a guide for developing your presentation:

- General motivation for the paper, why it was written, why anyone cares, and why the presenter chose the paper. If a paper is related to your potential research, talk about it. Share with the group what you'd like to do and ask for feedback on those ideas. Others in the group may have some good ideas to share with you.

- Present basic biological facts and definitions. Not everyone has taken a class in neurobiology or plant physiology, so a basic overview is very helpful.
- Present the details of the paper (see items 1 and 2 below for two possible approaches).
- Modeling assumptions and formulation. You may want to talk about the biological relevance of the assumptions that the author used when deriving the model or failed to include.
- Relate the math to the biology. This is often difficult for poorly written papers and may require some additional work.
- An overall summary of the results and conclusions. Explain how the details of the paper fit together.
- Present future results that stemmed from this research or how you might incorporate the ideas into your own research.

Again, this list is intended to give you some ideas about how to develop your presentation and is not meant to be a followed exactly. In addition, the purpose of journal club is to foster group discussion, so be flexible and allow for side discussions and group participation.

Example Presentations

Here are two possible ways to approach your presentation. Depending on the exact paper being presented, one way may seem more appropriate than the other. In many cases, you may want to do some combination of the two.

1. For very math technique oriented papers, that involve mathematical techniques above basic calculus and ODEs, the presenter may go through the paper step by step presenting key derivations, necessary background and motivation. It should not be assumed that all members of the group have taken the same classes, or have the same background in applied math. For example, some may have taken a lot of probability and not much numerical analysis, or vice versa. Obviously, it is possible to get bogged down in the details, so it is okay to skip some very technical parts of the paper that are not necessary for the larger goals of the paper. However, these parts should be mentioned briefly and, if there is interest in the more technical aspects, the presenter should be prepared to go through them. One thing to keep in mind, it is possible to "loose sight of the forest for the trees", i.e., the details can obscure the main ideas of the paper. As a presenter, you should keep this in mind and continually try to convey the big picture.

Remember, you are a math graduate student and at some point will have to go through every detail of a (perhaps poorly written) technical paper, so this is good practice. In addition, if there are details you don't understand, please get help before the presentation. Two good sources are faculty or the journal club advisors.

2. For less technical papers, the presenter might focus on the greater implications of the paper (biological or otherwise), provide a general overview of the background behind the paper, or present more current related work stemming from the paper. It is a good idea to briefly outline the techniques applied and be prepared to go into more detail if the group seems inclined to do so. For example, you do not need to demonstrate how one integrates by parts, but should explain why the author used the techniques they did. Depending on the paper, it may also be appropriate to mention other methods that could have been used and perhaps why they were not. When you are doing your own research it is often necessary to spend time following the paper trail from one publication to the next, so this is a good skill to learn. For papers of this type, the presenter is encouraged to use creativity and follow their interests.

If you will be presenting a biological topic that is not general knowledge you should present some general background so that everyone can participate in the discussion. If you decide to take this path, it is good to meet with a faculty advisor to help provide guidance.