During class students will lead discussions of peer reviewed journal articles from the primary literature. These articles represent the medium through which scientists communicate their ideas and results to one another. The dissemination of scientific hypotheses and findings in this manner is fundamental to the process and progress of scientific investigation because 1) it (hopefully) maintains the rigor of scientific investigation and the veracity of reported results through peer evaluation, and 2) it makes new findings and hypotheses available to a broad scientific audience,
facilitating the assimilation of data across labs, institutions, and disciplines. It is this assimilation which determines the rate and direction of scientific progress. In light of this, the ability to read and interpret articles in the primarily literature, both in terms of the specific methods/results and general conclusions/interpretations they convey, is a skill fundamental to scientific investigation.

TIPS FOR READING PAPERS:

FIRST, READ THE ABSTRACT CAREFULLY

Abstracts are designed to be the only part of the paper read by most people; outline the abstract, then fill in with more information later

Read the Introduction

be sure you understand the terminology -- this is the background you need for the study

Look at the graphics and read the captions

This should give you an overview of the results

Read the summary or conclusion at the end

NOW YOU HAVE A FEELING FOR WHAT THE PAPER IS ABOUT IN GENERAL

Look at the Methods -- don't get bogged down, but understand the kinds of processes the authors used

Read the Results to understand the graphics

Read the Discussion

See how it relates to the Introduction

Look for an argument and how it is supported by the Results

Make sure you have the take-home messages

Look for controversies or alternate hypotheses

Look for apologies -- what the authors could not accomplish

Look for future research ideas

Tips lead a discussion:

1. Motivation – what hypothesis or question motivated the study or analysis?

Think about the nested nature of the working hypothesis. To carry out the research the authors had to pose one or more specific questions based on the system in which they are working. The results, however, will also be interpreted in a manner that attempts to support or refute more general hypotheses. Try to scale up from the specific questions of the paper to identify the more general scientific hypotheses and principles that are under examination. This is critical to understanding why the science is done and to a large extent why it is published in the journal in which you found it.

2. Methods and Results – how did the scientists attempt to address the hypothesis or question, and what did they find?

Again, think general to specific. Understand the system-specific methods that the authors employed but also think about the general approach which was used. Is the work experimental, observational, or statistical (e.g. metanalytical: statistically analyzing results of multiple related papers)? What are the limitations of these approaches, both in general and in terms of the system in which the authors are working? How did they attempt to compensate for these limitations? Which data are most convincing and which data seem "weak"? What additional steps could be taken to strength the results? Briefly summarize the main, general findings of the study, but do not dwell unnecessarily on specific raw data. Make sure that you can clearly relate the reported data (quantitative measures) to the proposed conclusions (qualitative interpretation)!

3. Future – what new questions or experiments do the reported findings/interpretations motivate?

This is particularly relevant if there are alternative interpretations of the data that is provided, or if one or more untested/unmeasured parameters, or unconsidered processes/mechanisms, could have contributed to observed patterns.