MEETING 1: INTRODUCTION

Class Discussion:

What is an introduction?
- A method to familiarize and orient.
- Its content depends on its purpose and the audience.

What is the purpose of an introduction in scientific writing?
- Provide the context for your work.
- State your question or focus.
- Provide justification for your work.

What do we mean by context, focus, and justification?
- **Context**: Orient your reader to the published scientific literature related to the study you are presenting.
- **Focus**: What is the question or hypothesis you are addressing? (Define your research space “stake out your territory.”)
- **Justification**: Show how your work fits in to and extends previous work.

What are some common pitfalls of an Introduction Section?
- Including unnecessary background or being repetitive.
- Exaggerating (or understating) the importance of your work.
- Using lackluster openers and weak follow-through.
- Including new results in the introduction section.
- Improper tense (Introduction largely in present tense).

In-Class Exercises:

1. Use the discussion board to write a brief biographical sketch of about 100 words.

2. Use Star Office to write brief biographical sketches (about 100 words each) for the following audiences: a) foreign relative, c) potential summer employer.

3. Three research articles will be distributed in class. Review the introductions and break into small groups to discuss the features they share and the differences between them. What general properties of introductions can you distill?

4. Go to the discussion board and state one thing you learned and one question you have about your current work in the 7.02 lab. Then respond to a question posted by someone else. (Do the discussion board exercise first each time you come to a 7.021 meeting.)
**Out-of-Class Exercises: (Due at next class meeting)**

1. Paraphrase in plain language (suitable for a high school senior) the *introduction* to the research article provided as a pdf file on the 7.021 web page.

2. Find two published research papers in a print or on-line journal that interest you (e.g., *New England Journal of Medicine, Cell, Journal of Bacteriology, Genes and Development*). Print or photocopy the introduction and label the main parts (question/focus, context, and justification). Be prepared to discuss your observations at the beginning of the next class meeting.

3. Write the introduction to your long-term Project.
MEETING 2: METHODS

Class Discussion:

What are some observations you made about the introductions you collected from the published literature?

What are some methods of writing scientific papers?
- Use good role models.
- Consult writing texts.
- Follow established structure and models.
- Consult specific journals.
- Seek feedback and create several drafts (self-edit, peer-edit, expert-edit).
- Expect to learn by writing as well as to inform.
- Revise.

What are the goals of a methods section?
- Describe experimental design.
- Provide enough experimental detail to allow readers to interpret your results (virtual witnessing).
- Give enough detail for readers to replicate your work.

What are some pitfalls of a methods section?
- Providing too little or too much information given the purpose of a method section (above).
- Reiterating published methods rather than citing them.
- Writing strictly in chronological order (alternatives: most important first, most fundamental first, etc.).
- Omitting visual organizers that direct readers to specific aspects of the methods section, e.g., subheads.
- Lack of correspondence between methods and results (you have to provide methods for all the experiments you report).
- Writing a Protocol instead of a Methods Section.
- Improper tense (Methods largely in past tense).

In-Class Exercises:

1. Go to the discussion board and complete the activity posted for Meeting 2.

2. Edit the methods section distributed in class.

3. Examine the methods sections of two published papers distributed in class. Break into groups to discuss the merits and failings of these methods sections.
Out-of-Class Exercises: (Due next class meeting)

1. Write methods sections (based on your lab notebook) for two experiments from the Genetics or Protein Biochemistry Module. Be sure you write a Methods Section and not a Protocol.

2. Write the Methods Section for your long-term project and revise your introduction according to your instructor’s feedback.
MEETING 3: FIGURES AND LEGENDS

In Class Discussion:

What is the purpose of figures and tables?
- Condense large amounts of information
- Convince reader of your findings (by showing data quality).
- Focus attention on certain findings (e.g., relationship between values)
- Simplify complex findings
- Promote thinking and discussion
- Illustrate (morphology, pathological findings, experimental design, model, apparatus)
- Get your gorgeous illustration on the cover of the journal.

What is the purpose of figure caption?
- Provide a title.
- Direct attention.
- Define abbreviations.
- A figure legend is a key that identifies symbols used in a figure.

What are some pitfalls of figures and figure captions?
- Figures
  1. Not mentioned in text.
  2. Textual data inconsistent with figures.
  3. Mislabeled.
  4. Symbols and data points unreadable or cluttered
- Captions
  1. Reiterate results section
  2. Written in shorthand, abbreviated from rather than whole sentences.

In-Class Exercise

1. Go to the discussion board ...

2. Some experimental data will be distributed in class. a) Put the data in the form of a table and b) but the same data in the form of a graph. c) Write captions for each. d) Indicate the form that you think best displays the data. e) explain your reasoning.

3. A figure will be distributed in class. Note its deficiencies and return it to your instructor.

4. Begin to prepare two illustrations. Choose data to illustrate, mock-up the illustration, consider the information you will include in the figure caption: 1) An illustration from your current laboratory experiments, 2) An illustration for your long-term project.
Out-of-Class Exercises: (Due at next class meeting)

1. Complete the two figures that you began in class and make them look professional. Use the tool that suits you best, e.g., computer graphics, paper graphics, power point, etc. Don’t forget to include figure captions.

2. Look in the published literature and find one example of a good figure and one example of a poor figure. Print or photocopy them and bring them to the next class. Be ready to discuss why you categorized each figure as “good” or “poor.”

3. Create any additional illustrations for your long-term project that you are able to at this point. Mock-ups ok. Revise prior sections according to instructor feedback.
MEETING 4: RESULTS

Class Discussion:

Divide into four groups and compare the illustrations you have brought to class? What makes them good? Poor? Each group will present one good and one poor figure to the rest of the class.

What is the content of a results section?

- A brief description of the experiment or rationale at the beginning of each subsection.
- The data (in past tense).
- Use descriptive text for FEW determinations.
- Use tables or graphs for REPEETITVE determinations.
- Report only meaningful data (not all data).
- Report data in figures or text but not both.

What differentiates the methods, results, and discussion?

- Methods vs. Results: How data accumulated vs. What data accumulated.
- Results vs. Discussion: Data presentation vs. Data interpretation.

What are some qualities of a well-written results section?

- Results focus on the paper’s hypotheses.
- Methods and results sections correspond.
- Results are presented in a logical order
- Opening sentences orient reader to experiments that generated the data that follow.

What are some pitfalls of a results section?

- Including methods and discussion in the results section (some overlap is acceptable in some circumstances).
- Opening with weak or uninformative sentences.
- Overstating the results (“clearly shows…”).
- Reporting irrelevant results (although it is sometimes useful to mention experiments that didn’t work).
- Omitting visual organizers (subheads).
- Improper tense (Results largely in past tense).

In-class Exercises:

1. Go to the discussion board ….
2. Groups of students will be assigned simple experiments to perform on themselves. Conduct your research, collect the data, and write up a results section.
3. Write results sections for one of the experiments from your current lab module (based on your lab notebook). Use the illustration you created for the last Meeting. Be sure to include introductory remarks and to say what the data indicate. Share it with your writing partner for peer review.
4. Write two alternative opening sentences to the results section you just wrote and share them with your writing partner.
Out-of-Class Exercises: (Due at next class meeting)

1. Go to the published literature and find a paper that interests you. Analyze the results section, searching for its merits and deficiencies. What sorts of choices did the author make in terms of a) organization, b) tense, c) context, d) how results relate to the stated hypotheses. Be prepared to discuss your observations at the next class meeting.

2. Write the results section for your long-term project. Revise prior sections according to instructor feedback.
MEETING 5. DISCUSSION AND CONCLUSION

Class Discussion:

What is the purpose of a discussion section?

- Present the principles, relationships, and generalizations shown by the results.
- Point out shortcomings and define unsettled points.
- Show how your work fits with earlier work.
- Discuss theoretical and practical implications of your work.
- End with a short summary or conclusion about the work’s importance.

Why is writing a discussion section so hard?

- This section is not as well defined as the others.
- Writing a discussion requires perspective and knowledge of the literature.
- You may not have formulated your conclusions yet.

What are some pitfalls of a discussion section?

- Including too much information (wordy arguments, not focused, meandering, etc.).
- Failure to follow arguments set up in the introduction.
- Failure to focus on the current results.
- Speculating too much or not enough.
- Improper tense (Discussion largely in present tense).

In-class Exercises:

1. Go to the discussion board ....

2. Examine data sets distributed in class: Data Set 1) Substance abuse deaths, Data Set 2) Television viewing, Data Set 3) Stellar Discussions. Break into groups and draw some conclusions about these data.
Out-of-Class Exercises: (Due next class meeting)

1. Go to the published literature and find an article you find interesting and understandable. Read the article and create a one-page summary of the strengths and weaknesses of its discussion section.

2. Write the discussion and conclusion for your long-term project. Revise prior sections according to instructor feedback.
MEETING 6: TITLE AND ABSTRACT

Class Discussion:

What is the purpose of a title?
- Indicate the subject of your research.
- Distinguish your research from others of its kind.
- Show continuity with preceding papers.
- Provide key words for indexing.

What is the purpose of an abstract?
- Stand alone, miniversion of the paper (250 words or less)
- Summarize the main sections of the text.
- State purpose, findings, and impact of the work.

What are some pitfalls of a titles and abstracts?

- Title
  a. Too general or too specific
  b. Too long or too short (e.g., Studies on, Investigations on, Observations on, A, An, The)
  c. Incomprehensible (sometimes from the use of jargon)
  d. Inaccurate (often a syntax problem)
  e. Contains abbreviations, chemical formulas, jargon)

- Abstract
  a. Extraneous detail or information or conclusions not stated in the paper
  b. Wrong type (informative versus descriptive)
  c. Contains abbreviations, chemical formulas, jargon or references to the literature, tables, or figures.
  d. Failure to state the purpose of the work at the outset.
  e. Failure to state the importance of the work and where it leads at the end.

In-Class Exercises:

1. Go to the discussion board...

2. A disassembled abstract will be distributed in class. Put the sentences in meaningful order.

3. Do the title exercise distributed in class.

4. Write a title and abstract for a research article distributed in class.
Out-of-Class Exercises:

1. Write a title and abstract for your long-term project.

2. Make an appointment for a conference with me during the next week. Bring your Title and Abstract to that meeting. Revise prior sections according to instructor feedback.