7.021 Meeting 2: Methods
But, First, Some More Work on Introductions

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

- In small groups, note the similarities and differences between the three introductions distributed.
Multiple Methods

- Writing Process
- Experimental Procedure
- RA Methods Section
List the steps in your writing process for your long-term project introduction

1. Looked at the choices.
2. Went back to original materials/did some research on topic.
3. Looked at examples of introductions.
4. Made notes about main points.
5. Developed question/thesis.
6. Just wrote.
7. Spell check, proofread.
8. Printed out.
9.
A Model of the Writing Process

Goals/Questions
What do I know about my topic?
What is my purpose for writing?
Who are my intended readers and how much do they know about my topic?
How is this task like others I have had before?
What structure will work best for my topic?

Episode 1: Planning
Episode 2: Drafting
Episode 3: Revising
Episode 4: Editing
Experienced Scientific Writers...

- **Seek Feedback**
  - peer-edit
  - self-edit (after a long enough delay)
  - expert-edit
- **Expect to learn by writing** as well as to inform.
- **Revise, revise, revise, revise, revise, revise, revise, revise,**
  revise, revise, revise, revise, revise, revise.
Scientific Writing Materials
You Might Consult

– The MIT Guide to Science and Engineering Communication

– The Mayfield Handbook

– The Craft of Scientific Writing

– A Short Guide to Writing About Biology

– Guide to authors for specific scientific journals (see 7.021 web page)
What are Some Goals of a Methods Section?

• Present the experimental design.

• Provide enough detail to allow readers to interpret your results.

• Give enough detail for readers to replicate your work.
“Experimental Section” 
According to Paradis and Zimmerman

Experimental Section  The experimental section of an article describes the tools and processes that enabled you to meet the stated objectives of the introduction. This section is sometimes called materials and methods, experimental methods, procedure, or experimental apparatus, depending on the stylistic preferences of the journal. The section will be read for at least two major reasons. First, readers will judge how skillfully you have designed the empirical processes of problem solving. Second, readers may test your methodology against your results in their own laboratories.

In experimental sections, clarity and accuracy are priorities. You are describing a variety of objects and processes that have been used to deliver a set of data. Include significant numbers, but move detailed analyses to appendixes.
**Instructions to Authors**

**J. Bac., Materials and Methods**

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**Materials and Methods.** The Materials and Methods section should include sufficient technical information to allow the experiments to be repeated. When centrifugation conditions are critical, give enough information to enable another investigator to repeat the procedure: make of centrifuge, model of rotor, temperature, time at maximum speed, and centrifugal force (× g rather than revolutions per minute). For commonly used materials and methods (e.g., media and protein concentration determinations), a simple reference is sufficient. If several alternative methods are commonly used, it is helpful to identify the method briefly as well as to cite the reference. For example, it is preferable to state “cells were broken by ultrasonic treatment as previously described (9)” rather than to state “cells were broken as previously described (9).” The reader should be allowed to assess the method without constant reference to previous publications. Describe new methods completely and give sources of unusual chemicals, equipment, or microbial strains. When large numbers of microbial strains or mutants are used in a study, include tables identifying the sources and properties of the strains, mutants, bacteriophages, plasmids, etc.

Enzyme purifications should be described in this section, but the results of such procedures should be described in the Results section.

A method, strain, etc., used in only one of several experiments reported in the paper may be described in the Results section or very briefly (one or two sentences) in a table footnote or figure legend.

**Results.** The Results section should include the results of the experiments. Reserve extensive interpretation of the results for discussion.
What are Some Pitfalls of a Methods Section?

- Providing **too little or too much** information.
- **Reiterating** published methods rather than citing them.
- Writing strictly in **chronological order** (alternatives: most important first, most fundamental first, etc.).
- Methods and results don’t **correspond** (you have to provide methods for all the experiments you report).
- **Forgetting to use visual organizers** that direct readers to specific aspects of the methods section, e.g., subheads.
- Writing a Protocol rather than a Methods section.
Protocol vs. Methods Section

A Protocol is . . .
- A series of steps to be carried out.
- Written in sequential or temporal order.
- Intended for the reader to achieve a final result.

A Methods Section is . .
- A series of steps already completed and is written in past tense.
- Written in logical order.
- Intended for the reader to replicate the experiment.
Section headings should be descriptive and parallel

Non-Parallel
Non-Descriptive

Introduction
Background
Marx Generators
Line Pulse
Beam Generation
Transporting Beam
Pellets
Results
Conclusions

Parallel
Descriptive

Introduction
Past Designs for Particle Beam Fusion
New Design for Particle Beam Fusion
Charging Marx Generators
Forming Line Pulse
Generating Particle Beam
Transporting Particle Beam
Irradiating Deuterium-Tritium Pellets

Results of New Design

Conclusions and Recommendations
Performance of the Solar One Receiver

Introduction
Steady State Efficiency
Average Efficiency
Start-Up Time
Operation Time
Operation During Cloud Transients
Panel Mechanical Supports
Tube Leaks
Conclusion

Performance of the Solar One Receiver

Introduction
Receiver’s Efficiency
Steady State Efficiency
Average Efficiency
Receiver’s Operation Cycle
Start-Up Time
Operation Time
Operation During Cloud Transients
Receiver’s Mechanical Wear
Panel Mechanical Supports
Tube Leaks
Conclusion
Today’s In-Class Exercises

1. Go to the Stellar discussion board and respond to the topic for Meeting 2 Discussion.
2. Share your findings on the elements of the introductions you found in the literature.
3. Compare and contrast the three sample introductions distributed.
4. Describe your writing process for the long-term project introduction.
5. Examine the methods section of a paper published in the BUG journal that is distributed in class.
6. Examine the first and revised methods sections from 7.02 Genetics lab.
Out-of-Class Exercises for Methods

1. Write methods sections (based on your lab notebook) for two series of experiments from the Genetics or Protein Biochemistry Module (e.g., IA and IB or IIA and IIB).

2. Continue with your long-term Project, writing the methods sections for your particular choice.