

Meeting 2: Methods

*If a man can group his ideas, then he is a writer.
Robert Louis Stevenson*

What are Some Approaches to Writing Scientific Papers?

- **Model** your writing after someone in your field who is **an especially good writer**.
- Consult **texts on scientific writing**.

Good MIT Resources

Paradis, James G., and Muriel Zimmerman.
The MIT Guide to Science and Engineering Communication.
Cambridge, MA: MIT Press, 2002. ISBN: 0262661276.

Perelman, Leslie C., James Paradis, and Edward Barret.
The Mayfield Handbook of Technical and Scientific Writing.
New York, NY: McGraw Hill Higher Education, 1997. ISBN: 1559346477.

• <http://web.mit.edu/writing/temp2/home.htm>

- The Writing Center
- Stata Center
- 235-3090
- Appointment preferred but not required

Some Other Good Resources

Alley, Michael. *The Craft of Scientific Writing*. 3rd ed.
New York, NY: Springer, 1997. ISBN: 0387947663.

Day, Robert A. *How to Write and Publish a Scientific Paper*. 5th ed.
Westport, CT: Greenwood, 1998. ISBN: 1573561657.

Guide to Authors for Each Journal

e.g, J. Bac., Materials and Methods

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.

Consider Developing an Outline

- **The Mayfield Handbook: Section 1.5.1**
 - <http://web.mit.edu/writing/temp2/home.htm>
- Outlines **reduce and order your source materials**.
- And outlines force you to:
 - **partition** material
 - develop a **point of view**
 - establish the **scope** of your document
 - **sequence** your topics
 - **develop a writing strategy** (even if you don't have an outline, you need a strategy).
- The same outline can be used to generate [feedback](#), serve as a writing aid, and provide the [subject headings](#) or [topic sentences](#) for your paper.
- Work out a general plan first, and then make the outline more specific.

Perelman, Leslie C., James Paradis, and Edward Barret. *The Mayfield Handbook of Technical and Scientific Writing*. New York, NY: McGraw Hill Higher Education, 1997. ISBN: 1559346477.

Gillespie, Paula, and Neal Lerner. *The Allyn & Bacon Guide to Peer Tutoring*. Needham Heights, MA: Allyn & Bacon, 2000.

Three Aspects of Writing Style

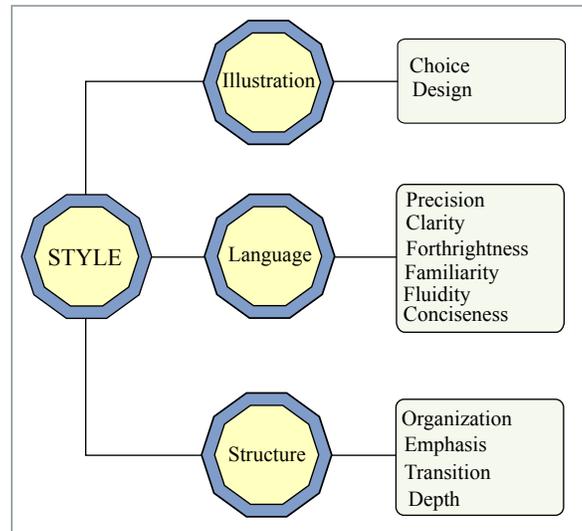


Figure by MIT OCW.

Structure

Structure is revealed in:

- Headings
- Subheadings
- Topic sentences
- Transitions between paragraphs and sections

Structure: Organization is hidden when headings occur in a long list without secondary headings

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

Language: Needless Complexity

See Table 8-1 in: Alley, Michael. *The Craft of Scientific Writing*. 3rd ed. New York, NY: Springer, 1997. ISBN: 0387947663.

Language: Needless Words

- (already) existing
- At (the) present (time)
- (basic) fundamentals
- (completely) eliminate
- (continue to) remain
- (currently) being
- (currently) underway
- (empty) space
- Had done (previously)
- Introduced (a new)
- Mix (together)
- Never (before)
- None (at al)
- Now (at this time)
- Period (of time)
- (private) industry
- (separate) entities
- Start (out)
- Write (out)
- (still) persists

Language: Weak Versus Strong Verbs

- made the arrangement for
- made the decision
- made the measurement of
- performed the development of
- arranged
- decided
- measured
- developed

Language: Passive Versus Active Voice

- The voltage was displayed by the oscilloscope.
- The feedthrough was composed of a sapphire optical fiber,
 - which was pressed against the pyrotechnic
 - that was used to confine the charge.
- The oscilloscope displayed the voltage.
- The feedthrough contained a sapphire optical fiber,
 - which pressed against the pyrotechnic
 - that contained the charge.

Vigorous Writing is Concise

Strunk, William Jr., and E. B. White. *The Elements of Style*. Boston, MA: Longman, 1999. ISBN: 020530902X.

What's a Methods Section?

“Experimental Section” According to Paradis and Zimmerman

Paradis, James G., and Muriel Zimmerman.
The MIT Guide to Science and Engineering Communication.
Cambridge, MA: MIT Press, 2002. ISBN: 0262661276.

What are Some Goals of a Methods Section?

Present the **experimental design**.

Provide enough 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.

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 (see next slide).

Writing a **protocol instead of a methods section**. Methods are written in narrative form in **past tense**.

An Example from the NEJM

Caffrey, Sherry L. et al. "Public Use of Automated External Defibrillators."
The New England Journal of Medicine 347 (October 17, 2002): 1242-1247.

NEJM Example

NEJM Example (continued)

Methods Sections for your Long-term projects

- For the 7.02 Experience - Describe your methods of learning:
 - e.g., attending lecture, recitation, laboratory, writing prelabs, studying for exams, meeting with your lab partner, study groups, background reading, etc.
- For the Mendel Paper - Describe:
 - Plant selection
 - Growth conditions
 - Monohybrid crosses
 - Dihybrid crosses
 - Data analysis

Today's In-Class Exercises

Please review the introduction to the Long Term Project of the student who's name appears directly below yours on the roster.

Today's Out-of-Class Exercises

- Read "The Science of Scientific Writing" and be prepared to discuss it at the next meeting.
- Prepare oral presentations for the Science of Scientific Writing (only some students).
- Write the Methods Section for your long-term project. Turn a hard copy into to me and post an electronic copy on the 7.02 Discussion Forum (Stellar web page).