5.32 Literature Review

We are all apprentices of a craft where no one ever becomes a master. Earnest Hemingway
Marilee P. Ogren Ph.D.
68-120
Enter via Biology Student Office
Ogren@mit.edu
2-2940
Office hours by appointment

Photos courtesy of Dr. Bill Calvin: http://www.williamcalvin.com/index.html
When sending me email
Please tell me that
Your’re a
5.32 student
Scientific Writing

Who likes to write?

Who dislikes writing?
Some Good Resources

Michael Alley

**THE CRAFT OF SCIENTIFIC WRITING**
Third Edition

**How to Write & Publish a Scientific Paper**
5th Edition
Robert A. Day
ORYX
Good MIT Resources


- The Writing Center
- 14N-317
- 235-3090
- Appointment preferred but not required
What is a Review Paper?
What is a Review Paper?

A review paper:

- Integrates
- Correlates, and
- Evaluates*

results from the published literature.

A review paper has:

- A well-defined theme
- Is critical*
- Presents novel theoretical interpretations*

*Seasoned chemists
What are the Constraints on Scientific Communication?
What are the Constraints on Scientific Communication?

**Audience**
Who is your audience and why are they reading your paper?

**Format:**
Formats vary

**Mechanics:**
Frustrating because of many inconsistent rules and lots of gray areas.

**Politics:**
Try to remain honest
Important Function of a Review Paper

Serves as a GUIDE TO THE PUBLISHED LITERATURE…

… organized by IDEAS, not by researchers or chronology…

A good guide is both ACCURATE AND COMPLETE
What Review Papers Don’t Do

Do not give experimental details (except in when a technique is of central interest).

Do not report new experimental findings.
The Writing Process: Step 1

READ

THINK

TALK

Do this to develop a clear idea of your thesis…

…and to develop a strategy for your writing.

Clear writing is impossible in the absence of clear thinking.
DEVELOP AN OUTLINE

An outline is an overview...

...it can help you:
  - Isolate topics (use keywords)
  - Partition topics into subcategories
  - Sequence topics
  - Identify gaps
  - Eliminate unnecessary content
  - Get feedback

These activities are accomplished more efficiently with an outline than with a draft.
The Writing Process: Step 3

WRITE

Fill in the content of your outline in any order you like.

Make sure you state your thesis in the introductory paragraph.

Be sure to use topic sentences in each paragraph.

Make all sentences within a paragraph pertain to the topic sentence.

Make intelligent transitions between paragraphs.
Reread and revise on your own.

Revise on the basis of feedback from your peers.

Revise on the basis of feedback from me.

Revise on the basis of feedback from your TA.
Do Review Papers Have Abstracts?

Yes

But there are two kinds of abstract:

**Informative Abstract: Used for research reports.** They summarize the study, including the findings and conclusions.

**Descriptive Abstract: Used for reviews.** They summarize the subject of the review and the approach the reviewer has taken in his or her coverage of the subject. *This type of abstract does not report findings.*
Examples of Descriptive and Informative Abstracts

**Informative:**
Based on an exhaustive review of currently available products, this report concludes that none of the available grammar-checking software products provides any useful function to writers.

**Descriptive:**
This report provides conclusions and recommendations on the grammar-checking software that is currently available.
Three Aspects of Writing Style

Figure 2-1. Aspects of style in professional writing.
What We Look For in Structure (checklist)

Structure

Title:
- does not orient (17)
- is too long (18)

Introduction:
- does not define scope (27)
- does not show importance (28)
- does not give background (30)
- does not map (31)

Conclusion:
- does not analyze (41)
- does not provide closure (41)

Transitions into sections:
- first sentences abrupt (55)
- reader not oriented (54)

Summary:
- does not map, if descriptive (22)
- does not inform, if informative (23)

Middle:
- strategies illogical (33)
- headings not descriptive (38)
- headings not parallel (39)
- depth inappropriate (59)

Appendices:
- are not introduced in text (49)
- do not stand alone (47)

Emphasis of results:
- repetition not used well (64)
- placement not used well (66)
What We Look For in Language (checklist)

Language

Imprecision, word choice (73)
Needless complexity:
  in word choice (84)
  in noun phrases (85)
  in sentence structures (86)
Too many abstract nouns (102)
Tone not controlled (97)
Terms undefined (112)
Needless words (119)

Imprecision, level of detail (78)
Ambiguities:
  from word order (92)
  from unclear pronouns (93)
  from punctuation error (94)
Too many passive verbs (104)
Discontinuity:
  from stagnant rhythms (129)
  from poor transitions (137)
Language Goals

Figure 2-2. A hierarchy of language goals in professional writing.
Language: Word Choice

Figure 2.8. A hierarchy for commonly confused word pairs (an issue of usage) in professional documents. A discussion of each word pair appears in the Appendix.
# Language: Needless Complexity

## Table 8-1
Examples of Needlessly Complex Words

<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
<th>Possible Substitute</th>
</tr>
</thead>
<tbody>
<tr>
<td>nouns</td>
<td>familiarization</td>
<td>familiarity</td>
</tr>
<tr>
<td></td>
<td>has the functionality</td>
<td>can function</td>
</tr>
<tr>
<td></td>
<td>has the operationability</td>
<td>can operate</td>
</tr>
<tr>
<td></td>
<td>utilization</td>
<td>use</td>
</tr>
<tr>
<td>verbs</td>
<td>facilitate</td>
<td>cause</td>
</tr>
<tr>
<td></td>
<td>finalize</td>
<td>end</td>
</tr>
<tr>
<td></td>
<td>prioritize</td>
<td>assess</td>
</tr>
<tr>
<td></td>
<td>utilize</td>
<td>use</td>
</tr>
<tr>
<td>adjectives</td>
<td>aforementioned</td>
<td>mentioned</td>
</tr>
<tr>
<td></td>
<td>discretized</td>
<td>discrete</td>
</tr>
<tr>
<td></td>
<td>individualized</td>
<td>individual</td>
</tr>
<tr>
<td></td>
<td>personalized</td>
<td>personal</td>
</tr>
<tr>
<td>adverbs</td>
<td>firstly, secondly, thirdly</td>
<td>first, second, third</td>
</tr>
<tr>
<td></td>
<td>heretofore</td>
<td>previous</td>
</tr>
<tr>
<td></td>
<td>hitherto</td>
<td>until now</td>
</tr>
<tr>
<td></td>
<td>therewith</td>
<td>with</td>
</tr>
</tbody>
</table>
Language: Too Many Abstract Nouns

Original:

The existing nature of Mount St. Helens’ volcanic ash spewage was handled through the applied use of computer modeling capabilities.

Revised:

With Cray computers, we modeled how much ash spewed from Mount St. Helens.
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: Ambiguities

Word Choice:

- $T$ cells, rather than $B$ cells, appeared as the lymphocytes migrated to the thymus gland.
- $T$ cells, rather than $B$ cells, appeared because the lymphocytes migrated to the thymus gland.

Syntax: (the ordering of words within a sentence)

- In low water temperatures and high toxicity levels of oil, we tested how well the microorganisms survived.
- We tested how well the microorganisms survived in low water temperatures and high toxicity levels of oil.

Pronouns: (particularly “it” and “this”)

- Because the receiver presented the radiometer with a high-flux environment, it was mounted in a silver-plated stainless steel container.
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.
Common Grammar, Punctuation, Usage, and Spelling Errors

Errors that would unsettle many readers
- run-on sentence (comma splice)
- fragment
- missing introductory comma
- major usage error (its, it's)
- misspelling (spell checker would catch)
- unclear pronoun reference
- missing parenthetical comma
- subject–verb disagreement
- verb tense error
- faulty parallelism
- misplaced modifier
- usage error (criterion, criteria)
- regardless
- alright
- typo (spell checker would miss)
- missing series comma
- colon error
- semicolon error
- possessive error
- center around
- very unique
- capitalization error
- quotation marks misplaced
- numeral error
- subjunctive error

Errors that would distract many readers or change the sentence's meaning
- data used as singular
- ending sentence with preposition
- split infinitive
- contractions such as can't
- minor usage error (if, whether)
- panacea for

Figure 2-6. A hierarchy for grammar, punctuation, usage, and spelling errors in a professional document. A discussion of each listing appears in the Appendix.
### What We Look for in Illustrations (checklist)

<table>
<thead>
<tr>
<th>Illustration</th>
<th>Illustration is not introduced (162)</th>
<th>Illustration is misplaced (167)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Illustration is not discussed (164)</td>
<td>Illustration raises question (161)</td>
</tr>
<tr>
<td></td>
<td>Illustration does not mesh (164)</td>
<td>Label is missing or incorrect (162)</td>
</tr>
<tr>
<td></td>
<td>Caption is not specific (163)</td>
<td>Caption has incorrect form (163)</td>
</tr>
</tbody>
</table>

- Please group all illustrations at the end of your review.
- This will save you the trouble of fooling around with awkward page breaks.
Choose the Right Type of Illustration

Charts and graphs: convey trends, comparisons, relationships
  Line graphs: trends
  Bar graphs: magnitude
  Pie charts: relative portions of the whole

Photographs: provide absolute proof

Chemical structures, reactions, mathematical expressions: essential for theories and processes
Proper Form for Tables

### Table 1. Column Dimensions in ACS Publications

<table>
<thead>
<tr>
<th>Publication</th>
<th>Column Width</th>
<th></th>
<th>Page Length</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>picas</td>
<td>inches</td>
<td>centimeters</td>
</tr>
<tr>
<td>Books, trim size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 × 9 inches</td>
<td>27</td>
<td>4½</td>
<td>11</td>
<td>42</td>
</tr>
<tr>
<td>7 × 10 inches</td>
<td>33</td>
<td>5½</td>
<td>13½</td>
<td>51</td>
</tr>
<tr>
<td>8 × 11 inches</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>single column</td>
<td>20</td>
<td>3¼</td>
<td>8¼</td>
<td>56</td>
</tr>
<tr>
<td>double column</td>
<td>42</td>
<td>7</td>
<td>17½</td>
<td></td>
</tr>
<tr>
<td>Journals and magazines, two-column format</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>single column</td>
<td>20</td>
<td>3½</td>
<td>8¼</td>
<td>60</td>
</tr>
<tr>
<td>double column</td>
<td>42</td>
<td>7</td>
<td>17½</td>
<td></td>
</tr>
<tr>
<td>Magazines, three-column format</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>single column</td>
<td>13</td>
<td>2</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>double column</td>
<td>27½</td>
<td>4½</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>triple column</td>
<td>42</td>
<td>7</td>
<td>17½</td>
<td></td>
</tr>
</tbody>
</table>
Figure Captions

Every figure must have a caption that includes the figure number and a brief, informative description, preferably in nonsentence format.

Figure 2. Mass spectrum obtained when laboratory ambient air containing 2.5 ppm of 1 was introduced into the MS system.

Figure 4. Change in carotenoid contents during maturation of three varieties of grapes.

Figure 6. Variable-temperature NMR spectra of 3d in CD$_2$Cl$_2$ solution at 500 MHz.

Figure 7. Reaction rate constants as a function of proton affinity for the reactions shown in eqs 5–7: $k_{\text{exp}}$, experimental; $k_c$, calculated.

Figure 1. Specificity of bovine muscle LDH antibodies in a sandwich ELISA. Data are the average of three replicates.

If more information is necessary, use complete sentences and standard punctuation. The caption should be understandable without reference to the text and should not include material that is not in the text. Use similar wording for captions of related figures.

If the art contains many symbols and the key to symbols will be large and give the artwork a cluttered appearance, put the key in the caption. If the artwork contains unusual symbols, and these symbols may not be available to the publisher for use in the caption, identify the symbols within the artwork. Make sure that the symbols and abbreviations in the caption agree with those in the figure itself and in the text.
### Checklist for Format

<table>
<thead>
<tr>
<th>Typefaces</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Text</td>
<td>Footnotes</td>
</tr>
<tr>
<td>Major headings</td>
<td>Figure captions</td>
</tr>
<tr>
<td>Subheadings</td>
<td>Table headings</td>
</tr>
<tr>
<td>Sub-subheadings</td>
<td>Figure call-outs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Layout</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Margins</td>
<td>Paragraph indents</td>
</tr>
<tr>
<td>Line spacing</td>
<td>Paragraph spacing</td>
</tr>
<tr>
<td>Position of major headings</td>
<td>Page numbers in text</td>
</tr>
<tr>
<td>Position of subheadings</td>
<td>Page numbers in front matter</td>
</tr>
<tr>
<td>Position of sub-subheadings</td>
<td>Page numbers in back matter</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Illustrations</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Illustration names in text</td>
<td>Placement of illustrations</td>
</tr>
<tr>
<td>Illustration names in back matter</td>
<td>Size of illustrations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>References</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference listings in the text</td>
<td>Reference citations at end</td>
</tr>
</tbody>
</table>
Headings

**Major Heading**

For major headings, skip three carriage returns from the top margin (or previous section) and place the heading. Use 14 or 18 points, initial capitals, and boldface. For minor reports, the major heading serves as the report’s title.

**First Subheading**

Subheadings are 12 or 14 points, flush left, and boldfaced. For all subheadings, skip two lines before and one line afterwards. Use initial capitals for all subheadings. Note that a sans serif font is acceptable for headings and subheadings.

**First Sub-Subheading.** Sub-Subheadings are placed in 12 point type, indented, boldfaced, and followed by a period. Skip one line before a sub-subheading. Begin the sub-subheading’s text after the period. Use initial capitals for sub-subheadings.

**Second Sub-Subheading.** If you have one sub-subheading, you must have a second. Otherwise, the first sub-subheading has nothing to be parallel with.
Citations

By author name and year of publication in parentheses inside the punctuation in Bioconjugate Chemistry (one of two acceptable styles), Biotechnology Progress, Industrial & Engineering Chemistry Research, the Journal of Agricultural and Food Chemistry, and the Journal of Chemical and Engineering Data.

The primary structure of this enzyme has also been determined (Finnegan et al., 1996).

According to Harris (1997), drug release is controlled by varying the hydrolytic stability of the ester bond.
Reference List

Periodicals

Recommended Formats

Author 1; Author 2; Author 3; etc. Title of Article. Journal Abbreviation Year, Volume, Inclusive Pagination.

Author 1; Author 2; Author 3; etc. journal Abbreviation Year, Volume, Inclusive Pagination.
Vigorous Writing is Concise

Advice from the Authorities

The Elements of Style
by William Strunk, Jr., and E. B. White

Omit needless words. Vigorous writing is concise. A sentence should contain no unnecessary words, a paragraph no unnecessary sentences, for the same reason that a drawing should have no unnecessary lines and a machine no unnecessary parts. This requires not that the writer make all his sentences short, or that he avoid all detail and treat his subjects only in outline, but that every word tell....

Avoid fancy words. Avoid the elaborate, the pretentious, the coy, and the cute. Do not be tempted by a twenty-dollar word when there is a ten-center handy, ready, and able.... All [words] are good, but some are better than others.
Matters of Format

- **15 - 20 pages double spaced**
- Laser quality print
- Time or Times New Roman font
- 12 pt
- Standard manuscript paper 8 1/2 x 11
- 1 side of paper
- 1 column
- Double spaced
- Ragged right
- 1-inch margins
- Header or footer on every page including name, running title, and page number
- Binder clip or staple (no report covers)
- Hand drawn graphics ok
- Keep a true copy