2005 UWEB
Communications Workshop

Writing a Scientific Research Article
Part II
Jennifer Patterson
July 13, 2005
Sections of a Scientific Paper

1. Title
2. Abstract
3. Introduction
4. Materials & Methods
5. Results
6. Discussion & Conclusion
7. Acknowledgments
Title

- Succinct and powerful
  - Delete unnecessary words
  - Avoid “Studies on…..”

- Broad yet specific
  - Do not overstate but make it interesting

- Use keywords
  - Comes up in database searches
  - Identifying details

- No abbreviations
  - Exception - very common words like DNA
Authors

- Include those who made significant contribution to the publication
  - This includes hypotheses and research direction!
- You are main author
  - Typically listed first
- Final author is PI
- Remaining authors are your mentor and other researchers in lab who contributed to the data
A model for studying epithelial attachment and morphology at the interface between skin and percutaneous devices

Negar G. Knowles¹, Yuko Miyashita¹, Marcia L. Usui¹, Andrew J. Marshall², Annalisa Pirrone¹, Kip D. Hauch³, Buddy D. Ratner²,³, Robert A. Underwood¹, Philip Fleckman¹, John E. Olerud¹*

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From Journal of Biomedical Materials Research Part A
Abstract

- Summary of complete study
  - Typically is informative (gives most important results)
  - Could be descriptive (no results)
- Relatively short
  - 150-300 words
  - Length and format dependent on journal
- Should stand alone
  - No references or figures
- Limit description of methods
  - 1-2 sentences
- Most important section
  - Most widely read, after title
  - Attracts audience
Introduction

- Background
  - General field, what has been done, rationale

- Objectives
  - Relevance of your project, hypothesis (purpose), what you have done

- Comparable to discussion

- Try to capture reader’s attention
  - But don’t give everything away

- Judicious choice of references
  - Primary papers, not reviews
  - Most important work in field
Database Searching

- UW Databases
  - http://www.lib.washington.edu/types/databases/

- Medline

- Web of Science Citation Databases

- What to search for
  - Keywords
  - Authors who are leaders in field
  - Start with a paper you know

- Cite the primary source
- Cite important papers/review articles
Materials and Methods

- All elements of research used to produce results
  - So it can be repeated by others
  - Includes specific information
    - Model numbers for equipment
    - Vendor and location for materials

- Cite previously described methods
  - Include brief description
  - Reference the original appearance of method

- Include more details than for presentation
- Some journals have on-line supplements
Results

- Presentation of the data
  - Keep concise and clear
- Include data supporting hypothesis and aims
  - Most relevant information
- Include data to support everything mentioned in the discussion
- Present in logical order
  - Not necessarily chronological order
  - Go back and characterize big discovery
  - Order materials and methods the same way
Results Continued

- Results reported as both figures and text
- Specific mention of figures and tables
  - In order that they are referenced in text
  - Describe data in text and reference figure
    - “…….. (Figure 1)”
- Judicious choice and arrangement of data
  - Limited space
- Present only analyzed data
- Do not provide interpretation in results section
  - Unless combined with discussion section
Discussion

- Interpretation of the results
  - Larger meaning of the work within context of study and previously published research
- Data are never “good” or “bad”
  - “Expected” or “unexpected”
  - Mention conflicting or negative results
- Use literature to broaden discussion
  - Compare results and conclusions
  - Be tactful
Discussion Continued

- Show your intelligence
  - Propose explanations for results
  - Display analytical skills
  - Show understanding of your project

- Be creative and imaginative
  - Potential implications of the results
  - Possible future work or directions
  - What are limitations of work

- Include conclusions within discussion section
  - Sub-section
Acknowledgments

- List those who helped
  - Helpful discussions
  - Technical assistance
  - Donated reagents
- Do not acknowledge other authors
- Include facilities used
  - UWEB, NESAC/BIO, etc.
- Funding sources
  - May be individual for some authors
  - Use NIH or NSF grant numbers
Great References

- Particularly for improving your overall scientific writing style
- The Craft of Scientific Writing by Michael Alley
- [http://www.writing.eng.vt.edu/courses/writing_half_day.html](http://www.writing.eng.vt.edu/courses/writing_half_day.html)
  - Avoiding errors of structure, language, and illustration
Improving your Writing Style: Using Language Well

- Avoid ambiguities caused by:
  - Word order
  - Word choice
  - Pronouns
  - Lack of commas

- Avoid weak verbs and avoid unnecessary passive verbs
  - OK to sparingly use first person

- Make connections using transitional phrases

- Vary sentence rhythms by varying sentence openers to make writing more lively

**From Michael Alley: The Craft of Scientific Writing, 3rd ed.**
Improving your Writing Style: Being Concise

- Eliminate redundancies
- Eliminate “writing zeroes”
- Reduce sentences to simplest forms
- Eliminate bureaucratic waste
  - Revise at the paragraph level
  - What is necessary for your audience

**From Michael Alley: The Craft of Scientific Writing, 3rd ed.**
Eliminating Redundancies

already existing
introduced a new
at the present time
mix together
basic fundamentals
never before
completely eliminate
none at all

**From Michael Alley: The Craft of Scientific Writing, 3rd ed.**
Eliminating Redundancies

(already) existing
(alternative) choices
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 all)
now (at this time)
period (of time)
(private) industry
(separate) entities
start (out)
(still) persists

** From Michael Alley: The Craft of Scientific Writing, 3rd ed. **
Eliminating Writing Zeroes

- As a matter of fact
- I might add that
- It is noteworthy that
- It is significant that
- It should be pointed out that
- The course of
- The fact that
- The presence of
- It is interesting to note that

**From Michael Alley: The Craft of Scientific Writing, 3rd ed.**
<table>
<thead>
<tr>
<th>Fat Phrase</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>At this point in time</td>
<td>Now</td>
</tr>
<tr>
<td>At that point in time</td>
<td>Then</td>
</tr>
<tr>
<td>Has the ability to</td>
<td>Can</td>
</tr>
<tr>
<td>Has the potential to</td>
<td>Can</td>
</tr>
<tr>
<td>In light of the fact that</td>
<td>Because</td>
</tr>
<tr>
<td>In the event that</td>
<td>If</td>
</tr>
<tr>
<td>In the vicinity of</td>
<td>Near</td>
</tr>
<tr>
<td>Owing to the fact that</td>
<td>Because</td>
</tr>
<tr>
<td>The question as to whether</td>
<td>Whether</td>
</tr>
<tr>
<td>There is no doubt that</td>
<td>No doubt</td>
</tr>
</tbody>
</table>

**From Michael Alley: The Craft of Scientific Writing, 3rd ed.**