Scientific Writing

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What makes a good paper?

- Hypothesis & study design that are novel, strong
- Methods that are validated & properly described
- Text that is clear, concise and non-repetitive
- Figures that stand alone (ie, text unnecessary)
- Data that are properly presented
- Discussion that:
  - interprets, not repeats, data
  - is signposted, divided into sections
  - is balanced and not selective
- Conclusion that is accurate
Principles of Scientific Writing

- Brevity
- Clarity
- Focus
- Readability
- Accuracy
- Balance
- Grammar and syntax
Elements of a journal article

- Title
- Key words
- Abstract
- Introduction
- Methods
- Results
- Discussion
- Figures
- Tables
1: Writing the title

- Tells the complete story
- Specifically describes study
- Uses as few words as possible
- Is unambiguous
- Includes the model studied
- Begins with an important word
- Has no undefined abbreviations
1: Writing the title

- Avoids “Effect of” and other waste words
- Follows journal’s length requirements
- Is specific with results
- Does not have “catchy” or “cute” titles (e.g., Fat Rats: Are Their Hormones Different?)
1: Writing the title

A) “Effect of hypoxia on exercise capacity”

Or

B) “Hypoxia impairs exercise capacity by limiting O$_2$ diffusion within muscle”

A) Has no result and no mechanism,
B) Has both, and is much better
2: Writing the abstract

First, check and obey **format & word limits** for the journal you are sending it to.

Usually, structure the Abstract with

- Background
- Hypothesis
- Design/methods overview
- Results (quantitative, with p values)
- Conclusions
2: Writing the abstract

- Is a self-contained summary of the work
- Includes a statement of significance
- Lays out principal data and p values
- Avoids abbreviations (defines any used)
- Does not contain references
- Is succinct and clear
- Is usually a single paragraph
- Is usually written after the rest of the paper is finished: easier to summarize
3: Choosing the key words

- Use words NOT already in the title
- Choose with considerable thought:
  They will form the basis of searchability, so you want words that will find Your paper (Citations!!)
4: Writing the introduction

- Keep it short

- Keep the purpose of an intro in mind:
  - Introduce the problem to be addressed
  - Provide only essential background
  - State what is missing: what you will add
  - Lay out your hypothesis
  - Give very short study approach overview
5: Writing the methods

- Keep it concise & well signposted
- Short summary + citations for known methods (rather than wordy descriptions)
- New methods: describe fully (so others can reproduce), and validate
- Don’t forget power calculations & statistics
- Use past tense, third person (X was measured)
- Human subjects: Written, informed consent
- Animal subjects: Indicate ethical approval
6: Writing the results

- Keep it concise & well signposted
- Consider sequence of results carefully
- Do not repeat methods
- Resist temptation to present ALL data
- Present only data relevant to hypothesis
- If prior published data are essential (for comparison), state this very clearly & justify
- Use tables for numerical data: efficient
- Use figures for histology & blots, obviously
- Use figures for relationships between data
Tables

- Give considerable thought to table layout
- Tables & figures must not duplicate data
- Assure proper sequence of variables
- Include units of measurement for all variables
- If abbreviations are used, define in a footnote
- Indicate statistical outcomes clearly, usually using symbols also defined in footnote
Figures

- Use figures only if really necessary
- Tables & figures must not duplicate data
- Assure adequate size of symbols/axis labels
- Indicate statistical outcomes clearly
- If abbreviations are used, define in caption
- Use color only when essential
- Obey journal rules on image enhancement
- Good figures stand alone – they do not need the reader to read the text to understand
ARTERIO-VENOUS PRESSURE DIFFERENCE, mm Hg

BLOOD FLOW, L/min
7: Writing the discussion

- Be concise; use present tense
- Use subtitled paragraphs for each point
- Do not re-present the results!!!
- Discuss the results:
  - Compare to literature
  - Interpret the results
  - Some extrapolation OK, not too much
  - Conclude ONLY what data allow
7: Writing the discussion

- Start with 30,000ft summary of results:
  Short, not detailed or numerical
- Discuss main findings first
- Discuss limitations openly and fairly
- Critique results of others fairly
- Strive to reconcile differences from prior literature. No place for arrogance
References

- Cite only most valid & relevant references
- Limit the number of references
  - Check journal policy
- Avoid excessive self-citation
  - Remember who the reviewers might be
- Check all citations for accuracy
- Format correctly for journal selected
Ethical responsibilities of a scientist

- Intellectual honesty
- Accurate assignment of credit
- Fairness in peer review
- Collegiality in scientific interactions
- Transparency in conflicts of interest
- Protection of human and animal subjects
Common ethical issues

- Prior (duplicate) publication and Plagiarism
- Animal & Human welfare concerns
- Authorship disputes
- Data fabrication/falsification
  - includes inappropriate manipulation of figures
- Conflicts of interest
- Others (reviewer bias, submission irregularities)
RESOURCES – BOOKS


RESOURCES- ARTICLES

- Guidelines for reporting statistics in journals published by APS. Douglas Curran-Everett and Dale J. Benos [http://advan.physiology.org/cgi/content/full/28/3/85](http://advan.physiology.org/cgi/content/full/28/3/85)


- Ethics and scientific publication. D.J. Benos, et al. [http://advan.physiology.org/cgi/content/full/29/2/59](http://advan.physiology.org/cgi/content/full/29/2/59)
RESOURCES – WEB SITES

- International Guidelines of Journal Editors

- Bates College “How to Write a Paper in Scientific Journal Style and Format”
  [http://abacus.bates.edu/~ganderso/biology/resources/writing/HTWgeneral.html](http://abacus.bates.edu/~ganderso/biology/resources/writing/HTWgeneral.html)

- University of Wisconsin, Madison Writing Center - Writer’s Handbook

- George Mason University Department of Biology: A Guide to Writing in the Biological Sciences: The Scientific Paper
JOURNAL IMPACT FACTOR

= # citations / # papers published prior 2 years

- IF is just one statistic of many possible
- IF is primarily a journal, not author statistic
- IF is an average over all papers in journal
- IF depends on size of field (current fashion)
- IF depends on size of journal
- IF is easily manipulated by Editors
- IF is grossly abused as value indicator
Postdoctoral Scholar Career Development Series Upcoming Events

- Spotlight on IRB, February 15, 2012 at noon in SSC 400
- SD Lab Management Symposium, March 2-3, 2012
- Effective Presentation, May 1, 2012
- Funding Fest, workshops throughout May, 2012
- Transition to Industry, TBA
- Academic Job Search Symposium, TBA

For additional information:
http://research.ucsd.edu/postdoc/training.html