

SCIENTIFIC PUBLICATION BOB VRIJENHOEK

HOW DO YOU KNOW WHEN YOU HAVE ENOUGH TO CONSTITUTE A SCIENTIFIC PAPER?

You have a complete story

When your supervisor tells you its done (the sign of a true artist is to know when to stop painting)

the LPU (Least Publishable Unit, a product of tenure mills. No one appreciates these, but we understand the reality)

The *magnum opus* (avoid it, you'll probably have opportunities to write more than one paper in your lifetime)

KINDS OF SCIENTIFIC PAPERS

Primary—typically unsolicited

peer reviewed research reports

Professional journals

Chapters in edited books

Notes and Brief Communications

Letters of Correspondence (Science, Nature)

Monographs

non-peer reviewed (gray literature)

Abstracts

Theses

Conference Reports

Government reports

Computer programs

Web pages

Secondary—most often solicited

peer reviewed

Subject reviews (e.g., Annual Reviews, etc.)

Solicited chapters for edited volumes

non-peer reviewed

Book Reviews

Comments

News & View

Books

ORGANIZATION OF A RESEARCH REPORT

1. Abstract
2. Introduction
3. Materials & Methods
4. Results
5. Discussion
6. Acknowledgments
7. Literature Cited
8. Legends to Figures
9. Tables (include table caption)
10. Figures (do not include Figure legend)
11. Appendices
12. Supplementary materials (often web-based)

HOW TO START WRITING

Organization

- Organization is the key to good writing.
- Always start with an *outline*
- Avoid *stream of consciousness*: never start writing on the first paragraph of the Introduction and think you are going to write from front to back.

- Try *Dr. Seuss approach*: Before you put a word on paper create all the cartoons (tables and figures) and put them in order according to the outline.
- *KISS rule* (Keep It Simple, Stupid!): simple is better than complex in terms of organization, sentence structure and vocabulary.
- *Economy of words*: concise is better than wordy.

Voice

- Active voice is preferable to passive voice, but some journals still prohibit use of first person (a bit old-fashion).
- Avoid repetitive phrasing that may be interpreted as arrogant (I did this..., then I did that...).
- Avoid the Royal "We" if you are sole author.

Tense

- *Present tense* to describe published ideas and results. Treat them as established facts even though they was done in the past.
- *Past tense* to talk about what you did in the present study.

Words that editors hate

- Limit *hedge words*: "likely", "appear to be", "apparently", "quite", etc.
- Avoid *double hedges*: 2 hedge words in one sentence destroy credibility.
- Avoid *superlatives*: "important", "very", "incredible", "first evidence", etc. "incredible claims require incredible evidence" (Carl Sagan, I suspect)
- Avoid starting sentences with *weak unreferenced pronouns*: "There are ...", "It is ...", "they did ...", etc.

THE TITLE

Specificity and a source of key words for literature searches

- Be informative, compare the following:
"Action of streptomycin in *Mycobacterium tuberculosis*"
"Inhibition of growth of *Mycobacterium tuberculosis* by streptomycin"

AUTHORS (ORDER AND ETHICS)

- Authors must contribute substantially to the work, materials, or writing.
- Order should relate importance of contribution to the experiments.
- *Ideas are cheap*, they don't necessarily impart first authorship.
- Getting the paper written is critical and deserves first authorship.
- Last author is often reserved for the director of the lab, the person who wrote the grant, or the person responsible for quality control.
- Ethics: 2-yr rule; understanding ownership of ideas and materials.

ABSTRACT

Generally no greater than 250 words

- Clearly state principal objectives and scope of investigation.
- Briefly state the methodology employed.
- Summarize main results.
- State principal conclusions (do not include citations here).

INTRODUCTION

- State nature and scope of problems or hypotheses to be tested.
- Orient reader to background on the problem and the pertinent literature.
- Briefly state how you will attack the problem or test the hypothesis. Discuss approach and why it is appropriate.

MATERIALS & METHODS

- Purpose: to allow *replication* and *verification* in someone else's hands or mind.
- Where did you get the specimens or materials?
- How did you treat them (storage, etc.)?
- Describe methods: All the gory details? Just what worked?

- Cite the methodology papers if detailed recipes are provided elsewhere, and you did nothing new or different.
- Clearly identify your modifications to existing techniques. How did you "tweak" the system and get it to work.

RESULTS

- It is also important to state what you did not find -- someone might get different results under different conditions, "absence of evidence is not evidence for absence." (Sagan 1977)
- Be **clear** and **concise**.
- TABLES — let your tables speak for themselves, just draw attention to one or more representative lines and the reader can refer to the rest.
- FIGURES — let your figures speak for themselves. A good figure is worth a thousand words.
- AVOID REDUNDANCY, AVOID REDUNDANCY, AVOID REDUNDANCY

DISCUSSION

- Avoid *verbiage* (unnecessary and wasteful words)
- Avoid the *squid* technique--"author is doubtful about his/her reasoning and retreats behind a protective shield of ink."

Components of a good discussion

- Restate your principal problem or hypothesis (from **Intro.**) and your principal findings.
- Interpret, but do not recapitulate the **Results**.
- Discuss exceptions and unsettled issues. Honestly consider alternative explanations for your results, and rule them out if you can. Don't ignore them, because the reviewers will notice.
- Show how your results or conclusions agree or disagree with published work.
- Point out theoretical or practical applications and the significance of your work. **DON'T BE SHY HERE.**
- Close with a strong statement of conclusions or a statement about the direction that future work should take.

ACKNOWLEDGMENTS

- Acquisition of specimens
- Libraries or museums that provided study materials
- Technical help and assistance
- Editorial help
- Grants and contracts

Rules

- Keep it short.
- Do not phrase acknowledgment as an endorsement.

LITERATURE CITED

- See journal you are targeting for the style
- Invest in **EndNote** or some other reference management software.

In text citations

Name and year: e.g., (Lutz *et al.* 1984; Rona *et al.* 1992, 1993)

- Order alphabetically then by year in some journals.
- Order by year, then alphabetically another journals

Number system (1, 2)

- Ordered from Literature cited which is alphabetical
- In order of citation (not alphabetical in Literature Cited)

Intellectual honesty and plagiarism

- Attribute ideas and methods to their authors
- OK to paraphrase, but not to steal words -quote is you can't come up with a good paraphrase
- Personal Communications— most good journals require confirmation from the communicator
- Citing unpublished studies: many journals disallow this.

References

Name and year

Lutz, RA, Jablonski, D, Turner, RD (1984) Larval development and dispersal at deep-sea hydrothermal vents. *Science* 226:1451-1454

Number system

1. R. A. Lutz, D. Jablonski, R. D. Turner, *Science* **226**, 1451-1454 (1984).
2. R. A. Lutz, L. W. Fritz, D. C. Rhoads, *Biol. Soc. Wash. Bull.* **6**, 199-210 (1985).

USE AND MISSUSE OF ENGLISH**Cardinal rule--KEEP IT SIMPLE and CONCISE**

The *thesis disease*: "The compulsion to include everything, leaving nothing out, does not prove that one has unlimited information; it proves that one lacks discrimination" (Aaronson 1977)

10 COMMANDMENTS OF GOOD WRITING (mostly from Day 1979, p. 115)

1. *Each* pronoun should agree with *their* antecedent.
2. Just *between you and I*, case is important.
3. A preposition is a poor word to end a sentence *with*.
4. Verbs *has* to agree with their subject.
5. *Don't* use *no* double negatives.
6. A *writer* mustn't shift *your* point of view.
7. When dangling, *don't use participles*.
8. Join clauses good, *like* a conjunction should.
9. *Don't write a run-on sentence that goes on and on forever because it is ever so difficult to read and comprehend by the rest of us mortal soles who have to work twice as hard in fact three or sometimes even four or five and maybe even six times as hard to get the meaning and then we frustrated with what it was you were trying to say in the first place.*
10. About sentence fragments.

References

Aaronson, S (1977) Style in scientific writing. *Current Contents* 2:6-15

Day, RA (1979) *How to Write and Publish a Scientific Paper*. ISI Press, Philadelphia