Scientific Writing & Manuscript Preparation: Writing for Publication in BME

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Overview

- Technical/scientific writing
- Preparation
- Article organization
- Figures and tables
- Writing the manuscript
- Revision and Style
- Word choice and usage
- Grammar and punctuation
- Common problems in technical writing

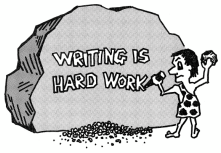
Publication

- What are your goals in publishing?
  - convey information, results, new technique
  - convince reader of validity of your results
  - tell your story to other experts
  - receive recognition/credit for your work
- *Poor writing will erode reader's confidence in your article*
- To accomplish your goals, your article must be professional in
  - content
  - logical development
  - writing

Technical writing

Technical writing

- Goals in technical writing
  - make complex technical information understandable
  - make it easy for the reader to read and extract information
  - achieve **clarity**, **conciseness**, and **coherence**
- Good technical/scientific writing
  - is a skill
  - can be learned and mastered
  - takes time and hard work
- Techniques of good technical writing are useful elsewhere
  - grant writing
  - technical presentation



Technical writing

- Learn good technical writing by
  - reading well-written journal articles
  - practicing writing –
    then have it rigorously reviewed
  - employing technical editor
  - using writers' aids

English as a Second Language (ESL)

- Those who learn English as a Second Language (ESL) face special challenges
- Each language has its own rules and characteristics; there is a natural tendency to carry them over into English
  - some common usage problems are
    - transitive verbs (require object): *This technique allows to …*
    - nonexistent words: *modelization*
    - missing or inappropriate articles: *a, an, the*
    - misused pronouns: *It means that …→ That means that …*

ESL

Preparation

Getting ready to write

Preparation

- In early stages, before writing or even planning to write, you need to organize your approach and materials
- Collect your information
- Make a preliminary list of topics to present
- Assemble possible preliminary figures and tables
- Think about means of publication: journal, proceedings, report …
- Get your collaborators involved

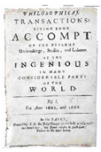
Collaboration

Consider the role of your collaborators

- If they contributed to work, they could also be involved in
  - planning the manuscript
  - preparation of results, figures, and tables
  - writing
  - reviewing and editing
- If your collaborators will help with the writing
  - coordination is critical
    - writing assignment & schedule
    - uniform use of style and symbols
    - manuscript should be uniform!!!

Journals

- Considerations for publishing in journals
  - prestige – peer reviewed, a necessity for academicians
    - often improves quality of paper
  - read by many experts in field
  - sometimes edited for English
  - archival, but access limited by subscription
  - publication takes 6 – 24 months
    - consider online journal
  - fee charged for publication (page charges)



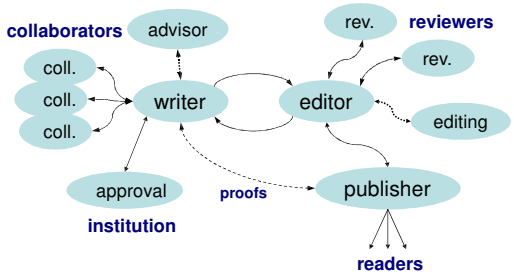
First scientific journals, 1665

Proceedings

- Considerations for publishing in proceedings (papers associated with conferences)
  - not usually peer reviewed; less prestigious
  - seen by fewer researchers than in journals
  - semi-archival (depends on publisher)
  - seldom edited for English
  - usually require "camera-ready" manuscript
  - publication easier than in journals
- High impact proceedings
  - ➢ 8 page submissions
  - ➢ Double-blinded review
  - ➢ Edited – papers require revision
  - ➢ 28-32% acceptance rate

Life of a journal manuscript

- A manuscript goes through many steps to be published



- Process can take from 6 months to 24 months
  - author can speed process by responding quickly to editor's requests

Author's responsibilities

Author is responsible for:

- Organization of paper and quality of writing
- Dealing with own institution's requirements
  - advisor/supervisor's agreement
  - review for copyright and security issues
  - page charges
- Ensuring manuscript meets publisher's requirements
  - format – single/double spaced text, etc.
    - citations and reference list
  - figures, photos, multimedia
  - submission protocol – hardcopy, electronic media, internet, …
- Communicating with editor and publisher

Dealing with editor and reviewers

- If revision of manuscript is requested
  - consider seriously the reviewers' comments
    - they most likely have some good points
    - revise your manuscript accordingly and resubmit
  - if you think reviewers misunderstand your manuscript or are in error
    - do not reply in anger; deal with disagreement diplomatically
    - ask friends/colleagues for advice
  - editor has final decision
- If manuscript is rejected, consider
  - performing additional research or taking new approach and resubmitting
  - submitting to a different, more suitable journal

Organization

The foundation for logical development

CJ

Standard article organization

- *Title*
- *Authors and affiliations*
- *Abstract*
- *Keywords (or citation index)*

Front matter

- *Introduction*
- *Materials and methods*
- *Results Discussion*
- *Conclusion*
- *Acknowledgments*

Body of article

- *Appendices References*
-
-

End matter

- Floats (figures and tables)

Reader's approach to reading an article

- For lack of time, most readers will not read the whole article
- Typical order in which a reader will read the article
  1. title (& author list)
  2. abstract (& keywords)
  3. figures and their captions
  4. skim text and section headings
  5. conclusion
  6. equations
  7. portions of main text in more detail
- Consequently, make sure that elements at the top of the list are especially well crafted

Front matter

Material that precedes the body of the article

- *Title*
  - concisely describe main theme of work presented in paper
  - not be too long (≤ 12 words)
- *Authors*
  - list of those who directly participated in work
- *Affiliations*
  - institutions with which authors are associated

Front matter (2)

- *Abstract*
  - concise, clear, and informative summary of work in paper
  - single paragraph
  - not too long (< 200-250 words)
  - avoid lengthy background
  - many readers only read the title and abstract
- *Keywords* or citation indices
  - select these very carefully
  - researchers will search databases for keywords

Titles

- Some good article titles
  - *Edge completion from sparse data: a level-set approach*
  - *Validation of complex cascaded models of medical-imaging systems by Monte Carlo*
  - *Evaluation of algorithms for segmentation of the prostate boundary from 3D ultrasound images*
- Some not-so-good titles
  - *Moving linkage*
  - *High-frame-rate and high-resolution ultrasound imaging with virtual-source element in B-mode ultrasound system based on sparse synthetic transmit aperture method*
  - *Strive for conciseness*
  - *Find balance between not enough and too much information*

Abstract

- Example of a well-written abstract:

For a signal-detection task, the Bayesian ideal observer is optimal among all observers because it incorporates all the statistical information about the raw data from an imaging system. The ideal-observer test statistic, the likelihood ratio, is difficult to compute when uncertainties are present in backgrounds and signals. In this work, we propose a new approximation technique to estimate the likelihood ratio. This technique is a dimensionality-reduction scheme we will call the channelized-ideal observer (CIO). We can reduce the high-dimensional integrals of the ideal observer to the low-dimensional integrals of the CIO by applying a set of channels to the image data. Lumpy backgrounds and circularly symmetric Gaussian signals are used for simulations studies. Laguerre-Gaussian (LG) channels have been shown to be useful for approximating ideal linear observers with these backgrounds and signals. For this reason, we choose to use LG channels for our analysis. The concept of efficient channels is introduced to closely approximate ideal-observer performance with the CIO for signal-known-exactly (SKE) detection tasks. Our preliminary results using one to three LG channels show that the performance of the CIO is better than the channelized-Hotelling observer for the SKE detection tasks.

S. Park et al., *Proc. SPIE* **5372**, pp. 12-21 (2004)

background
problem statement
proposed solution
results

- concise summary of article contents
- logical structure and development
- single paragraph; 191 words

Body of article

Substance of article; the main story

- *Introduction*
  - more informative than *Abstract*
  - introduce reader to context of paper
  - provide brief background, referring to previous work
  - briefly state problem to be addressed and how it will be solved
  - provide outline of paper
- *(Background)*
  - additional section, if more space needed for background material

Body of article (2)

- *Materials and Methods*
  - describe means by which work was done
    - apparatus
    - materials
    - methodological approach
  - section headings may vary
- *Results*
  - present research results
  - interpret in terms of theory or model
- The above two categories may include multiple sections
  - use descriptive section and subsection headings
    - headings should read like an outline of the article

Body of article (3)

- *Discussion* (optional)
  - establish relationships among data and results
  - review results as a whole, in the context of other works
- *Conclusion*
  - summarize succinctly what the results demonstrate
    - avoid hyperbole – don't claim more than supported by results
  - relate results to general problem
  - indicate implications for field
  - suggest possible follow-on work

Repetition of message

- The main message should be stated in the
  - (*Title*)
  - *Abstract*
  - at least three times in the body
    - *Introduction*
    - *Results* or *Discussion*
    - *Conclusion*

End matter

Auxiliary material, but essential to article

- *Acknowledgments*
  - credit those who helped by providing funds, material, apparatus, data, ideas, inspiration, or advice
- *References*
  - cite foundational or background work
  - list sources of information and techniques
  - avoid plagiarism by including all sources
  - give credit where warranted
    - formatting of reference list dictated by publisher
- *Appendices* (optional)
  - additional material that diverges from central theme of body
    - more detailed description than desirable in body
    - derivations or proofs
    - sizable tables

Figures and tables

Floats – figures and tables

- Figures – graphs, block diagrams, maps, images
  - figures and their captions should tell the story
    - ideally, they should describe results without relying on text
  - graphs useful for displaying behavior of data
    - caption should describe the figure and provide link to text
    - caption placed below figure
- Tables
  - lists of calculated results, experimental conditions, measurements, etc.
  - caption should describe the entries in each column
  - caption placed above table

Multimedia and hypertext

- Multimedia include
  - video – sequence of images (time-evolving phenomena, simulations)
  - audio – sound clips
  - interactive demonstrations
- Hypertext – active links to elsewhere in paper or online material
  - provides means to link to multimedia
- Multimedia are increasingly becoming available in electronic publications (online and on CDs)
- Multimedia can illuminate some things much better than stationary figures
  - consider how you might put multimedia to good use
  - but use them only when they help achieve the goal of the paper; avoid unnecessary distraction

Writing the manuscript

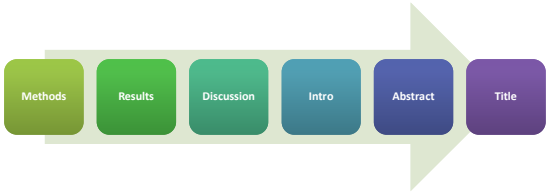
Planning, organizing, writing, and revising

CJ

The writing process

- Planning
  - identify objective, audience, and scope
- Organization
  - logical development
  - outline
- First draft
  - write rough draft
  - refine by revising
- Revision – recursive process
  - goal of revision is completeness, accuracy, and coherence
  - edit for style, word choice, and grammar
- Find the best approach for you

Process of Writing



Storyline

- *You asked a question and conducted experiments to discover things and arrive at the answer to your question*

1. Question (Introduction)
2. Experiments (Methods)
3. Findings (Results)
4. Answer (Discussion)

Writing the first draft – tactics

Useful techniques for beginning to write:

- Write first draft very quickly (and roughly)
  - don't worry too much about spelling and style
  - start with sections that are easiest to write
  - write in stream-of-consciousness mode
- Writing conditions
  - set aside blocks of time to write, perhaps an hour or two
  - establish goal for writing in each session
  - make sure your environment is conducive to writing
- First draft is not ready to show anyone until after first revision

Revision – tactics

Some useful strategies for revising a manuscript

- Print it out!
  although, some authors prefer to revise on computer monitor
- General approach
  - see manuscript as a whole
  - rearrange sections and paragraphs to improve development
  - identify what is missing and add new text
  - tired of it? Put away for 1-2 days & ask others to read it!
  - read several times; each time looking for particular type of problem
  - make cursory notations in text or margin, correct later
    - use standard proofreading marks, especially if for someone else
    - use 1½ to 2 times line spacing to allow insertion of notes, new text
- Create new version often and keep old versions until finished

Writing style

Revise for clarity, conciseness, and coherence

CL

Good technical writing style

Style is how you say things

- Good style is imposed in the revision process
- Goal is **clarity**, **conciseness**, and **coherence**
  - clarity
    - use correct word usage, grammar, punctuation, and spelling
    - avoid colloquialism, slang, and shoptalk
  - conciseness
    - avoid wordiness
  - coherence
    - maintain overall organization
    - use transition elements throughout
- Common problems will be described in following sections
- For guidance, read Strunk and White's "Elements of Style"

Transition elements

- Transition elements are crucial for keeping the reader on track
  - purpose is to link together different parts of article
- Effective transitions are needed at all levels of article structure
  - article
    - *Introduction* connects with previous work and lays out organization
    - *Conclusion* summarizes what has been presented
  - section
    - Begin each section with short introduction to establish its relationship to previous section and the overall context
  - paragraph
    - use topic sentence and logical development within each paragraph
    - establish links between paragraphs
  - sentence
    - use compound sentences with transition or subordinating conjunctions

Word Choice

- **Limit abbreviations**
  - OK if term used >10 times or if cumbersome

Word Choice

- **To *we* or not to *we***
  - Not taboo to write in first person … most of the time
  - OK when making judgments & discussing your work
  - +/- OK in methods section (controversial)
  - Try to be consistent throughout manuscript

Word Choice

Very strong	Strong	Medium	Weak	Very weak
Proves	*Demonstrates*	*Shows*	*Indicates*	*Suggests*
Caused	*Resulted in*	*Led to*	*Is associated with*	*May be associated with*

Try to avoid the extremes

Common problems in technical writing

Learn more from web sites and books on technical writing

Common problems

- Missing or inappropriate articles (*a, an, the*) — articles
  - *No: Analysis requires statistical model … ;*
    Yes: The analysis requires a statistical model …
  - *No: From a x-ray image, we conclude …;*
    Yes: From an x-ray image, we conclude …
- Treating countable nouns as uncountable — countable
  - *No: less problems … ;* *Yes: fewer problems …*
  - *No: so much artifacts … ;* *Yes: so many artifacts …*
  - *No: Ten items or less. ;* *Yes: Ten items or fewer.*

Common problems

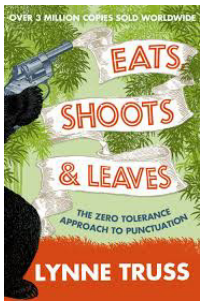
- Inappropriate use of words
  - *in order to* – should be avoided, except to prevent ambiguity
    - *No: In order to control … ;* *Yes: To control …*
  - *which, that, who*
    - use *that* before a restrictive phrase (without comma) — that which
      - *The approach that proved to work best …*
    - use *which* to begin a nonrestrictive phrase, with comma before and after
      - *Our approach, which we adopted from Andrews, proved to work well.*
    - use *who* when referring to a person or people
      - *People who follow Wagner's suggestion …*

Common problems

- Inappropriate use of jargon — jargon
  - appropriateness of jargon depends on expertise of intended audience
- Too many acronyms
  - acronyms should be defined at first use, with few exceptions
- Inappropriate use of punctuation — punctuation
  - correct punctuation enhances readability

(,) comma – pauses the flow of a sentence to prevent ambiguity (e.g., series, introductory phrase, nonessential phrase) (:) colon – initiates series
(;) semicolon – initiates independent clause
(–) dash – sets off phrases with emphasis
( ) parenthesis – encloses nonessential words and phrases

Punctuation!!!



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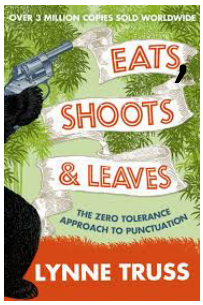

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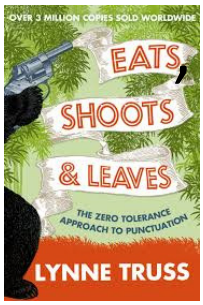

Active voice

Passive: The figure of merit is based on the area under the curve

Active: We base our figure of merit on the area under the curve

- Active voice is desirable because it generally
  - improves clarity
  - reduces ambiguity and wordiness

active

Summary of technical writing

- Organization of material is key
- Good technical writing style is learned by
  - reading well-written journal articles
  - paying attention to the details
  - using writing guides and dictionaries, especially when in doubt
  - having your writing critically edited by technical editor and/or colleagues
- Find the approach to writing that works best for you

Tools for technical writing and manuscript preparation

CL

Document processors

- MS Word
  - full featured
  - spelling checker and grammar checker
  - compatible/ interplay with other MS office products
  - WISIWYG editing
  - expensive
- OpenOffice
  - comparable to MSWord
  - free
- WordPrefect
  - full featured
- AbiWord
  - free

Document preparation

- LaTeX
  - used by many authors, accepted by most publishers
  - numerous desirable features
    - excellent equation formation
    - enforces publishing rules
    - automatic numbering of sections, figures, equations, etc.
    - citation and references made easy; bib files usable with various bibliography style files
    - AMS packages for enhanced mathematical capabilities
    - free
  - need word processor, DVI (Device Independent) viewer, and ability to convert to standard document format (PS, PDF,…)
  - style files for formatting manuscripts

Learn LaTeX ...over the weekend ☺

The Not So Short Introduction to LaTeX 2ε

Or LaTeX 2ε in 157 minutes

by Tobias Oetiker
Hubert Partl, Irene Hyna and Elisabeth Schlegl
Version 5.01, April 06, 2011

http://tobi.oetiker.ch/lshort/lshort.pdf

Disclosure

- Lectures and book of Mimi Zeiger
  - http://www.amazon.ca/dp/0071345442

Thanks for your attention!

Questions? Suggestions for improving this presentation?

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