# Writing for Publication

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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
- Writing aids

# 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 a lot of time and hard work

# Writers' aids

Good references are essential

- Dictionaries and thesauruses
  - *American Heritage Dictionary*; www.bartleby.com/61/
  - *Wordsmyth Dictionary and Thesaurus*; www.wordsmyth.net
- Technical writing; grammar, usage, and punctuation
  - *Handbook of Technical Writing* (St. Martin's, New York, 2003); highly recommended
  - *Mayfield Handbook of Technical and Scientific Writing*; very helpful; mit.imoat.net/handbook/
  - *Online Writing Lab (OWL)*; owl.english.purdue.edu/handouts/
- Web is an invaluable resource
  - search for suggested keywords at specific sites
    for example: Google wordiness site:owl.english.purdue.edu/handouts/

wordiness

# 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: *This technique allows to …*
    - nonexistent words: *modelizations*
    - missing articles: *a, an, the*
    - misused pronouns: *It means that …→ That means that …*
- Learn about coping with ESL problems in
    - *Handbook of Technical Writing*
    - *Mayfield Handbook*
    - *Online Writing Lab (OWL)*
    - *An Outline of Scientific Writing*

# Reader's approach to reading an article

- For lack of time, most readers will not read the whole article
- Typical order in which they 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 well crafted

# Title

- The title is the most visible part of article
- Goals for the title
  - informative about what is in the paper
  - no longer than about 12 words
  - distinctive
- The title is
  - not a replacement for the abstract
  - usually not a sentence
- Do not start with *A* or *The*
- Avoid all but the best-known acronyms

# Abstract and keywords

- 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

# Figures

- Figures and their captions help tell the story
  - ideally, they should describe results independently from text
- Anticipate how graphs and images will appear in published article
  - how big will they be? one column or two?
  - make sure
    - lines and axes are thick enough
    - symbols and fonts are large enough
    - dependent on size of final graph and proportion
  - use color to distinguish lines only if published paper will be in color
  - use solid, dashed, and dotted lines, and various data symbols
  - caption should describe the figure and provide link to text

# 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

# Planning

- Start writing process with a plan
- Identify purpose of article
  - solve a problem
  - convey new information
  - express a point of view
  - persuade reader of something
- Identify audience
  - to whom do you want to tell your story?
  - why would they want to read your article?
  - level of expertise
- Determine scope of presentation
  - depends on purpose and audience

# Outline

- Before beginning to write, create an outline
  - will be used as the skeleton for the manuscript
    - provides organization and structure
    - establishes overall logic of presentation
  - try to include every topic you want to mention
- The following techniques can help you get started:
  - define the essence of your message in a few core ideas
  - write down key points first, then secondary ideas, …
  - give informal talk to friends or colleagues
  - maintain momentum – don’t stop prematurely

# Writing the first draft

- Base first draft on outline
  - outline provides organization
    - topics and subtopics of outline become sections and subsections
    - paragraphs emanate from subtopics and sub-subtopics
  - skip *Abstract*, *Introduction*, and *Conclusions*
    - these are often easier to write after everything else

# 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

- Revision is a critical step in writing a well-written manuscript
  - where good writing happens
  - usually takes many passes through manuscript
- Review content and organization
  - does it say what you want?
    - include all the data, graphs, etc.?
  - is it easy to read and follow logic of presentation?
  - is it accurate, complete, and truthful?
- Check for style and proper English
  - clarity, conciseness, and coherence
  - sentence construction
  - word choice and usage
  - grammar, punctuation, and spelling

# 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
  - 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

# Good technical writing style

- Style is how you say things in your writing
- Goal of technical writing is clarity, conciseness, and coherence
- Use straightforward and simple sentence construction
- Choose words carefully
  - aim for conciseness and clarity; avoid wordiness
  - avoid colloquialism, slang, and shoptalk

# Good technical writing style

- Strive for text that is readable and easy to follow
  - maintain overall organization
  - use transition elements throughout
- Use correct word usage, grammar, punctuation, and spelling
  - most common problems will be described in following sections

- Read and reread Strunk and White

# 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

# Paragraphs

- The paragraph is the unit of composition
- Organizing principles
  - unity
    - focus on a central topic
    - topic sentence
      - placed first, second, or last in paragraph
  - development
    - advance the topic through logical argument
  - coherence
    - sentences should hang together
    - transition elements link sentences
      - connecting phrases (*On the other hand*, …; *Therefore*, …)
      - repetition of keywords
- Paragraphs should not be too long (or too short)

# Sentences

- Sentence structure should generally be simple
  - to promote clarity and readability
  - use subject-verb-object construction
  - avoid complicated structure to explain complex ideas
- Use
  - strong verbs
  - active voice
  - first person, when appropriate
- Keep sentence length moderate
- Equations are part of a sentence; punctuate accordingly
  - equation numbers are always presented in parentheses, e.g., Eq. (9)

# Sentences – compound

- Deviation from simple sentence construction can be helpful
- Compound sentences can be used to
  - make transitions
    - *The x-ray tube had a large focal spot; therefore, we used a collimator to constrain the beam.*
    - *The radiographs had excellent image quality, but we still could not detect the lesion.*
  - indicate subordination of ideas
    - *Because the input signals were too strong, the data were corrupted.*
    - *The microscope, which we borrowed from the biology department, allowed us to visualize the defect.*

# Verbs – tense

- Use *present tense* as a general rule
  - although it may seem unnatural to write about the past in the present tense, it is usually desirable
- Other tenses may be used
  - *past and future* may be used in *Introduction* – to refer to previous work and what will be presented
  - *past* may be used in *Discussion* – to refer back to body of text:
    or in describing materials used – to refer to set up of experiment
  - *future* may be used in *Conclusion* – to refer to future work
  - do not to switch tenses too often

# First person

first person

- Write in first person, when appropriate
  - person indicates the writer's relation to the material presented
    - writing in first person shows direct involvement; is more immediate
    - writing in second or third person indicates impersonal relation
  - use first person, singular if one author; plural for two or more
    - plural first person may be used for a single author to include reader
    - *I conclude that …*
      *We can conclude that …*
  - use first person when writing about
    - your choices, opinions, expectations
    - your measurements, calculations, conclusions
- Writing in first person tends to promote active voice
  - *No: The results are calculated using Monte Carlo.*
    *Yes: We calculate our results using Monte Carlo.*

# Word choice

- Chose words carefully to convey precise meaning
  - pick powerful words with definite meanings
  - avoid
    - ambiguity
    - ornate or erudite words
    - wordiness and redundancy
    - informal English usage
    - idioms, unnecessary jargon, shoptalk

# Measurement units

units

- Measurement units are usually abbreviated
  - mm millimeter; length
  - s second; time
  - HU Hounsfield units; x-ray CT amplitude
  - Hz Hertz = second$^{-1}$; frequency
  - pt. points; length in type setting
- Generally include space after number and do not italicize units
  - ***No:*** 2.47 *mm* ; ***No:*** 2.47mm; ***Yes:*** 2.47 mm
  - ***No:*** 6pts. ; ***No:*** 6 *pt.* ; ***Yes:*** 6 pt.
  - ***But:*** 54ºC
- See AIP Style Manual for list of abbreviations of physical-units

# Cursory list of common problems

Some of the most common problems in technical writing:

- Passive voice

  active

  - active voice improves clarity
    - ***Passive:*** *It was hypothesized by Bethe in 1937 that …*
      ***Active:*** *In 1937 Bethe hypothesized that …*
- Nominalization (*weak verb + noun*)
  - instead, use a strong verb
    - ***No:*** *We perform a calculation using Eq. (8) to obtain the results shown in Fig. 2.*
      ***Yes:*** *We calculate the results shown in Fig. 2 using Eq. (8).*

# Common problems

- Wordiness — wordiness
  - eliminate unnecessary words to achieve conciseness
  - watch out for wordy clichés, e.g., *for the reason that* → *because*
- Comma missing after introductory phrase or clause — comma
  - *No*: *To test our hypothesis we calculate … ;*
    *Yes*: *To test our hypothesis, we calculate …*
- Compound modifiers (adjectives) without hyphens — punctuation
  - use hyphens to connect modifying words that go together
    - *No*: *… the high spatial frequency components are attenuated … ;*
      *Yes*: *… the high-spatial-frequency components are attenuated …*

# Common problems

- Missing or inappropriate articles (*a*, *an*, *the*) — articles
- Treating countable nouns as uncountable — countable
  - *No*: *less problems …* ; *Yes*: *fewer problems …*
  - *No*: *so much artifacts …* ; *Yes*: *so many artifacts …*
- Transitive verbs without a direct object — transitive
  - *We evaluate Eq. (6) to obtain the result show in Fig. 2.*
  - *No*: *The algorithm allows to calculate …* ; (object missing)
    *Yes*: *The algorithm allows us to calculate …*

# Common problems

- Inappropriate use of words
  - *in order to* – should not generally be used, except to avoid ambiguity
    - *No: In order to control … ;* *Yes: To control …*
  - *which, that, who*
    - use *that* before a restrictive phrase (without comma)
      - *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 words
  - *due to* – do not use in place of *because of*
    - *No*: *The computer failed due to … ;*
      *Yes*: *The computer failed because of …*
  - *data* is a plural countable noun, especially in technical writing; also *spectra*, *criteria*, *phenomena*, *momenta*, *radii*, …
  - *This*, at beginning of sentence with no following noun, often indicates ambiguous reference
    - *No*: *This means that … ;* *Yes*: *This result means that …*

# Common problems

- Inappropriate use of jargon
  - appropriate use 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

# Summary

- 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

# Online writing guides

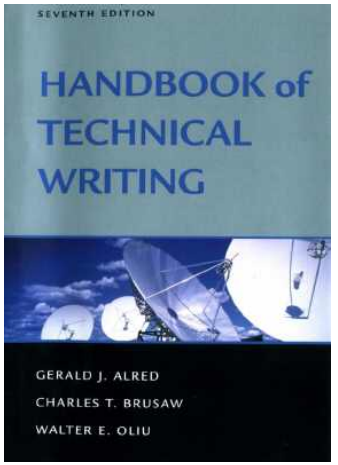
- *Mayfield Handbook of Technical and Scientific Writing*, L. C. Perelman, J. Paradis, and E. Barrett; http://mit.imoat.net/handbook/home.htm
  - recommended; complete guide to technical writing from MIT; concise explanation of most aspects of technical writing; ESL pointers
- *Online Writing Lab (OWL);* http://owl.english.purdue.edu/handouts/
  - guide to effective writing at college level; grammar and punctuation with exercises; English as a Second Language (ESL)
- Supporting material for book *Handbook of Technical Writing*, Alred et al.; http://bcs.bedfordstmartins.com/alredtech/
- *Grammar, Punctuation, and Capitalization: A Handbook for Technical Writers and Editors;* http://stipo.larc.nasa.gov/sp7084/
  - NASA Report; hypertext or PDF; rules for technical writing
- *AIP Style Manual*; http://public.lanl.gov/kmh/AIP_Style_4thed.html
  - American Institute of Physics gives stylistic guidance, especially relevant to physics articles

# Online writing aids

- *Merriam-Webster Dictionary and Thesaurus*; http://www.m-w.com
  - usable, gives etymology and pronunciation of words
- *Wordsmyth Dictionary and Thesaurus*; http://www.wordsmyth.net
  - very usable, although definitions are brief; identifies parts of speech
- *Bartleby Classic Online Books*; http://www.bartleby.com
  - a wonderful collection of writers' aids: the American Heritage Dictionary, Roget's Thesaurus, quotations, and more:
  - *American Heritage Dictionary*; http://www.bartleby.com/61/
  - *Elements of Style*; http://www.bartleby.com/141/
    - classic handbook, written by William Strunk in 1918
  - *King's English*; http://www.bartleby.com/116/
    - by H. W. Fowler (1908), another classic

# Books

- *Handbook of Technical Writing*, G. J. Alred, C. T. Brusaw, and W. E. Oliu (St. Martin's, New York, 2003) [$26-39]
  - highly recommended; complete handbook on technical writing; entries arranged in alphabetical order; excellent index; ESL guidance; includes succinct guide to the writing process
  - supporting material at http://bcs.bedfordstmartins.com/alredtech/




- *An Outline of Scientific Writing: For Researchers With English As a Foreign Language*, J. T. Yang (World Scientific, 1995) [$18]
  - may be especially useful to ESL writers
- *MIT Guide to Science and Engineering Communication*, J. G. Paradis and M. L. Zimmerman (MIT, Cambridge, 2002) [$32]
  - discusses all types of technical communication; includes list of 27 guidelines for style and usage