Rules for Good Scientific Writing & Presentation
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A. LAYOUT

1. Double-space.

2. Indent paragraphs at least 5 spaces.

3. Double-space after each period ("full stop").

4. Leave a blank line between paragraphs.

5. Center equations.

B. STYLE

1. Minimize passive voice (use of the helper verb "to be.")

   They differ… (not "They are different...")
   This study has shown… (not "It has been shown in this study...")
   Our understanding remains incomplete… (not "Our understanding is not complete...")

2. Don’t hesitate to use the first person pronouns ("I" and "we"), but use them sparingly so as to avoid the impression of self-promotion.

3. Use Latin phrases and their abbreviations carefully and with precise understanding of what they mean. Always italicize Latin words and abbreviations. [etc. and i.e. are nowadays mostly treated as adopted English words and not italicized, though consistency would favor italics...]

   et alii = and others (usually et al.)
   et cetera = and so forth (also, etc.)
   in vivo = in the living system (cell or organism)
In vitro = in glass (or plastic!), i.e., outside of the living system
In silico = in silicon (i.e., in a computer)
Ex vivo = outside the living organism
Id est = that is (usually i.e.)
Modus operandi = way of operating

Among these terms, the one most abused is et al. This literally means “and other people,” hence should never be used to indicate multiple objects. It would be quite wrong (indeed gauche), for example, to say “various polar amino acids such as arginine, glutamate, lysine et al.). The other issue concerns the abbreviated form. In Latin the two-letter word et means “and.” Thus it is quite incorrect to write et.al. (with a period after et).1

4. Always italicize Latin species names:

*Escherichia coli* (E. coli)
*Hemophilus influenzae* (H. influenzae)
*Saccharomyces cerevisiae* (S. cerevisiae)
*Mus musculus*
*Canis familiaris*
*Felix domesticus*
*Homo sapiens*

Note that the genus name (first word) is always capitalized while the species name (second word) is never capitalized.

5. Put a space between a numerical measurement and its units (or unit abbreviations). 5.0 M (not 5.0M)

6. Learn the rules for using hyphens and employ them correctly.

7. Pay attention to consistent, correct use of verb tenses!

8. Minimize capitalization. (free energy, not Free Energy)

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1 Note that the familiar ampersand (&) – which also means “and” – derives directly from the word *et* written in cursive script.
9. Don’t be literary. Use simple, direct language and restrict vocabulary to the conventional terms appropriate to the subject.

10. Avoid repetition of words in the same sentence – or even in adjacent sentences.

C. HYPHENATION

1. COMMON HYPHENATED TERMS

   solvent-exposed [side chain]
   native-like [conformation]
   free-protein [surface] (vs. bound-protein)
   small-molecule [binding]
   pH-dependent
   cysteine-rich
   three-dimensional
   nitrotyrosine-containing [protein]
   solid-phase [support]
   genome-wide [experimental data sets]
   extended-length [loci]

2. ROLE OF THE HYPHEN IN LANGUAGE EVOLUTION

   Hyphens serve as the midwives of compound words (nouns, adjectives…). They tie two words together to create a single concept (similar to the fusion of radicals in Chinese characters?). Often pairs of words that are initially hyphenated ultimately become fused into a single term. For example, inter-molecular and intra-molecular once carried hyphens, but now are complete (un-hyphenated)
words: intermolecular and intramolecular (note that “un-hyphenated” can conveniently be replaced by unhyphenated!).

3. CATEGORIES OF HYPHENATED EXPRESSIONS

a. Appended adjectives

vitamin-poor (diet)

b. Adjective-noun pairs (when used as adjectives!)

solid-phase (density) [BUT: density of the solid phase.]

D. CORRECT WORD USAGE

1. preventive [medicine] (not “preventative” – there is no such word!)

2. affect (as a verb) – to influence [gravity affects all masses]

   affect (as a noun) – apparent psychological state

   effect (as a verb) – to accomplish [chromatography effects a separation]

   effect (as a noun) – the result of some agent’s activity [the effect of temperature on the separation]

E. REFERENCES

Scientific writing demands close and careful attribution for all of the facts and ideas that you have gleaned from other sources. In most cases there’s no point to compiling exhaustive reference lists. That’s the job of authors of in-depth review articles, and you can take advantage of such resources by referring your reader(s) to the review articles. Whatever your subject, however, there will certainly be a few key papers (or books) that you must acknowledge as central to your arguments. Cite them carefully and in all your references use a consistent bibliographic style. I personally like the style Nature uses, for example,

Note the features included here: (1) a list of all authors by last name and initials of first and middle names, (2) the complete title of the paper, (3) the journal name indicated by the standard abbreviation in italics, (4) the journal volume in boldface type, (5) the inclusive pagination for the article, and (6) the year of publication. Journal abbreviations can be found in PubMed references and other standard bibliographic resources, including EndNote.

**F. REWRITING AND REVIEW**

It’s a rare person who can churn out a piece of decent prose in a single session. When we write, typically we produce clumsy turns of phrase, make mistakes in matching the number between subject and verb (using a singular verb with a plural subject and vice versa), choose an inappropriate preposition, etc., and very often tend to write heavily in the passive voice. Rereading what you have just written will probably catch many of these mistakes, but you will do well to set your document aside for a longer time before you review it for final corrections. “Sleep on it,” is a good motto. When you return to your writing after an interval you will probably catch many mistakes and discover lots of ways to make it crisper, clearer and more direct. Readers will appreciate that!

One other modality to use in revision of your first or second draft of any piece of writing is to examine it sentence by sentence with a view to cutting out superfluous words. It’s often surprising how much one can condense a piece of prose without any substantial loss of meaning. As an inspiration for this exercise, pause a moment and reread Abraham Lincoln’s Gettysburg Address: [http://en.wikipedia.org/wiki/Gettysburg_Address](http://en.wikipedia.org/wiki/Gettysburg_Address)

Finally, unless you have some powerful reason not to share your writing with friends and colleagues – and potential embarrassment should not constitute a powerful reason – ask for other people’s comments on what you have written. They often will spot things you have missed that can be changed so as to improve your document. *This applies particularly to manuscripts you plan to submit*

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2 In many blockbuster papers in this era of “big science,” the author lists exceed 100 names. One can best deal with such cases by giving several of the lead authors’ names and indicating the others with *et al.* As a practical matter, some arbitrary cut-off (such as 10 names) might be used.
for publication. Depending on the end use of the document, you may or may not consider it appropriate to acknowledge a reviewer’s help. In any event, it should not be a cause for shame that you have sought such help. Naturally in an academic setting you may need to ask your instructor whether or not such criticism is acceptable for a given assignment.

F. A FINAL WORD

Clarity of thought and clarity of expression go hand in hand. If you understand something, you can describe it in clear, concise language that readers can easily understand. Conversely, if what you write is muddy, vague and confusing, your understanding of the topic probably shares those characteristics... Get the ideas clear in your mind before you start to write. Then as you develop your document feel free to write a condensed version that touches on all the main points in the correct order, even though it may not cover every detail. You can add more material later to flesh it out. But if you start with a welter of details you may have difficulty pursuing a clear, continuous line of thought...