

Common errors in writing professional physics papers in Physics 381 and how to avoid them

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Main writing tools

Your most important tools for writing high-quality professional physics papers are:

- (1) The American Institute of Physics (AIP) Style Manual
- (2) A good dictionary
- (3) A good reference on general style, such as Strunk & White
- (4) The spell check feature on your word processor (if you use one).

Neglect of any of these tools is likely to lead you to make common mistakes, actual scientific errors, and illiterate written products.

Capitalization

Do capitalize a letter that begins a new sentence. Do capitalize the first letter of proper names (of people and places) and people's formal titles. Do capitalize the first letter in chemical symbols. Do use capital letters for variables when appropriate (although, in general, lower case should be used first unless convention dictates otherwise). Do capitalize all letters of the *highest-level section heading only* in manuscripts written for publication. Do capitalize the first letter of the first word only in a table column heading. Do capitalize the first letter of each line in a poem (unless you are e. e. cummings).

Do not capitalize for emphasis. Do not capitalize words because they seem important. Do not capitalize words in figures (including axis titles in graphs) unless they are proper names or chemical symbols. Do not capitalize all words in titles or in section headings other than the highest-level ones.

Examples:

(Article titles)

Wrong: Measurement of the Rydberg Constant Using a Rowland Grating Spectrometer
Right: Measurement of the Rydberg constant using a Rowland grating spectrometer

(Nouns)

Mercury is a planet
Mercury is a Greek minor god
mercury is a metallic element, liquid at room temperature
Hg is the chemical symbol for mercury the element (not the planet or the god).

The working medium of a laser is a collection of excited atoms.
Each element has a unique schema of spectral lines, which can be seen in emission or absorption.

The principle quantum numbers of the transition are m and n .

The meter's new reading was the same as its old reading.

The second precision leadscrew was screwed up.

Baby its cold outside.

(These phrases differ by only a single comma. Who's the object of laughter in each?)

Named after Mrs. Malaprop, a character invented by Charles Dickens who continually made hilarious misstatements, ...

Named after Mrs. Malaprop, a character invented by Charles Dickens, who continually made hilarious misstatements,

The basic idea behind being *so* particular is that you are writing not only for an audience of people whom you know, or who were raised in the same generation and subculture as you, but for people of any age, living anywhere in the world, who may have learned English in a very different culture, or from teachers whose own first language was not English, or from books, or BBC broadcasts – or who knows where? Such readers' knowledge of formal English may be impeccable, while their knowledge of informal expressions and U.S. dialects (yes, there are such!) Remains far from complete.

Mathematical English

The best way to begin learning how to express yourself mathematically is to follow the example of the highest-quality mathematics or physics texts you have, as well as articles printed in the leading physical science journals. Then turn to the AIP Style Manual.

One *really important point* for modern students: Computer math is as out of place in scientific writing as computer English is, despite the ubiquity of both these illiteracies. The dialect known as "computerese" was born partly from industry jargon and partly from the primitive nature of early computer hardware – especially keypunches used for data entry, whose keyboards included only the capital letters A-Z, the numbers 0-9, and a very few punctuation symbols, in order to reduce the complexity of hand-wired circuits. Out of these limitations grew an impoverished "pidgin English" dialect, which continues to survive today, even though the hardware that created it has long since fallen out of use.

The following are just a few of the more common rules – and errors – of mathematical and technical English. Notice the extra subtlety and richness of expression that are available in standard English and its mathematical extension, compared to computerese. Notice also how a single misplaced comma can change meaning in mathematical English as completely as it can in the ordinary variety.

(Computerese vs. English)

Wrong

3E+06

3E+00

$(dy/dx)*(x^2)$

She inputted some good suggestions.

She inputted some good ideas.

She inputted the data.

She outputted the coffee.

Right

3×10^6

3

$x^2 dy/dx$ or $x^2 \frac{dy}{dx}$

She made some good suggestions.

She offered some good ideas.

She entered the data.

She poured the coffee on the cretin who told her to fetch it.

(Comma placement)

Substituting, x , into this equation ...

The inner radius denoted r lies ...

Substituting x into this equation ...

The inner radius, denoted r , lies ...

A note on the use of parentheses and mathematical symbols

In general, the fewer parentheses you use in a mathematical expression, the better – but not beyond the limit of clarity or correctness. The standard parenthesis hierarchy is $\{[(...)]\}$. If you need more levels than three, repeat this cycle, or better, rewrite the expression in a simpler way. And always, unless there is a good reason not to, reduce expressions to their simplest form.

Variables should be written in *italic font*; sometimes this convention reduces the need for parentheses.

Wrong

$(a/c)*(b/d)$

$n/n+1$

$(A + 2a)(\sin(b))$

$q\{\exp[-\ln(2q)]\}$

Right

ab/cd

$n/(n+1)$

$(A + 2a)\sin b$

$\frac{1}{2}$

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Of course, there's more, much more. For further discussion, see the references given at the beginning of these notes.

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