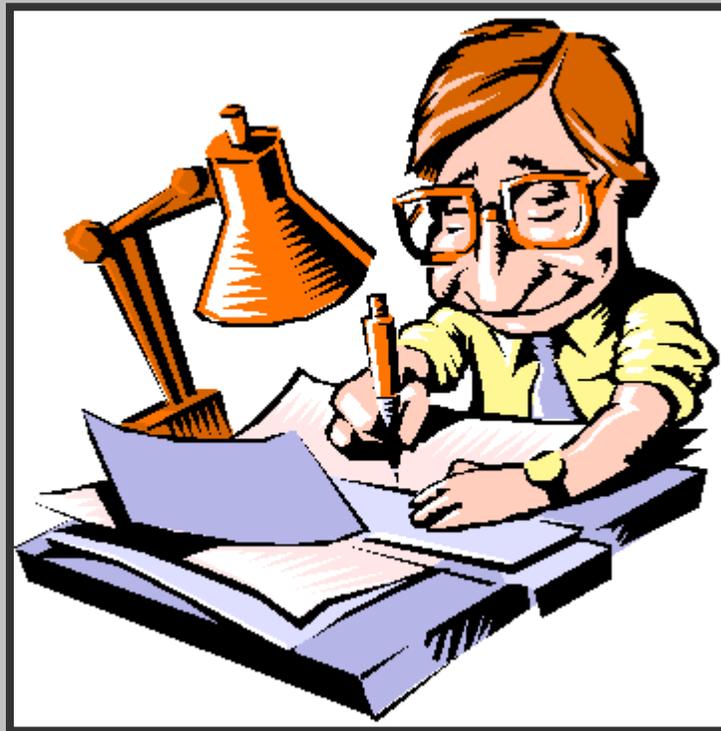


ELEMENTS OF STYLE IN SCIENCE WRITING



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Elements of Style in Science Writing by David. Olton,
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ELEMENTS OF STYLE IN SCIENCE WRITING

Abbreviations, when used appropriately, can help to simplify the presentation of scientific material. They should contain as much information as possible and be easily interpreted. The ideal abbreviation is one that is easily remembered even after a single reading. As an abbreviation for melatonin, "Mel" is preferable to "M". Each abbreviation should be explicitly defined in the appropriate portion of the text. Abbreviations for experimental groups can often save many words. For example: "One group, Mel, received intracerebroventricular infusions of melatonin...The Mel group was impaired...." That definition allows "Mel group" to be substituted for "hamsters receiving intracerebroventricular infusions of melatonin" or "the melatonin infusion group."

Too many abbreviations, however, can make comprehension difficult, especially if the reader is unfamiliar with them or there is more than one commonly used meaning (e.g., LD can mean "long-day" or "light:dark"). Care should be taken in using abbreviations.

Accept versus except. *Accept* is a verb meaning "to receive"; *except* is also a verb; however it means "to exclude" or "to set aside from consideration".

Acclimate versus acclimatize. Animals *acclimate* to lab conditions, but *acclimatize* to field conditions.

Adverbs should generally be used sparingly, as they typically accomplish little more than reduce the clarity of the verb. Certainly, it is ill-advised to have two sequential adverbs modifying one verb.

Affect is not the same as *effect*. A manipulation can *affect* (verb) some response; this *effect* (noun), however, may not occur in every animal tested.

All of. "All of the ____" is typically unnecessary; it can usually be rewritten as "All the _____," "All _____," or "Every _____."

Alot is not a word! It is a *lot*. Please write it as two words and consider using *many* instead.

Alternate versus alternative. An *alternate* is often used as a noun for "someone empowered to act for another". It is not interchangeable with *alternative*, which is a choice. Strictly speaking, the choice should be between two things, but it is now commonly used and acceptable for more than two choices.

Amount versus number. "A normal heart beats 3.5 billion times during a lifetime, but vigorous exercise can increase this amount." This is not a correct use of the word amount, however. *Amount* should be used for bulk quantities, *number* should be used for countable quantities (e.g., heart beats).

An (or is it a) acronym. When using acronyms, use the appropriate article based on how the abbreviation, not the words they stand for, sounds. Therefore, you would write "an NSF grant proposal", but "a National Science Foundation grant

proposal.” By the way, an acronym is not an acronym unless you pronounce the initials as a single word (e.g., NIH and NSF are not proper acronyms, but CISAB, IGERT and AIDS are), but who’s going to quibble! For those who will, the former are properly called *initialisms*. For the rest of us, calling them *acronyms* is acceptable. Words like “scuba” and “posh” were once acronyms, but have been elevated to the lofty status of real words.

And/or is a short-cut that typically damages sentence structure and can lead to ambiguity; it is best avoided.

Animals can be of many different kinds. Specificity is typically preferred when it is appropriate. If rats were the subjects, use *rats* rather than *animals* because this term is more informative. The use of *animals*, however, is acceptable on the second usage after the specific animal name is introduced. For most papers, it is important to indicate the Latin binomial of the species as well (e.g., *Genus species*), as well as a specific strain if applicable (e.g., C57BL6J mice). Note, the *Genus* name is always capitalized whereas the *species* name is not (both are in italics).

Lastly, *animals* (rats, monkeys, starlings, etc.) is rarely the most important noun in a sentence. Most sentences beginning with these words can be changed to emphasize the important concept and be made clearer.

Approximately. This word is often used in a redundant fashion. For example, it is not “approximately 7-10 samples”; use either “approximately 10 samples” or “7-10 samples”, but not both.

Anticipate versus expect. *Anticipate* means more than expect. If you *anticipate* something, you take action in preparation for it.

Authors are not as important as results, unless history, rather than science, is the focus. For example, “Infusions of vasopressin increase resident-intruder aggression (Smith, 1984)” is preferable to “Smith (1984) showed that (demonstrated that) infusions of vasopressin increase resident-intruder aggression.”

Average is a term that is too vague for science writing because it can indicate mean, median, or mode. Always specify the type of average, which means never use the term “average”.

Basically is almost always useless. Qualifiers such as *basically*, *essentially*, *totally*, etc. rarely add anything to a sentence; they're the written equivalent of “Um.”

Begging the Question. It does not mean what you think! “Begging the question”, from the Latin *petitio principii*, is a logical fallacy; it means assuming your conclusion in the course of your argument. If you say “Everything in the Bible must be true, because it's the word of God,” you're taking your conclusion for granted. If you say “The defendant must be guilty because he's a criminal,” you're doing the same. It's a kind of circular logic. The conclusion may be true or false, but you can't prove something by assuming it's true. This is very different

from *raising* the question, though people are increasingly using the phrase that way. It's sloppy, and should be avoided. In fact, it should not be used in scientific writing, regardless of its intended meaning.

Being That. An overused idiom (probably coming from "it being the case that"), favored by those who want to sound more impressive. Avoid it. Use *because* instead.

Between versus among. *Between* is used to compare two things, such as species (e.g., "differences between male starlings and juncos in song production..."). If you are comparing more than two things, then *among* should be used (e.g., "sex differences in spatial memory among five species of arvicoline rodents"). One exception is if you are comparing *more* than two things, but you are considering several of them as one group (e.g., "the difference between house mice and other rodents...").

Bi- versus semi-. *Bi* means two, *semi* means half. Thus, *bi-monthly* means once every two months; *semi-monthly* means twice a month. The same logic holds true for daily, weekly and annual.

Both can usually be avoided. (e.g., "both wild-type and knock-out mice..." should simply be "wild-type and knock-out mice...")

But at the Beginning? Contrary to what your high school English teacher told you, there's no reason not to begin a sentence with *but* or *and*; in fact, these words often make a sentence more forceful and graceful. They are almost always better than beginning with *however* or *additionally*. Beginning with *but* or *and* does make your writing less formal.

cf. is an abbreviation for the Latin word *confer*, meaning "compare" or "consult." It is mainly used in academic writing to indicate a reference to a contrasting finding or viewpoint (it is often used instead of "but see"). It can also appear occasionally in binomial nomenclature by placing before the species name to indicate that the species is not confirmed.

Can refers to "is (are) able" and should not be confused with *may*. Use this simple rule: *can* for ability or power to do something, *may* for permission to do it.

Careen versus Career. *Careen* does *not* mean "to lurch or swerve speedily"; the word for this is *career*. *Careen* means "to tilt to one side", as in a ship.

Colloquium is a formal talk or seminar and the singular of *colloquia*. There are many *colloquia* in a *colloquium* series.

Compared to is almost always used incorrectly in science writing. If you are comparing items of the same general order (e.g., apples vs. cherries, control vs. castrated hamsters), the correct wording is *compared with*. *Compared to* is reserved for comparisons of different orders (e.g., "traditionally, the drama has been compared to a battle, whereas a comedy has been compared to a festival").

Comparisons should always be of like elements (e.g., "adrenalectomies, unlike control

mice, impaired performance" is incorrect). The comparison of apples and oranges pales against the comparison of adrenalectomies and normal rats!

Compliment versus complement. These two words are often confused. *Compliment* is a noun or verb that is an expression of praise. *Complement*, however, is to supplement or complete. It is also the correct name for the collection of proteins constituting part of the innate immune system.

Comprise means "embrace", not "composed of". The word *constitute* is almost always more appropriate when referring to the composition of something.

Concept versus idea. An *idea* is simply a thought with no tangible product. A *concept* has been made more concrete by providing an outline or prototype of the idea.

Consistent versus constant. *Consistent* means regularly occurring; *constant* means unending.

Continuous versus continual. *Continuous* means unbroken; *continual* means repetitive, but not necessarily continuous.

Control data should always be presented first. The results of experimental manipulations can be evaluated only when they are compared with the unmanipulated baseline. Also, always compare your experimental results with those of the control, not the other way around (e.g., "estrogen-treated lizards displayed more social behavior than control lizards"; not "control lizards displayed less social behavior than estrogen-treated lizards").

Criterion performance is often incorrectly stated in an abbreviated form. A criterion of "8 out of 10 correct responses" is meaningless. Obviously, if 10 responses were correct, 8 of them must also have been correct. The correct statement is "a criterion of 8 correct responses in 10 consecutive trials."

Dangling phrases can often be amusing, and usually result from a failure to use direct language. "Scurrying down the alley, I observed the mice vigorously searching for food." Hmm...do you scurry often?

Dangling prepositions. Ah! To dangle or not? Many of us were taught in grade school not to end a sentence with a preposition (e.g., about, across, against, as, at, by, for, from, in, on, out, over, through, to, toward, under, up, with, etc.). In fact, some have also heard the famous retort by Winston Churchill in response to an accusation of dangling his prepositions: "That is something up with which I will not put." What Churchill's statement makes clear is that there is no hard-and-fast rule about avoiding dangling prepositions. In many cases, the dangling preposition makes the sentence structure clumsy: "Where is it at?", "Which staircase should I climb up?" These should simply be "where is it?" or "which staircase should I climb?"

Data, like *strata*, *media* and *phenomena*, is a plural word; always use the appropriate plural verb with it. You should say "These data suggest..." or "the data are indicative of..." Also, be careful not to confuse phenomenon (singular) with

phenomena (plural). (e.g., "This phenomenon occurs"...but "these phenomena occur...").

Department is capitalized if you refer to a specific department (e.g., Department of Biology, Chemistry Department), but is lower-cased when used in the generic sense (e.g., many departments).

Die of, die from. Organisms die of a disease, not from a disease.

Different than. Things differ *from* one another; the use of "different from" is more appropriate than "different than."

Discrete versus discreet. *Discrete* means separate, as in a variable; *discreet* means prudent and is rarely used in science writing.

Disinterested versus Uninterested. The words are often used interchangeably, but traditionalists prefer to keep them separate. Both mean "without interest," but "interest" has several meanings. Disinterested means "without a stake in", without a bias, impartial. Uninterested means "indifferent" or "without a care about", you just don't give a damn.

Dissociate versus disassociate. Both words mean to separate from, but the former is more proper in scientific writing.

Distinguish versus differentiate. To *distinguish* is to perceive differences; to *differentiate* is to point out differences.

Each versus every. If I had a dollar for *every* mistake I made, how much would I have? The answer is one dollar. If, however, I had a dollar for *each* mistake I made, I would be rich.

e.g. versus i.e. These are often misused. The former is the Latin abbreviation for *exempli gratia* (for example) and should be reserved for true examples; the latter is Latin abbreviation for *id est* (that is to say) and is used to introduce a similar idea. For example: "Photoperiod (*i.e.*, day length) is the primary cue used..."; nocturnal rodents (e.g., deer mice) undergo..."

Enormity. *Enormity* is etymologically related to *enormous*, but it has a more specific meaning: it's used for things that are tremendously wicked or evil. You can use it to describe genocides and other related events, but it's not the same as enormousness or immensity. Saying things like "the enormity of the effect of the drug" when you mean simply the great size of the effect might scare people from using that drug!

Entitled versus titled. *Entitled* does not mean "the title of"; you want to use title in this case. So, it is "Frank Beach's book, titled *Hormones and Behavior...*", not "Frank Beach's book, entitled *Hormones and Behavior...*")

Estrus versus estrous. *Estrus* is the noun form, whereas *estrous* is the adjective form. Thus, it is “animals displayed postpartum estrus”, but “the estrous behavior of rats was measured.” In case you were wondering, it should be “estrous cycle”.

Every day. When you are referring to all days, use *every day* as two words. In contrast, the single word *everyday* mean commonplace or ordinary (e.g., its an everyday occurrence).

Fancy words are not typically very useful. The purpose of science writing is to explain to the readers what was done in a way that all can understand, not impress others with your tremendous vocabulary. Although in some cases a less-commonly used technical word imparts more precision (e.g., *virgin* is not the same as *nulliparous*), the simpler word is almost always preferred if it does not affect the intended meaning (e.g., *daily* instead of *quotidian*; *day/night* instead of *nycthemeral*).

Farther versus Further. Though very few people bother with the difference these days, there is a traditional distinction: *farther* applies to physical distance, *further* to metaphorical distance. You travel *farther*, but pursue a topic *further*. Don't get upset if you can't keep it straight; no one will notice.

Feasible versus possible. A technique or procedure may be *possible*, but not *feasible* if the costs (e.g., time, money) are too high.

Female versus women. At the risk of violating political correctness, use *women* as a noun and *female* as an adjective. For example, it is “female soldiers” but “women in the armed services.” Also, *female* is used for non-human animals (e.g., female hamsters).

Fever versus temperature. All animals have temperatures; a fever is present only when the animal is sick.

Few versus less. Use *few* (or *fewer*) for things that can be counted; *less* for things measured in other ways.

Fish. Did I catch three fish or three fishes when I went fishing last week? The answer is...it depends. If it is three fish from three different species, it is three fishes, if it is three rainbow trout, it is three fish. For example, in a paper comparing stickleback to beta splendens, then the use of “these fishes” is acceptable. If, however, you used 10 stickleback in your study, then you used 10 fish.

Following, prior to. The more simple yet elegant words *before* and *after* are almost always more suitable and less wordy than *following* or *prior to*. Sometimes, however, that latter are more suitable because they suggest a cause-and-effect-type relationship not contained within *before* and *after*.

Forego versus forgo. *Forego* means “to go before”. If you mean that something is being given up or someone is going without, you mean *forgo*.

Fortuitous. Fortuitous means "happening by chance," and not necessarily a lucky chance. Don't use it interchangeably with *fortunate*. Breaking your arm can be *fortuitous* (and not just because it gets out of taking notes in class).

Found, observed, showed, demonstrated are often unnecessary. "Exogenous testosterone impaired humoral immunity" is preferable to "Exogenous testosterone was found to impair humoral immunity". Obviously, if you know the result, somebody found it. Unless you want to emphasize history about the process of finding, the result is important, not the process.

Founder versus flounder. To *founder* is to sink, to *flounder* is to struggle clumsily.

Gender is not the same thing as *sex*! *Sex* refers to the biological makeup of the animal (most often the genetic sex, but it can be the morphological sex in species with environmentally determined sex). *Gender* is a truncated version of the clinical term, *gender identity*, coined by Dr. John Money to reflect the sex which people most identify themselves with. Thus, there is an implicit cognitive component to the term. Unless you have devised a way to assess which gender your bird, lizard, mouse or hamster most associates itself with, use the term *sex*. Use *sex* for humans unless you are making an explicit point about one's gender identity.

Grow (grew), as a transitive verb, refers mainly "to raise or cultivate", not "to expand or increase in size". It is almost always better to replace *grow* with the more appropriate *increase (increased)*.

Headings are an excellent way of organizing material. The headings can help organize the writer's thoughts, and make the writer's intentions clear to the reader. Three levels of headings are commonly used. These are as follows:

First Order

Second Order

Third Order. The paragraph starts here. Organization of these headings into the appropriate categories is important so that the appropriate hierarchy is maintained. Often, writing down just the headings, without the text, is necessary to be certain that the appropriate was used for each heading.

Highly significant. Results are either statistically significant or not (based on the critical value you have chosen *a priori*). A smaller p value (e.g., $p < 0.0001$) is not "more significant" than a higher one (e.g., $p < 0.049$).

However should never be placed at the beginning of the sentence if you are using it to mean *nevertheless*. When *however* appears at the beginning of a sentence, it means "in whatever way" (e.g., "However you decide to do it is alright with me").

Hypothesis. The correct use of this word is a *hypothesis*, not an *hypothesis*. *An* is only used for words beginning with *h* that have a silent “h” sound (e.g., an honor). Some people claim that they pronounce *an hypothesis* without the “h” sound, but that’s because the “an” gets in the way! Try saying *hypothesis* without the “an” and I doubt you hear yourself saying “eye-pothesis”!

If...then... is an excellent construction to present the logic of a prediction and experimental design. It is far preferable to forms that leave out the “if” clause (“lesions ought to impair behavior,”) and to constructions that emphasize the expectation of the individual (“we expected that...” or “Smith (1984) predicts that...”). An idea should be evaluated on the merits of its logic, not on the merits of the individual making the argument.

Imply versus infer. These words are not interchangeable. Something that is *implied* is suggested, but not expressed. Something *inferred* is deduced from the available evidence.

Importantly, although not technically incorrect (please excuse the double-negative), is often abused (how important is it really if you have to tell them it’s important?). The sentence can typically be re-worded to avoid its use.

Inflammable versus Flammable. Despite appearances (and a very funny bit by Homer Simpson), they mean the same thing. In many words, the “in-“ prefix means “not” (think of inedible, indirect, or inconceivable).

In other words. This phrase typically suggests that the previous sentence is vague or unclear. Although it can be used to clarify certain important points, you should consider it as a potential “red flag” that the previous text needs re-wording.

In terms of can usually be avoided. (e.g., experimental and control groups did not differ in terms of the number of...” should be “experimental and control groups did not differ in the number of...”

Irregardless. There is no such word! The word is *regardless*. True, some dictionaries list *irregardless* as an option. If you read closely, however, you’ll notice it is typically indicated as being slang or colloquial (These dictionaries also list the word “crap” as well). Keep in mind, most dictionaries are descriptive, not proscriptive. Just because a word is listed, does not make you exempt from being considered an ignoramus if you use it in formal scientific writing.

Issues are most important, previous experiments are subordinate. A good issue is worth examining even if no one has studied it before. A bad issue is not worth examining even if many people have studied it before. Introductions should present issues first, previous experiments (if any) second.

It is always incorrect to start a sentence with the impersonal form of it. The word is meaningless. Delete “it” and substitute the important noun.

Its versus it's. These words are often confused. Despite looking like a possessive, *it's* is a contraction of "it is" (e.g., "it's cold in here!"), whereas *its* is the correct word for the possessive form of it ("the dog lifted its head").

Italics should be used for all non-English words and their abbreviations, including *ad libitum*, e.g., *i.e.*, *in vitro*, *in vivo* and species names (*Genus species*). Italics can also be used to emphasize key words (e.g., the results suggest that the suprachiasmatic nucleus is *critical* for...) but it is best to do so sparingly.

Lead sentences in a paragraph can make the organization of the entire paper more clear. Placing the "bottom line" at the top provides the framework in which to understand the subsequent analysis.

Leading nouns in a sentence can help organize ideas. A sentence should begin with the most important information. "Sheep with thalamic lesions were impaired in sensory processing" is a good construction if the results from sheep are being compared with those from monkeys, but a bad construction if thalamic lesions are being compared with amygdala lesions in sheep. Likewise, "thalamic lesions in sheep impaired sensory processing" is a good construction if the comparison is of thalamic and amygdala lesions in sheep, but a poor construction if the comparison is between thalamic lesions in sheep and thalamic lesions in monkeys.

Less versus fewer. *Less* means "not as much" and is used for non-countable things (anxiety); *fewer* means "not as many" and is used for countable things (coins, siblings) (e.g., "long-day animals were *less* aggressive than short-day animals" but "long-day animals displayed *fewer* attacks than short-day animals.").

Like is not the same as *as*. *Like* governs nouns and pronouns and should be used only as a preposition; *as* should be used as a conjunction. Something can be *like* something else (there it's a preposition), but avoid "It tastes good *like* a cigarette should" — it should be "*as* a cigarette should." Quick test: there should be no verb in the phrase right after *like*. Even in phrases such as "It looks like it's going to rain" or "It sounds like the motor's broken," *as if* is usually more appropriate than *like*.

Literally literally means literally. Use the word *literally* with care, and only where what you are saying is literally true. "We were literally flooded with work" is wrong because the flood is a metaphorical one, not an actual deluge. Don't use *literally* where *really*, *very*, or *extremely* will do.

Mass versus weight. *Mass* is an absolute measure whereas *weight* is the mass of an object at a given force of gravity. Because the earth's gravity is approximately 1 m/s², science tends to report masses rather than weights, so use body *mass* rather than body *weight*.

Minimize versus diminish. To *minimize* is to reduce something as much as possible (e.g., variability). To *diminish* is to reduce something by an indefinite or unspecified amount.

More, greater, higher are often misused in science writing. If these words are being used in the comparative degree, they must be compared to something (e.g., “male mice display *more* aggression *than* females”).

Nauseous. *Nauseous* means causing nausea, not suffering from it. The word for the latter is *nauseated*. A decaying carcass is *nauseous*, and (unless you have odd tastes) will probably make you *nauseated*.

Neither should be used in reference to two items and no more. It is accurate to say, “neither the cortex nor the hypothalamus expressed c-fos” but not “neither the cortex, limbic system nor hypothalamus...”

Noun phrases are a difficult form of communication for the reader. Typically, adjectives modify nouns, nouns do not modify nouns. Sometimes, a noun phrase with two nouns may be acceptable. More than that is almost always inappropriate.

Numbers. One-digit numbers should generally be spelled out (e.g., three, eight); two-digit numbers can be written as numerals (e.g., 11, 23). An exception is made for standard units of measurement, which should be always written as numerals (e.g., 3ml, 10g), except when beginning a sentence (“Three ml of chemical X was added” or “Chemical X (3ml) was added”). Note that the singular verb “was added” is used even if the amount is greater than 1 (e.g., 3g); “3 g were added” is incorrect because a only single amount is added, regardless of how big this amount is. Lastly, if a sentence contains a series of numbers with at least one being a digit, then digits should be used of all of them. (e.g., hamsters received 10 days of training and 2 days of testing”).

One of the most is one of the most abused phrases in science. Something is the most or it is not; it is not “one of the most”. This phrase typically suggests a conflict within the writer between “hyping up” one’s findings and “softening” the initial hyperbole. The phrase is best avoided. Try using “one of the more...” if you must use something.

Only is often misplaced. Only I went to the store. I went only to the store. I went to the only store. Typically, “only” is placed too early in the sentence. Make certain it modifies the appropriate item.

Over primarily describes the physical position of an item with respect to another. “During ten days” or “for ten days” is preferable to “over ten days”.

Paradigm is not the same thing as a method, technique or model! As defined by Thomas Kuhn, a paradigm is a “world view” that guides current thinking and

experimentation in a scientific discipline. Thus, it is a resident-intruder *model* or delayed discrimination *procedure*; these are not paradigms.

Parallel construction is always to be preferred. If two phrases are discussing the same point and making a comparison, the form of the phrases should be identical. "Splenectomies impair humoral immunity; whereas thymectomies impair cell-mediated immunity" is preferable to "splenectomies impair humoral immunity, whereas cell-mediated immunity is impaired by thymectomies".

Period is almost always unnecessary. Period. Replace "a two-day period" with "two days" or "a period of 10 weeks" with "10 weeks."

Principle versus principal. *Principal* can be either an adjective or a noun; *principle* is strictly a noun.

Principal (adjective): chief, main, leading, most important.

Principal (noun): the most important person or group of people ("After much debate, the two principals reached an agreement"); the head of a school (the principal person in the administration); borrowed money (as distinct from interest).

Principle (always a noun): a rule, standard, law, guideline, or doctrine.

Pronouns are almost always inappropriate unless you are telling a personal story. That you are involved in the enterprise is not directly relevant to the scientific merit of the discussion. (but see **Voice**).

Quite is often used in science writing. With rare exceptions, *quite* is quite unnecessary as it is quite vague.

Quotations in science writing are usually reserved for unusual or atypical phrases or colloquialisms (e.g., energetic "bottleneck"; "tradeoffs"). If you are quoting passages of text from other authors, it suggests that you do not have a good grasp of what this author is suggesting. These kinds of quotes are best avoided. *Important Note:* Even if published text is re-written in your own words, the original source must still be cited; failure to do so is plagiarism. A note from the esoterica department: "quote" is actually an abbreviation for "quotation."

Reason is because is a redundancy. Use "reason is that" instead.

References. It depends on the journal, but typically "&" is used to separate authors when the reference is parenthetical, but "and" is used if the reference is outside parentheses. Also, "et al.", is used when there are three or more authors. "Previous research (Smith & Johnson, 1993)...", "Smith and Johnson (1983) found...", "These results (Smith et al., 1983)."

Repeated phrases usually indicate that the sentence has not been constructed appropriately. The construction should be changed so that the phrase occurs only once, followed by all of the appropriate items. For example, the phrase “as discussed above” is usually an indicator that the author is being redundant and attempting to apologize for it rather than simply fixing the problem.

Sacrificed. Unless you performing some important pagan ritual before overdosing your experimental subjects, this word is inappropriate and the more straight-forward word, *killed* should be used instead. The more technical word *euthanize* is acceptable for those of you apposed to killing.

Serial (Oxford) comma. In most style books, the comma is suggested before the last item in a list: "the first, second, and third chapters. Leaving it out, "the first, second and third chapters", is a habit picked up from journalism and is considered acceptable. While it saves some space and effort, omitting the final comma runs the risk of suggesting the last two items (*e.g.*, the second and third chapters) are some sort of special pair. A famous dedication makes the danger clear: "To my parents, Ayn Rand and God." This is a matter of personal choice (I admittedly leave the Oxford comma in Oxford).

Showed (demonstrated, etc.) is almost always unnecessary. "This research showed that the thymus is involved in immunological memory" can be written as a stronger sentence stating the only conclusion: "The thymus is involved in immunological memory."

Since refers primarily to the passage of time, and not logic. When logic is involved, the correct word is *because*. "Because ventral pallidum lesions impair social behavior, they should disrupt pair-bonding" is preferable to "since ventral pallidum lesions..."

Singular is usually more accurate than plural. "Rats were trained to criterion ..." might mean that the group was trained until the mean performance of the group reached the criterion, or until each rat reached criterion. Those plural statements can be replaced by singular, correct ones: "Each rat was trained ..." An even better statement is to emphasize the important point about the criterion. "Criterion performance was ..."

Site versus cite. *Site* is a location and is typically used as a noun (*e.g.*, a site license); *cite* means to call attention to, as in a reference or citation, and is used as a verb.

So as to. Often the word *to* alone will do the trick.

Species. The singular form of species is...*species*, not “specie” or specy”. Whether it’s one species, two species or more, the word is still *species*. (Note: the word is pronounced “spee-sees”, not “spee-shees”)

Split infinitives occur when and adverb is placed between “to” and the infinitive. For example, “to carefully test...” should be “to test carefully”. In many cases,

the adverb is not needed and can simply be removed (e.g., “to test...”). It is important to note, however, that it is not grammatically incorrect to split one’s infinitives, despite the prevailing myth. In many cases the split infinitive form sounds less clumsy than the alternative (e.g., to boldly go where no man has gone before” versus “to go boldly...” The best strategy is to use what sounds best.

Strong inference is the guiding principle for all scientific research. The object is to exclude one or more alternative explanations so that the field of possible explanations can be reduced. An experiment is worth doing only if it is capable of providing information that will refute an idea (see Platt, Strong Inference, *Science*, 1964)

Strunk and White, *The Elements of Style*, is a classic short text on style. It should be read and followed by everyone.

Suggest and may are both used to indicate that a finding is less than definitive. There is no need to use both “hedge words” in the same sentence (e.g., the results *suggest* that testosterone *may*...). Such usage only weakens the sentence.

Tense should be consistent, but this can be tricky in science writing. The commonly accepted protocol is that procedures and results of the present study are described in the past tense (tissue was incubated for 1 hr). Previously published and validated results are described in the present tense as they have presumably become knowledge (e.g., stress suppresses immunity). Conclusions and implications may also be in the present tense.

Than versus then. These words are quite often confused. Than is a conjunction or preposition used in unequal comparisons; then is (usually) an adverb indicating time or consequence. Be careful not to confuse them: something is bigger than something else; something happens then.

That versus which. The relative pronoun *that* is restrictive, which means it tells you a necessary piece of information about its antecedent: for example, "The word processor *that* is used most often is MS Word." Here the *that* phrase answers an important question: which of the many word processors are we talking about? And the answer is the one that is used most often.

Which is non-restrictive: it does not limit the word it refers to. An example is "IU’s student union, *which* is called the IMU, has been successful so far." Here *that* is unnecessary: the *which* does not tell us which of IU’s many IMUs we’re considering; it simply provides an extra piece of information about the plan we’re already discussing. "IU’s student union" tells us all we really need to know to identify it.

It boils down to this: if you can tell which thing is being discussed without the *which* or *that* clause, use *which*; if you can't, use *that*. In general, if the phrase

needs a comma, you probably mean *which*. Go on a "which" hunt to be certain that the correct word is used.

This, there, these, that should always be followed by a noun. This is to make certain that individuals understand the item referred to by these words.

Though is an acceptable short-hand for *although* in informal writing, but stick with *although* in scientific writing.

Titles of manuscripts should be proactive and descriptive. It is better to state that "Infusions of melatonin increase aggression in prairie voles" than "Effects of melatonin infusions on aggression in prairie voles". The latter is acceptable for conference abstracts when the exact finding is not known at the time of submission.

Toward versus Towards. They're interchangeable. *Toward* is a little more common in America, and *towards* a little more common in Britain; but both forms are perfectly acceptable in either place.

Try And. "Try and" is common enough in speech, but it's out of place in formal prose. Use "try to" instead.

Under refers primarily to the relative position of two items. See comments for *over*. A common misuse of this term is to describe an animal as "under anesthesia."

Undoubtably. There is not such word; the correct word is *undoubtedly*.

Utilized can almost always be replaced with *used*.

Varying is not the same as *various*. *Varying* means "changing" and is often used incorrectly when *various* is meant instead. For example, "various concentrations" should be used instead of *varying concentrations*; the concentration itself does not change with time.

Voice. The active voice is almost always more precise and less verbose than the passive voice. Although for years it was considered taboo to use "I" or "we" in science writing, the recent emphasis on the active voice has made usage of these pronouns acceptable. Do not be afraid to use them.

With respect to, with regard to. Vague and verbose; best avoided.

While refers to the passage of time, not some aspect of logic. (e.g., "While you were away, I cleaned the garage") "Whereas" is appropriate for the logical statement. (e.g., "The bottle-nose dolphin is a mammal, whereas the stickleback is a fish.")

Who versus whom. While it's possible to memorize a rule for distinguishing who from whom, it's easier to trust your ear. A simple test to see which is proper is to replace *who/whom* with *he/him*. If *he* sounds right, use *who*; if *him* is right, use

whom. For example: since he did it and not him did it, use who did it; since we give something to him and not to he, use to whom. It gets messy only when the preposition is separated from the who: Who/whom did you give it to? Rearrange the words in your head: "To whom did you give it?"

Whose should refer only to a person. For example, the statement "the field of endocrinology, whose goal is to..." is incorrect. It should be changed to "the goal of endocrinology is to..."

Whose versus who's. A confusing pair, like its and it's. Whose means "of whom" or "belonging to whom"; who's is a contraction of "who is" or "who has."

Words; the fewer, the better.