PNIS EDITORIAL

Guide to understanding scientific writing. I. Abbreviations

Office of the Copy Editor[1]

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Prologue: *Reading a scientific paper can be daunting and frustrating, especially if you are unfamiliar to the various conventions of scientific writing. This multipart series of articles is designed to introduce the virgin reader to these idiosyncrasies and decrease communication barriers between science and the public.*

The novice reader of scientific literature is probably familiar with the basic components of a scientific paper (e.g., Title, Abstract, Introduction, etc.) and their purposes. The same novice reader is probably less familiar with some common abbreviations favored by scientists in their writing, such as *et al.*, spp. or *cf.*, or at least are unsure of their proper usage. Thus, PNIS is proud to begin our Guide to Understanding Scientific Writing with an in-depth explanation of the common abbreviations of scientific papers.

We've ordered the following abbreviations based on how frequent each abbreviation has been used in published scientific papers (so, thus, how often you are expected to encounter them). Frequency of use was obtained from a Google Scholar search for that exact abbreviation (e.g., a search for "e.g.")[1].

et al. (9.45 million results)

What's it stand for? – *et alii*, which is Latin for "and others".

Is it really necessary to abbreviate alii *to* al.*? You're only saving one character space* – Yes, space in journals comes at a premium. For every 1 million abbreviations of *alii* to *al.*, a journal can typically publish one more paper. Do you really want to tell that graduate student that your journal didn't have room for their paper because you wanted to use *alii*, you pretentious snob?

How's it used? – When a scientist wants to cite a paper, they usually put the last names of the author and year of the paper in parentheses, like "(Smith and Jones 2013)". Scientists are generous folk, though, and often invite many people to be authors (e.g., this one has over 200. Check it carefully, you actually might be an author). So instead of making a scientist type all 200 of those names and take up all that precious journal space when they want to cite that paper, they're allowed to use *et al.*, for example "(Böhm et al. 2013)".

Wait, shouldn't you have italicized et al. *just then?* – Some journals want you to italicize the *et al.*, while some don't. Some journals want you to use *et al.* when there are 3 or more authors, while some want you to use *et al.* when there are 4 or more authors. And then there are sadistic journals that want you to type all 3 authors the very first time, and then use *et al.* after that.

Why is none of this standard? – Mostly because the journal companies are often owned by liquor industries.

What's the policy at PNIS? – We don't care.

sp. (5.23 million) or spp. (2.17 million)

What's it stand for? – Species, which comes from the Latin *species*, meaning "appearance". In this context

1 Please note that such a search for "e.g." or any two letter abbreviation would also return results for an author with those initials (for example, E.G. Jones), so the estimates given here are likely to be overestimates).

species refers to the taxonomic rank of organisms.

How's it used? – In a scientific paper, species are denoted using their genus and species designations (e.g., for humans, this would be *Homo sapiens*). Sometimes, a scientist doesn't know exactly what species they are working with, so they use "sp." or "spp." (the plural form; used when there are multiple unknown species of the same genus) to denote that the organism belongs to a particular genus, but its species cannot be determined. For example, if they are working with many species of oak trees, but are unsure of exactly the species name, they would use *Quercus* spp.

Wait, why would a scientist not know what species they're working on? – Well, actually, scientists don't really agree on what a species even is. In fact, one scientist counted at least 26 different definitions for "species". This confusion makes it difficult for scientists to confidently ascribe a species name to an organism, especially if that organism closely resembles another species. Also, we should note that "sp." or "spp." is never italicized. And that instead of "spp.", some people use "sps.".

Sometimes, I see "ssp."; is that another version of "spp."? – No, "ssp." is an abbreviation for subspecies, which is another type of taxonomic rank that is below species.

Well, are you going to talk about "ssp."? – No. That (along with other types of abbreviations, such as "var.") will be covered in an upcoming article: Guide to understanding scientific writing. XVI. Scientific nomenclature of plants, animals, fungi and viral genes.

etc. (6.71 million)

What's it stand for? – *et cetera*, which is Latin for "and other things" or "and so on".

I know this one! It's used to shorten long lists – Yes, that's correct.

But how is it different from et al.*?* – Well, you use *et al.* for lists of persons and *etc.* for lists of things. We don't want to associate ourselves with things, now.

That's easy to remember – Yes, it is. I should also mention that an alternative form of *etc.* is &*c.*

What? – Yes, &*c.* And it's actually quite common, having 1.79 million search results from Google Scholar.

Well, can et al. *also be written as* &al.*?* – Yes, it can, but it's not used very often (only 0.19 million results), and, unlike &*c.*, the convention is to put a space in between & and *al.*, so like & *al.*

Is there a specific reason for the space? – I'm sure there is; scientists never do anything without a specific reason. We don't know what that reason is, but it's best just to trust that they know what they're doing.

i.e. (6.48 million)

What's it stand for? – *id est*, which is Latin for "that is".

How's it used? – to clarify or rephrase a statement. Scientists usually write a complicated phrase and then use *i.e.* to show how that phrase could have been written simpler. This is their way of reaching out to non-scientists.

Do you have an example? – Here's two: "This quantity, associated with the measured reflectivity at the less attenuated wavelength (i.e. the longest one)…[2]" and "We conclude that long-distance runners who pace themselves with intermittent moderate intensity activity (i.e. slow jogging or walking)…[3]"

Why include both? Why not just replace the complicated phrase with the simple phrase? – I can tell you're not a scientist.

e.g. (5.03 million)

What's it stand for? – *exempli gratia*, which is Latin for "for example".

Why don't they just use "for example" or "ex."? – Haha, you're funny. I like you.

How's it used? – When a scientist wants to give three, and exactly three, examples of anything.

Wait, why three? – It's a law (we're not sure, but it might be one of Newton's Laws of Motion).

So, what if a scientist has only one or two examples? – Then they use *i.e.*.

But, doesn't i.e. *mean something completely different from* e.g.*?* – Yes, it does, and this has actually been a point of confusion for many scientists (see here for a nice explanation), and many times you see them use *i.e.* and *e.g.* interchangeably (and incorrectly). But you can't really expect scientists to keep up with proper gram-

2 Louf V. 2014. The Dual-Wavelength Method for Hailstorm detection by airborne radar. Geosciences and Remote Sensing. Vol PP, page 1-9.

3 Durocher B et al. 2014. Influence of intensity on acute aortic pulse pressure and central arterial stiffness in long-distance runners. The FASEB Journal 28:705.4

matical techniques while doing serious, groundbreaking research, can you?

cf. (3.85 million)

What's it stand for? – confer.

Finally, a non-Latin word! – Well, no, *confer* is latin for "compare".

Son of a…okay, how's it used? – When you want to point out a specific comparison. Think of it as shorthand for "see, by way of comparison".

Why not just say "see"? Isn't there a Latin word for "see"? – Well, *video* is Latin for "see", but scientists just write "see" instead of *video*, as in "see Jones and Smith 1998".

What!? Why don't they use the Latin form? – It was mathematically proven in a 1961 paper that scientists can only remember a certain number of Latin abbreviations. Sadly, *video* didn't make the cut.

eq. (3.43 million)

What's it stand for? – equation. An honest, English word.

Thank you. – …which comes from the Latin *aequatio.*

You just couldn't resist, huh? – No.

How's it used? – Simply just an abbreviation for "equation".

That sounds pretty simple. – It is, it's probably the most straightforward abbreviation on our list. Unfortunately, you'll never need to know it because the odds of you wanting to read a scientific paper with equations is close to nil.

They can't be that bad. – They are. Not even scientists can understand most equation-laden papers.

viz. (0.904 million)

What's it stand for? – *videlicet*, which is Latin for "that is to say", and is shorthand for *videre licet*, which is Latin for "it is permitted to see".

What's with the "z", then? – We don't know, but we assure you that dedicated scientists are working on this now.

How's it used? – Mostly used to clarify or expand upon a statement.

Wait, that's exactly how you said i.e. *is used!!* – Well, yes, that's true, but *viz.* is different because it's mainly used to clarify a statement by introducing a list or series.

Like give examples? – Yeah, something like that.

BUT THAT'S WHAT e.g. *DOES!!!* – Hmm, yes. I can see the confusion, but *viz.* also implies that the examples given are all the possible examples, like all the planets in our solar system.

*I'm beginning to hate these abbreviations (*viz. e.g.*,* i.e.*, and* viz.*)!* – There, you've got it!