

satisfied with the standard of your work, format the paper in the style of the journal. Then give the article to your co-authors or some colleagues and ask them to comment on the scientific content, pointing out errors of logic and interpretation, noting where your writing is clumsy, and recommending further improvements.

4.8 Revising language and style

By now, you should be confident of the science in your article. Next, you need to look at the language and style, so that the paper can be read and understood easily. This is one of the things that editors will be looking for. Use a spell checker; however, most grammar checkers cannot handle scientific text very well, without “training” (see Chapter 5 on writing English).

4.9 Check the references

At this stage, you must check that all the references listed are mentioned in the text. Then look at it the other way around, and check that all the references in the text are included in the reference list. If you are using a “reference assistant” program such as EndNote, then this process is easier, but you may be doing it manually. If you are using the numbering system (see Chapter 7), tick each reference in the list as it is cited in the text, and carry on. Make sure that all references are numbered in the order they are mentioned. If you are using the name/date system (see Chapter 7), you have to be more careful. Check first that the references in the list are in the correct order, either in order of citation or, more commonly, in alphabetical order. Check then that the spelling of the authors’ names in the text corresponds with that in the list. If they are not the same, check the original, and also check the date.

How many authors are there in the reference? If there are two, then both names should be given in the text. If there are more than two (or sometimes three) names in the reference, you should use the first author’s surname and “*et al.*” in the text (see Chapter 7). Should *et al.* be in italics? That is another question you should answer by looking in the journal. Is the date in the text the same as that in the list? Should you also be using a, b, c to distinguish references by the same authors from the same year?

Work through and check every page of the typescript and every reference. When you have finished, check that you have ticked every reference in the list. If some are not marked, then you should go back and look again to see where they should be cited in the text, or delete them. Then, when you have done all that, go back and check with the original reference, wherever possible, to make sure that all the information in the reference is correct.

4.10 Handling the figures and tables

See Chapters 8 and 9 on how to prepare figures and tables. Chapter 10 deals with statistics in your paper, but check in the publishers’ Instructions to Authors on how to handle your tables and figures. You may have to collect all the tables at the end of the paper and submit all the figures as separate files. Many authors prefer to paste their figures into the computer file where they are mentioned, but this may cause problems for the publisher. Check on the journal’s website.

4.11

The final manuscript

Remember that the journal will expect you to prepare your paper according to the instructions of the journal. You might not think this is very important, but the journal editor will. You only have to worry about your own article; the editor has to worry about the whole journal. The editor wants all units, abbreviations, etc. to be the same in every paper in the journal. That is, the editor is looking for consistency throughout the journal.

Look again at the journal and its Instructions to Authors. Some of these are very detailed. Note how wide the margins of the page must be, the line spacing, whether headings should be on the left or in the middle of the page, how to indicate bold face and italic letters, etc. Number the pages and insert a header in the computer file that includes your name and a short title of the paper.

On the title page, make sure that you have given a title, the correct spelling of the authors' names, an accurate list of authors' addresses, an abstract, and keywords if required. You should also make clear on the manuscript to whom the proofs of the paper should be sent. That is, who is responsible for the paper and who the editor or publisher should contact. If you do not state it, then the publisher will assume it is the first author on the title page.

4.12

Preparing a covering letter

Some journals ask for a covering letter that gives basic information, such as contact details of the corresponding author, the title and authorship of the paper. You might also be asked briefly to describe the specific area of the paper and the scientific strengths that qualify it for consideration by the journal. The editor will use this information to check that the paper is within the scope of the journal, and which referee to send it to.

4.13

Submitting the paper

Many journals today actively encourage you to submit your paper by email (see Chapter 15). It is faster than posting manuscripts around the world. Check on the journal's website how to submit a paper electronically. Some journals have their own on-screen submission forms. These might take a while to complete, so be sure you have enough time on the computer to complete the procedure, and all the files you need, in the correct format. Note, for example, that the *American Journal of Agricultural Economics* will accept manuscripts only in pdf format (<http://ajae.arec.umd.edu/news submissions.htm>).

If you are submitting a paper copy (some journals require this as a supplement to email submission), check that you have the right number of copies, then wrap up the whole package securely. Then look in the journal and find the correct address. You will often have to send the paper to an editor or editorial board at an address that is different from the publisher's address, so make sure you select the right one. Some journals have different editors dealing with different parts of the world, or different subject areas. All this information is usually on the inside front cover of the journal, or on the website, so make sure you read all the information carefully. Send the manuscript via airmail, and wait for an acknowledgement.

Online submission allows international authors and referees to become a part of the journal's community. As an author, you can check on your paper's progress while peer review takes place. Usually, everything is managed and tracked online, so the whole process is logged and accountable. The process is designed to be simple for everyone involved.

4.14 Resources

4.14.1 Useful websites

Science publishing trends, ethics, peer review, and open access

– <http://journalology.blogspot.com>

Writing in English

– http://bookshop.europa.eu/is-bin/INTERSHOP.enfinity/WFS/EU-Bookshop-Site/en_GB/-/EUR/ViewPublication-Start?PublicationKey=HC3010536

– www.oxfordjournals.org/our_journals/annbot/for_authors

Online submission

– www.oxfordjournals.org/for_authors/online_submission.html

4.15 Exercise – Review of published papers

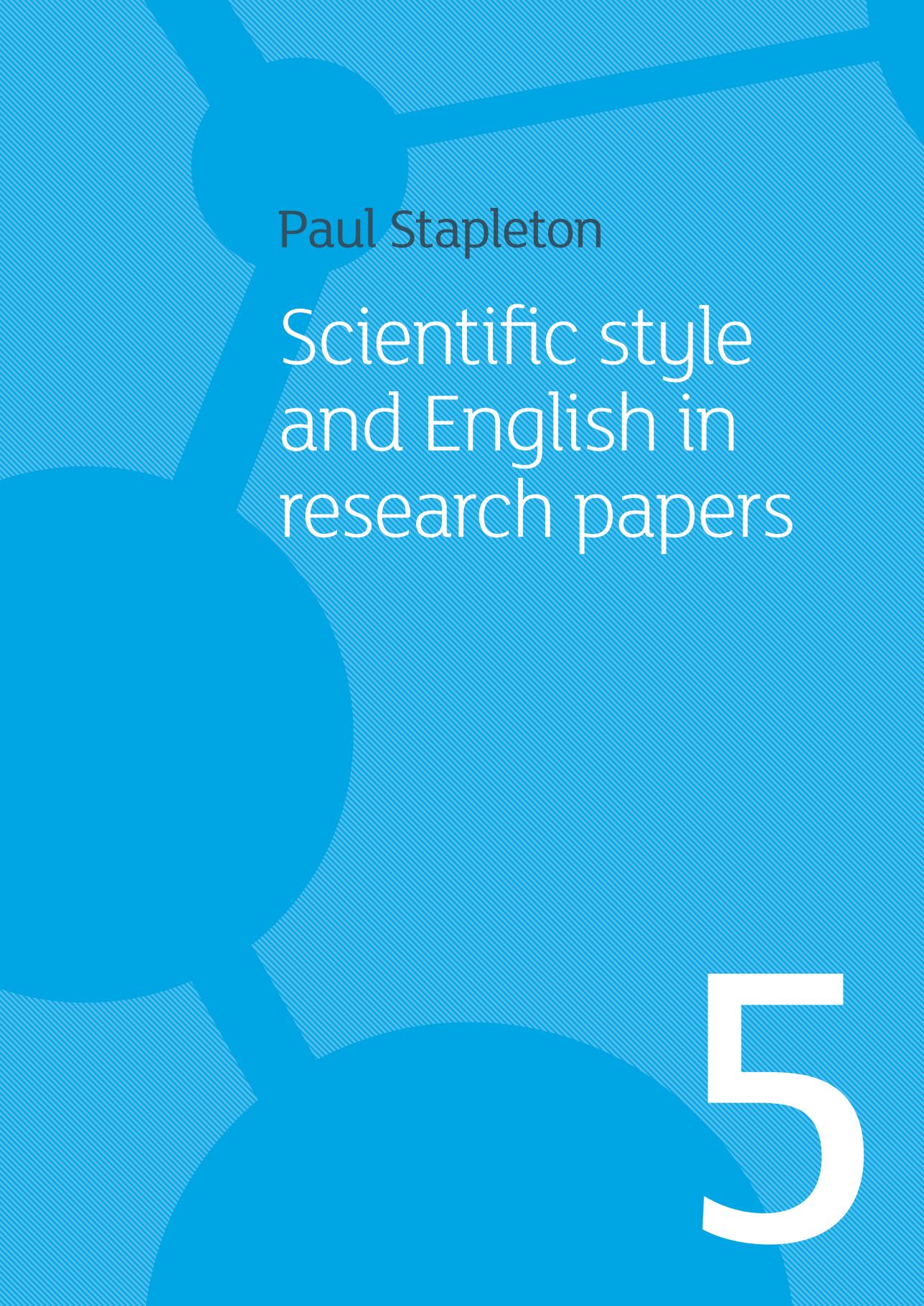
You will receive copies of previously published papers. Analyse these papers, looking at each with the following questions in mind:

- Does the paper report new, significant or innovative work?
- Is the title accurate and informative?
- Does an introduction describe the background and objectives of the work?
- Are the methods explained clearly enough for the reader to repeat the work?
- Are the results valid, and properly presented and described?
- Is any criticism or review well thought out, supported and researched?
- Do any parts of the paper need to be shortened, or lengthened?
- Is the paper adequately referenced?
- Are all figures, tables and photographs necessary?
- Can the paper be improved in any other way?

Can the paper be:

- accepted as it stands?
- accepted conditional on recommended revisions? – if so, list the revisions
- submitted for reconsideration after recommended revisions?
- rejected?

If you have brought a paper of your own, the group could analyse it for you in the same way – if you are willing!



Paul Stapleton

Scientific style
and English in
research papers

5

5.1 Introduction

Publishing is a highly competitive field, and journals receive many more good papers than they can publish. An editor will select a well written and well presented paper before one that is clumsily written and presented, if the scientific quality is similar. Language and style are like packaging: good packaging can never make up for poor content, but attractive packaging enhances good content. Clear, concise writing gives the impression of confidence and knowledge, credibility and authority.

Much of the advice on writing scientific papers applies to writing in general. The following points can help you in scientific writing. Even so, bear in mind that few papers are rejected solely because of poor English. If the scientific content is good enough, the language can be corrected.

5.2 Objectives and expected learning outcomes

After completing this chapter, you will be able to:

- become aware of good writing style and how it can increase comprehension;
- differentiate between the elements of good and poor style in writing research papers;
- correct the style and English of a paper to enhance readability.

5.3 Writing in the English language

If English is not your first language, don't expect to write it perfectly. English is a difficult language to write well – even native English speakers have problems. Do not worry about, or waste time on, the finer points of grammar. The journal editor or publisher will usually correct your language. The most important thing is that your message is clear. For editors to correct your language, they must be able to understand what you are trying to say. Be as definite and specific as possible when you are writing. Avoid vague statements.

Be sure of what you want to say. The following points could help when you are writing and revising your paper:

- use simple and direct language;
- avoid abstract nouns made from verbs;
- avoid noun clusters;
- be aware of errors of meaning and form;
- avoid jargon;
- be aware of sentence structure;
- use the correct verb forms (tense and voice);
- use personal pronouns (sometimes).

5.3.1 Simple and direct language

Always choose the simplest way of saying something. Choose a simple word rather than a difficult one; a concrete word in preference to an abstract one; a familiar word instead of a rare one. Complex, hard-to-understand sentences are rarely good sentences. Good scientific writing communicates in simple terms, even though the subject may be complicated. Repeated use of unnecessarily difficult, abstract words and phrases makes the subject hard to understand.

Unnecessary and difficult words

'Verbosity' means to say a thing in a complicated way, with lots of words, usually to make it sound more important. This is poor style. For example, you might say:

The efficacy of the soil restorative agent utilised was undeniable.

This is verbose. Much better if you write exactly what you mean in a direct and simple way:

The fertiliser we used was effective.

Use simple verbs such as use instead of utilise. Cut out phrases like "It is interesting to note that...". Many writing guides and grammar texts give lists of unnecessarily wordy ways of saying things along with preferred, shorter alternatives. Always try to use the simple expression. Avoid buzzwords and phrases that are suddenly popular but are not well defined, for example, sustainability, participatory approach, proactive, gender-sensitive. Concentrate on what you want to say, and try to say it in the simplest, most direct way.

Double negatives

In English, you can use two negatives or negative words together to make a positive statement. For example: "It is not unlikely." "Not" is a negative, and so is "unlikely", so they cancel each other out and mean: "It is likely." Although this sort of construction is common, it is convoluted and often gets in the way of plain speech. There is sometimes a fine difference in meaning between a positive statement and a double-negative one, but if your first language is not English, it is better to avoid using the construction. Examples are:

The total was not unimpressive. (It was impressive.)

Here the reader might miss the word "not" and thus misunderstand the meaning. This is also verbose – it uses extra words to say a simple thing in a more complicated, less direct way.

No decrease in numbers of species...

This is vague and ambiguous. Does it mean the numbers stayed the same, or the numbers increased?

Spelling

Check to see if the journal you have selected uses British or American spelling – or Canadian, which is a mix of both. Then use that style of spelling consistently. Consistency is part of the packaging and helps give a paper a finished look.

5.3.2 Nouns from verbs

Abstract nouns are often made from verbs. This can be done quite easily: the verb to measure gives the noun measurement, a common English word. But because it is a noun, you have to put a verb with it, for example, "The measurement was done [or carried out]". Often it is much easier to use a verb and say that something was measured. So instead of: "Measurements were carried out on the variation", write "The variation was measured."

Or, if the subject of the action is important: “Yilma (1992) measured the variation.” Other common examples of this are production from produce, interpretation from interpret, and observation from observe. Using such abstract nouns too often produces long sentences and dull prose. The extra length comes in part from the length of the “-tion” nouns, and in part from the need to use extra words as verbs. The dullness results from the abstractness of these nouns and the usually passive, weak verbs that must go with them. Replacing an abstract noun with a verb gives you more chance to bring the subject into the sentence and to make it more alive and specific.

In science writing today, abstract nouns are extremely common, but it is better to avoid using too many of them. When you review your manuscript, look for the nouns ending in -tion, -ance, -sion, -ment, -ness, -cy. Usually you can replace them by rewriting the sentence using the verb. These changes may also shorten a sentence and put its elements into a clearer sequence.

For example, not:

It is possible that the pattern of herbs now found at the site is a reflection of past disturbances.

But, with better and fewer words:

The pattern of the herbs now found at the site may reflect past disturbances.

5.3.3 Noun clusters

In English, nouns can be used as adjectives, and strings of them can be put together to form a phrase. To some, these clusters sound impressive. But in fact they hide the meaning of what you are trying to say and also make the message unclear or ambiguous, leaving your meaning open to interpretation. Although these noun clusters are used frequently, your writing will be clearer if you avoid them.

Note that nouns in a cluster are usually abstract nouns. Sometimes you can go back to the verbs and make a good sentence with a clear meaning. Look at the way a noun cluster can build up. We can start with:

Research

Which leads to:

Research dissemination

Then:

Research results dissemination improvement

And finally:

Research results dissemination improvement methods

This final phrase has become hard to “unstring” and understand. It is much clearer if you break it up:

Methods of improving the dissemination of the research results.

Unfortunately, noun clusters are common today, especially in science writing. Two nouns together are easy enough to understand; when more are strung together, the meaning can be lost. As you look through your text, mark the places where more

than two nouns occur together. Then go back and try to rephrase the sentences, using verbs instead of nouns.

5.3.4 Errors of meaning and form

Make sure you understand the meaning of all the words you are using. Do not use a long word that you think sounds impressive unless you are certain of what it means. If you have used it wrongly, you will hide what you are really trying to say. It is much better to use several simple words that give the correct meaning and are easily understood. There are many words in English that look almost the same but have different meanings, sometimes subtly – for example, various, varying, variable.

Remember that words such as data, phenomena and criteria are plural, not singular; equipment and information are always singular and never have a closing “s”.

5.3.5 Jargon

According to the *Oxford English Dictionary*, jargon is “a mode of speech familiar only to a group or profession”. All scientific disciplines have their own special language of technical words, but be careful not to use them in your manuscript without defining them. English has become the universal language of science because so many people understand it. But if the reader cannot understand the specialised terms you are using, you are not communicating. Remember that researchers outside your own field or discipline may not understand the terms. Review your manuscript to make sure you have defined all the jargon that you may have included.

For example, not:

Suakoko 8 rice yields less than other lowland varieties.

But:

Suakoko 8, a lowland variety of rice, yields less than other varieties.

For example, not:

Samples were 5-cm augered from depths of 2 and 3 metres.

But:

Samples from depths of 2 and 3 metres were taken with an auger 5 cm in diameter.

5.3.6 Sentence structure

Avoid long sentences. How long is a long sentence? Any sentence that is more than two typewritten lines may be too long. However, remember that a mixture of short and long sentences adds variety and improves the rhythm of your writing. There are several different types of sentence that are too long. Below are two common examples.

Too much information in the sentence

If too much information is compressed in one sentence, it is difficult to understand the message. If a sentence seems too long, look for a place to split it into separate parts. Read this sentence straight through, then ask yourself if you understood it all:

“Preparation of the derivatising agent required the addition of 5 ml molecular sieve-dried benzene to 200 mg nitrobenzoyl chloride in a test tube which was vortex mixed then 5 ml dry pyridine was added and lightly mixed after which a 1.5-ml

portion was added to the dried ethers, the tube capped and heated for 45 min.”

Several things are wrong with the sentence, but the main problem is the lack of punctuation. Breaking up the long string of words makes the text more understandable:

“The derivatising agent was prepared by adding 5 ml of benzene, which had been dried in a molecular sieve, to 200 mg nitrobenzoyl chloride in a test tube. This was mixed by vortex, 5 ml dry pyridine was added and the whole lightly mixed. A 1.5-ml portion was added to the dried ethers, then the tube was capped and heated for 45 min.”

Hiding the subject under conditions

Often you may have a list of conditions that describe the main topic of the sentence, but by including them all, you bury the main statement. Sometimes you can make a series of sentences, but at other times it may be better to take the conditions out of the way. Either start a new sentence after you have said the most important thing, or make a list.

For example, here is a long sentence with a list of conditions hiding the main subject.

“If the society is to provide farmers with a milk-collection service and help them market their milk, and also dry their pyrethrum and help market it, and provide a ploughing and harrowing service, and market farmers’ wool, it is meeting its objectives.”

This can be understood much more easily if the subject and verb are first identified and brought to the beginning of the sentence. A short list could follow:

“The society can meet its objectives if it provides member farmers with the following:

- a milk-collection and marketing service;
- a drying and marketing service for pyrethrum;
- ploughing and harrowing services;
- a wool-marketing service.”

5.3.7 Verb forms

Tense

Most of the time, the past tense is used in scientific papers because whatever is described in the paper has already happened. The Introduction describes work that has already been done. The Methods section describes how the current work was done, and the Results section describes what happened. However, in the Discussion section the present tense might be used for something that exists or has already been demonstrated.

For example:

“There are [present – already known] only four different amino acids in DNA, but we found [past] that...”

Where you are making predictions or describing current work, you might use the future tense:

“These results mean that less fertiliser will be needed.”

Active and passive voices

Many books on English style, and grammar checks in word-processing software,

recommend that you avoid the passive voice because it makes text boring and dull, adds words, reduces impact and may confuse. This is true, but the passive voice is often used in scientific style. In the sentence “We measured the variation” (active), it is clear that the subject (we) did something (measured) to an object (the variation).

In the passive voice, the object comes first and has something done to it by the subject: “The variation was measured by us.” But in the passive voice you can also leave the subject out and say: “The variation was measured.” Most of the time the subject is you, the writer, and the subject is not important in what you have to say. Readers do not need to be told that “you” measured the variation. However, you should try to use the active voice where it fits, because it adds variety and interest to your writing.

Examples of passive and active construction:

- passive: “In this paper, the second approach is considered.”
- active: “This paper considers the second approach.” or “In this paper, we consider the second approach.”
- passive: “The screening procedure is illustrated in Figure 5.”
- active: “Figure 5 shows the screening procedure.”

Personal pronouns

If you did the work, or if you think something is right, then you should say it. Don't say, “It is felt by us that...” or “One of us...”. Take responsibility for your ideas or work. Classical science writing encouraged the use of impersonal language at the expense of readability and clarity. But the contemporary trend is to use personal pronouns sometimes for a livelier style and easier reading.

5.4 Lists

Lists are often a good way to present material clearly and concisely. All items in a list should be grammatically parallel in their construction. Sometimes, however, an author starts a list one way and then switches gear, changing to a different construction half-way through.

It would be wrong, for example, to write:

“The objectives of the society can be met if it provides member farmers with:

- a milk-collection and marketing service;
- to dry their pyrethrum and market it;
- ploughing and harrowing services for members;
- marketing their wool for them.”

A good way to check if your series is parallel is to see if each item correctly completes the introductory part of the list. The rule of parallel construction applies even if the list is in straight text, without bullet points.