VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wananga o te Upoko o te Ika a Maui

Department of Computer Science

PO Box 600
Wellington
New Zealand

Tel: +64 4 471 5328
Fax: +64 4 495 5232
Internet: Tech.Reports@comp.vuw.ac.nz

A Computer Scientist's Guide to Writing and Publishing Technical Articles

Paul Martin

Technical Report CS-TR-95/4
March 28, 1995

Abstract

This guide is for computer scientists who want (or need) to write technical articles. The guide covers the entire process, from the conception and drafting of the article, through the nuts and bolts of writing correct English, to the submission of the article for publication. The guide is organised as a series of short sections (with a small, integral number of pages per section) and each section contains hints and tips on a specific topic. Thus, the guide may be read from beginning to end, or dipped into as the mood strikes.

Enjoy!

Contents

Part I

Writing Strategy

1 Starting the First Draft

I often find the first draft very hard to start, mainly because there are so many variables to play with. Where to start? What to include? How much detail to go into? What structure to use?

Here are some practical tips to get you going.

- Allow yourself 'prewriting' time. Spend time thinking about the paper while wandering around the house, browsing journals or staring into space. This is a good point at which to consider whether collaboration might be sensible and to analyse the practical, economic, and political constraints on writing the paper.

- Try to decide which journal you are aiming for or which audience or audiences you want to communicate with. Are you reporting detailed work for experts in your field or are you trying to inform a wider audience of, say, areas in which your work can be applied.

- Decide what the main message of your paper is to be. What do you want to convince your audience of?

- Plan for work sessions of three to four hours—any longer and fatigue will make your efforts counter productive. Do not try to write the paper in one hectic session!

- Scientific articles tend to have complex structures with many linked points. Expect to spend the first twenty minutes of each work session re-familiarising yourself with the article.

- Free-write the first draft—allow yourself to put down anything that seems relevant without worrying about structure, grammar or spelling. Once you have your first draft you can criticise and revise, but at this stage allow your creativity and imagination some space. Writing is *not* a passive process—as you write you will have new ideas, find better explanations and see new connections.

- If you are stuck for more than a minute trying to think of the right word then insert the name of your favourite chocolate bar and keep going. Your subconscious will almost certainly find the right word in the next couple of days.

- Likewise, if you can't find the perfect sentence to express yourself then don't get hung up with writer's block—leave a blank space on the page and keep going. Blocks often occur when you need to think more deeply about *what* you want to say rather than *how* you want to say it.

- Many people hear critical voices telling them that they are no good at writing and never will be. If this is a problem for you, then try a little background noise or relaxing music to drown out the voices.

- Other techniques that people use to break the back of the first draft include devising outlines, dictating onto cassette, drawing diagrams to organise and link topics, and working out priority schemes.

- It matters very little in what order you write the sections of your article. If you want a pattern to follow then try doing a quick introductory section, then more detailed body and conclusion sections before finally writing the abstract and expanding the introduction.

When you feel you have completed the first draft (and you should expect there to be three, four, or more subsequent drafts) you can change from free-writing mode to critic mode and make the first revision.

2 Revising a Draft

Revising a draft involves many subtasks, e.g. strengthening the structure, adjusting the content, fixing spelling errors, and checking that the margin widths are okay for the target journal.

The number of drafts and revisions that you should aim for depends at least partly on the prestige of the target journal and the rewards you anticipate from being published there. If you are writing for a low-prestige outlet then don't spend your time on too many revisions. If you are writing for a top-notch journal then expect to make five, six, even ten revisions.

By revising aggressively you are increasing your chances of being published and decreasing the chances that your article will be rejected, forcing you to submit to another journal and wait for another review to be completed. Aggressive revising also makes it less likely that a faulty article will be published and then come back to haunt you!

There are a number of tricks which make your revising easier and more effective.

- Revise with just a small number of particular criteria in mind—don't try to find all the faults in one pass.
- Do not become disheartened by all the reading and rereading—think of the rereading as a way of deepening your understanding of the topic.
- Put the article aside for a while—some elapsed time often helps you find a more objective approach to the article.
- Try reading the article aloud because this is often the only way to show up certain kinds of problem.
- Revise from a double-spaced, printed copy.
- If you are revising on a sentence-by-sentence basis then try revising the last sentence first and then working backwards. Alternatively, print the article out one sentence per line.

  When using LaTeX get your editor to append `\\` to all occurrences of a period followed by a space or a newline. In emacs this can be done using the command `replace-regexp` to replace RE `\.  \|\.$` (note the space) with RE `\&\\`.
- Do the revising away from where you normally write. This helps, honest!

- On each revision go through the whole article—this will allow you to find inconsistencies, erroneous repetitions and structural problems.
- Don't try to do two revisions one right after the other.
- Read other authors' articles to hone your reviewing skills. Which articles are strong or weak? Why does the author succeed or fail?

Some questions need to be resolved early on in the drafting process:

- Does the paper have a single, unifying purpose? If the paper has more than one focus then maybe the paper should be split into two papers.

Some questions can be deferred for later drafts:

- What kind of persona does the article project? Is the voice friendly and confident, or are there places in my article where I appear angry, confused or defensive?
- Is the article structured well? Are the sections well chosen and in a logical order?

Here are some specific questions that you may want to ask of your article:

- Am I addressing my audience? Are my explanations pitched at the right level? Have I made any comments which may aggravate my readers?
- Have I used the active voice (Section 22) where possible?
- Have I achieved clarity and precision (Section 6) in my article? Do I inform my readers as quickly and efficiently as possible?
- Are the statements I make in my Introduction and Conclusions consistent? Does the body of my article meet the aims stated in the Introduction? Are there any superfluous sections which do not relate to the main theme of my article and which should be cut out?
- Am I open to attack anywhere? Are there any gaps in my arguments? Are there places where I should back myself up with a citation? Have I pre-empted likely counter arguments?

- Are my citations (Section 27) correct?
- Are the different parts of my article in proportion? Do I spend too long talking about the problem and too little talking about my results?
- Is my language appropriate? Am I using jargon (Section 28)? Am I using colloquial phrases or euphemisms in an international journal?

During late revisions you should:

- Check your use of abbreviations (Section 20).
- Look for long sentences and sentences with complicated structures: can they be shortened or simplified? Your readers may be smart, but why make things more difficult than they need to be?
- Consider using examples in the article body to ground the general statements you make in your abstract and introduction.
- Check your use of pronouns (Section 30). Look for *it*s and *they*s that appear a long way after their nouns.
- Ensure that you introduce the subject of the sentence early on. Readers need to know the subject so that they can start to 'evaluate' the sentence. The later the subject appears, the more readers need to store in memory before they can begin evaluating.

3 Assistance from Colleagues

Colleagues can help you with your revision, but be aware of the following problems:

- Journal reviewers will typically dedicate between four and six hours to revising an article.
- The review you get from a journal may be different because their reviewers will not (usually) know you personally.
- Your reviewers need to have some background in the research area if they are to do more than criticise your grammar.
- Your reviewers will inevitably have different viewpoints—the more reviews you ask for, the more contradictory comments you will receive.

Don't even bother asking your colleagues for their time if you are not the sort of person who can accept criticism—because criticism is what you'll get.

When you are deciding who to ask you should consider the following points:

- You need strong readers—not 'yes men'.
- Look for readers with the same diversity of background as you expect in readership of the journal you are submitting to.
- Correct your spelling and grammar *before* giving your article out for review—your colleagues are most valuable to you for their higher-level comments.

4 Structuring an Article

At the highest level, almost all papers follow the IMRAD structure: introduction, methods, results and discussion.

Unless the paper is very short the IMRAD structure should be further broken down into subsections, and possibly sub-subsections. Sectional units are good for a number of reasons:

- The sectional titles remind the reader of the paper's structure and allow her to locate particular topics.
- Sectional units break the paper into manageable pieces. Ten paragraphs is about enough for one sectional unit.
- The end of each sectional unit provides a place for the reader to pause and reflect.

Consider the relationship of each heading to the heading of the enclosing section and the headings of sections at the same level.

- Each heading should be independent enough to be read and understood on its own.
- However, where two or more sections parallel each other in terms of content, their headings should also be parallel. For example, if your Section 5 describes techniques for measuring the performance of computer systems, Section 5.1 describes software-based monitoring, and Section 5.2 describes alternative methods involving special hardware, then the example below right is to be preferred.

5. Measurement Techniques	5. Measurement Techniques
5.1 Monitoring by software	5.1 Software-based monitoring
5.2 Hardware approaches	5.2 Hardware-based monitoring

The first sentence in a section should not assume the subject of the heading as its own subject. The second example below shows the better practice:

5. Measurement Techniques	5. Measurement Techniques
These come in two forms. . .	There are two forms of measurement techniques. . .

Avoid 'only child' sectional units—don't have a section 1.1.1 unless there is also a 1.1.2.

5 Style in Your Writing

Most journal authors seem to assume that they should be as impersonal, dull, and boring as possible. Why do they assume this? Perhaps because journals are full of such articles. Or perhaps because they confuse being objective with being boring.

Research is exciting. Isn't that why we do it? So why, when we start writing about our research, do we seek to hide the excitement?

You may feel that spending time worrying about your punctuation and grammatical mistakes is somehow demeaning to your professional status. Don't feel this way. Few writers produce perfect first drafts. Besides, that stack of papers you plan to read when you have time—wouldn't it be nice if you could get through each paper quickly rather than having to struggle with it for hours on end?

Journal articles are there to inform in as efficient a manner as possible. So why do we not do what the readability experts tell us to and improve our articles by making them fluid, energetic, personal, and exciting?

There are several elements of good style which you should know about:

- Clarity.
- Precision.
- Use of images.
- Fluidity.

Each of these elements is covered in turn, starting on the next page.

6 Clarity, Precision & Use of Images

A *clear paper* is one which efficiently conveys ideas from the writer to the reader. As scientists we strive to reduce complex phenomena into general rules and principles. We strive to obtain clarity and understanding from confusion. It is a great pity, therefore, that so many papers are so difficult to understand.

Clarity is especially important when we remember that our papers will be read by scientists from other disciplines, students new to our area of research, and others who do not have English as their first language.

One good way to achieve clarity is to rid your article of superfluous words, sentences, and paragraphs. Extra material waters down your message and makes it less likely that a reader will persist.

A *precise* paper is one which uses the words that express exactly what you mean—no more, no less. Carelessly selected words may introduce ambiguities and possibly surprise and distract the reader so that she loses the main sense.

Precision often suffers when authors notice that the same word has been used several times and substitute at least one of those words for another with a similar meaning. In technical writing, however, it is more important to use the correct word than merely to have variety.

The connotations of a word affect its appropriateness. 'Adequate' means sufficient, but 'the performance improvement was adequate' suggests that the improvement could have been greater.

Abstractions provide a powerful and general way of reasoning. However, most people still need to see several examples before they can fully grasp a new abstraction. The use of *images* provides a halfway house between slippery abstractions and long, detailed examples. What most people remember about Einstein's theories are the images of passing ships, flying birds and stones dropping from trains.

How do you come up with strong images? It's not easy, but try some of the following techniques:

- Use concrete descriptions involving one of the five senses. Tell your reader what she would see (hear, taste, feel, smell) if she were there.
- Use metaphors and similes carefully.
- Use analogies to explain the new in terms of the familiar.

7 Fluidity

To make your prose *fluid* you need to vary your sentence structure and length. Here are five examples in which simple subject-verb sentences are rewritten in an alternative form with a different structure and hence a different rhythm.

- Verb phrase:

  The savings obtained by broadcasting are significant when sending messages over LANs.

  Sending messages over LANs, the savings obtained by broadcasting are significant.

- Prepositional phrase:

  The new architecture proved to be twice as fast as the previous configuration.

  For a number of applications, the new architecture proved to be twice as fast as the previous configuration.

- Introductory clause:

  Concurrent execution can often improve system throughput. Some programs are inherently sequential.

  Although concurrent execution can often improve system throughput, some programs are inherently sequential.

- Verb introducing question:

  Some scientists believe sender-initiated migration is best. Other scientists believe receiver-initiated migration should be preferred.

  Is sender-initiated or receiver-initiated migration to be preferred?

- Infinitive phrase:

  We need to replicate shared files. We need to resolve read-write conflicts.

  To replicate shared files we need to determine the best way to resolve read-write conflicts.

As mentioned above, some variation in sentence length also enhances the fluidity of your prose.

- Try for an average sentence length of ten to twenty words (rather than the twenty-five found in many journals).
- Ensure that no more than three or four consecutive sentences have the same length.
- Short sentences add emphasis!

8 The Pros and Cons of Writing

Some researchers find the whole process of writing articles for journals depressing and unrewarding. The problems quoted include:

- The fierce competition between writers to obtain limited journal space.
- The peer review process which is time consuming and often seems to have a random element to it.
- The time absorbed by writing which could otherwise be spent on research and teaching.

Furthermore, being published does not guarantee that you will be read. Other researchers often fail to keep up with the literature for several reasons.

- Libraries can only afford to carry a small number of the journals that are published.
- Journals are often unrewarding to browse because the standard of writing is frequently low.
- Researchers have many other pressures on their time.

So, what are the counter arguments? Why should we put effort into writing?

- An investigation into which authors publish the most has shown that a minority (10%?) of names comes up over and over again. This is not fair. This means that scientific literature does not reflect the true diversity of views.
- If you are committed to doing science then you should be committed to publishing your results. Your data doesn't become scientific knowledge until you add it to the global database by publishing. Once you have published, your new knowledge can be tested and your experiments repeated (at least in theory) in the scientific tradition.
- Consider the amount of time you spend doing research. What fraction of this time is actually spent writing? 5%? 1%?
- Writing is not that difficult, it just looks difficult because established authors like to mystify the process. Writing is not something that only 'Arts' people can do. Writing a scientific article is much more about structuring ideas in a logical way than about using 'literary skills'.

- As with most other skills, your writing abilities can be improved by writing more (and reading more of the right kind). Even famous writers often find writing hard work and have to produce multiple drafts before they are satisfied.
- Writing is not a passive recording of events, it is a creative process. When you write you have to structure and refine your ideas, you have to seek plausible and consistent explanations. Thus, the activity of writing supports the activity of researching.
- If you are teaching a course then writing course notes can be a valuable way of rehearsing the material. Furthermore, a set of well-written notes can do heaps to improve your students' understanding.
- A well-published scholar confers prestige and distinction on lecture classes and departments, boosts self-esteem and increases promotion prospects and ability to attract funding.

Now you know why writing is so important.

9 The Writing Habit

If you decide that you like writing and would like to make it a regular part of your work then consider the following tips which should prevent you from getting stuck in the usual traps.

- Create a regular slot in your schedule for writing—once a day is reasonable. Decide how long to make the slot. Count on spending the first twenty minutes reading what you wrote last time and deciding what to do this time.
- End your writing session in such a way that there is something obvious to get started on next time. Do not stop writing at the end of the last sentence in the section.
- Your writing location and choice of time slot should be such that you are unlikely to be interrupted by phone calls, crying babies, or the temptation of television.
- Collect all the necessary writing materials around your terminal—this will prevent you from falling into the 'I just need an x, y, z before I can start' trap.
- Try to analyse the way that you work and, in particular, any personal traps or other time-wasting activities that you tend to fall into.
- When you complete a draft, print out a neat copy and file it. This is not only useful if someone asks to see what you've done since last time, but psychologically it makes you feel like you've produced something complete it its own right.
- If you work best under deadlines then plan your article out in sections and allocate a segment of time to each section.
- If you hate shutting yourself away to write then you might like to think about co-authoring a paper, discussing the plans for your article with sympathetic colleagues, or having other people criticise your drafts.
- You may find a notebook useful for writing down ideas that occur to you while you are doing other things, like waiting for the train or lying awake at night.

Once you get into the habit of sitting down at your desk to write you should find that you can make some progress even on days when you are not feeling particularly inspired. A little progress each day will keep you from falling into the 'I'll never finish!' trap.

10 Writing and Other Activities

Writing need not be a separate activity from doing research.

- The process of writing a paper will often make you realise that there are gaps in your understanding. Thus, writing influences research.

A *research notebook* may help you integrate researching and writing. It is also a good opportunity to practice and develop your writing skills.

- In your notebook discuss topics that deserve your attention now as well as those you'd like to investigate in the future. Consider what papers you might get out of such research.
- Try to maintain an overview of each topic area. Note down recent developments, weaknesses with current techniques, and unresolved questions. These overviews are invaluable when writing introductory sections about the background to a subject.
- Summarise the papers you are reading (include any useful quotes) and keep a list of other articles that you should obtain and read some time.
- Record results and discoveries as you make them.
- Record also your feelings about your progress (or lack thereof). This is a vital first step to identifying blocks and removing them.
- Keep the notebook to hand so that you can note down ideas as they occur.
- Use a ring binder so that you can restructure your notes as necessary.

11 Collaboration

Collaboration with other authors can be very valuable, provided that certain pitfalls are avoided. Advantages of being a co-author include:

- It is easier to keep your enthusiasm going.
- New writers can learn from experienced writers.
- Synergy may produce new ideas.
- Longer-term relationships may develop.

The problems with co-authorship that typically arise include:

- Inconsistency and unevenness in the final paper.
- Unfair distribution of work between authors.
- Disagreement over whose name should go first in the author list (Section 36).

However, most of these problems can be avoided with a bit of planning. Decide in advance who is going to do what. In particular, ensure that one person takes responsibility (and credit) for:

- Defining the structure of the paper.
- Smoothing the transitions between sentences, paragraphs and sections.
- Ensuring that the language is consistent.

When choosing a collaborator you should remember that researchers with big reputations often have multiple concurrent projects at any one time and, therefore, proportionally less time to devote to a new project.

As a final point, the success of a collaboration often depends on the personalities involved and may therefore be difficult to predict.

Part II

Nuts and Bolts

12 The Title

On journal covers, in abstracting journals, in computer databases, in lists of citations—often the only information you'll find about an article is its title and the author list. To motivate readers enough to find *your* article you need a strong title.

What makes a strong title?

- Keywords that mention the main topics of your research. Don't include any references to topics of secondary interest.
- Keywords that are specific rather than general.
- Keywords that will work well in an automated search. Avoid abbreviations, proprietary names, titles framed as questions, titles with subtitles, and jargon words.
- Some indication of what makes your article different from the others in the same subject area.
- As few 'padding' words as possible. 'Observations on', 'a study of', and 'an investigation into' do not tell the reader anything interesting.
- The absence of double meanings. Reread your title again just to check that it isn't open to misinterpretation.

If the target journal prints the article title at the top of each left (or right) page then make sure your title is not too long to fit.

Many authors leave the title until last, when they know exactly what the paper is about.

13 Abstracts and Acknowledgements

Your *abstract* should be strong.

- Abstracts are often made available on their own, either in abstracting journals or in on-line databases.
- If the abstract does not appeal to the reader then she is unlikely to persist with the rest of your paper.
- It is suspected that journal reviewers sometimes base their recommendations solely on abstracts!

Think of the abstract as your paper in miniature.

- Consider writing the abstract last, once you know exactly what you've said in the body of the paper. You can go through the paper with a high-lighter pen, marking the important points which should be mentioned in the abstract.
- Summarise the main aim of your work, its significance, its claim to originality, and its place in the context of current research.
- Outline the methodology you used.
- State your conclusions, mentioning any important limitations.

Do not worry that by mentioning your results and conclusions in the abstract that you are somehow giving the game away:

- Scientific papers are meant to inform, they are not meant to be thrillers or suspense novels. On the contrary, a statement of your conclusions will often motivate a reader to persist with sections of detailed information.
- It is a respected pedagogic technique to tell 'em what you're going to tell 'em, tell 'em, then tell 'em what you've told 'em.

Rules for abstracts:

- Because abstracts often appear on their own you cannot include citations, abbreviations or terminology defined in the rest of the paper.
- Watch what assumptions you make—the reader knows nothing about the paper when she starts to read the abstract.

- Set yourself a maximum of about 250 words for the abstract. If, however, you can say all you need in 100 words then stop there.
- Be general and, dare I say it, abstract in the abstract. Keep the detail and examples for the body of the article.

Your *acknowledgements* should note:

- Sources of technical assistance.
- Providers of special hardware or software.
- Sources of financial assistance (grants, contracts, and fellowships).

Bear in mind that some individuals may not wish to be acknowledged, perhaps because they find your results to be too controversial. Show your draft acknowledgement to those mentioned in it.

14 The Introduction Section

Introduction sections have several purposes:

- To establish the context for your research. A typical way to do this is to review the literature.
- To state the aims of your work: how you build on current knowledge and what problem your work solves. Nobody will care about your research unless they know it provides an original solution to some (interesting) problem.
- To define assumptions and limitations on the scope of your research.
- To list the methodologies and techniques you have employed. People may read your article less because of the problem you've solved but more because you've used one of their favourite techniques, computer languages or algorithms.
- To review your results and conclusions.
- To tell the reader what sections she will find in the rest of the paper.
- To define terms and abbreviations that you use in the body of the paper.

Your introduction is going to repeat a lot of what was said in the abstract (if you've written it yet) and that's fine.

The length and pace of your introduction depends on the audience you are trying to reach:

- If you are trying to reach a wide readership then you need more background information, more suggestions for applications, more on how your results are better than previous results, and more on why your particular bit of blue sky is so fascinating.
- If you are writing for people who might give you money, then they'll probably not be scientists and so you'll need to make your introduction even stronger.
- If your results are controversial, then you need to spend more time justifying the approach you used in your research.
- However, the introduction is not a place where you can ramble on at length making general statements. You've caught your reader's attention with your title and abstract so don't lose momentum now.

- Neither is the introduction the place to give a historical review of developments in your field—ideas that have been superseded are not relevant to your readers.

- Background material which is relevant to only one section of your paper is often best put at the start of that section rather than in the introduction.

When citing other work in your introduction:

- Do not cite twenty-three papers on the same piece of related research. Cite *one* paper which is easily available and which sums up the topic well.

- Do not use citations in such a way that readers cannot understand your paper without looking the citations up.

- For the benefit of interested readers you may want to note somewhere near the end of the introduction related papers that you have written.

15 The Body Sections

Use the body sections to describe methods (what you did) and results (what you discovered). In some disciplines, Biology for example, methods are described first and results second. In other disciplines methods and results are interleaved.

- If the methods are described separately then readers that so wish may skip them conveniently.
- Nevertheless, you must describe your methods carefully and fully. Your work cannot be considered scientific unless your experiments can be reproduced.
- Integrating methods and results may seem messy, but it does mean that your reader is not kept in suspense for so long. You can always use your conclusions section to draw together your principal findings.

Whether you decide to separate or integrate methods and results, you should plan a sensible path to help the reader navigate through your paper. Good paths should do the following:

- Present the information in a logical, comprehensible manner.
- Introduce new topics, elaborate on those topics and then discuss or evaluate those topics.

Bad paths are those which:

- Overload the reader with information.
- Veer off into side issues.
- Use technical terms or concepts that have not yet been properly explained.
- Make the reader say, 'Help! I'm lost.'

What makes a sensible path depends on the subject of your paper. However, paths determined by time or space are often good:

- Time: describe what happens first in your system. What happens next? What is the final outcome?
- Space: describe the system inputs. Which components use this input? Where does their output go?

If you cannot impose a sequential ordering on your material then how about using a hierarchical approach?

- Hierarchical: describe the top level. Break this down into second-level modules. Can these second-level modules now be treated sequentially?

Sequences are good: the reader is introduced to new ideas and then applies them. There are as many backward references and as few forward references as possible.

If hierarchical and sequential organisations fail you, then as a last resort you can organise your material by order of importance—most important last in a short paper and most important first (in case readers switch off) in a long paper.

There are a number of things that you should do to increase the impact of your results:

- When you present a result take time to indicate its significance. In particular, indicate how your result compares with previous work.

    1. 'A bandwidth of 3.466 bps was achieved' is likely to make a reader ask 'So what?'
    2. 'A bandwidth of 3.466 bps—nearly twice that of previous systems' is likely to make a reader ask 'How on earth did she do it?'

- Be aware of the questions that your results might provoke: 'Why are the results different from those predicted?' 'Why is there a discontinuity here?' 'Why is the value for x=0 not shown?' It is sensible to satisfy such questions rather than leaving the reader in limbo.

- Be selective with your results. Generally readers want to know about trends, principles, generalisations, surprises, and contradictions. They do not want to know about *all* the measurements you made.

- If in doubt about whether to include a particular measurement then look back at your abstract and introduction. Would including the measurement contribute towards the research aims you defined there?

- Be honest about your results. You cannot in good conscience suppress data simply because it does not fit your theory or because it was ambiguous. The fact that your results were not 100% cut-and-dried is of scientific interest.

When you have good results flaunt them! There are several ways to highlight a result:

- Repeat the result in the abstract, introduction, main body and conclusion.
- Illustrate the result with a figure, graph, or picture. When a reader scans through an article she will often look first at the illustrations.
- Use italics, a short sentence (preferably at the end of a paragraph), or give the result its own paragraph.
- Invent a name for the result, even if the name is just something in quotes, e.g. the 'slowdown' region.

Of course you cannot accentuate all your results however good they are.

The article body is the place to include detail and examples. Your abstract and introduction will contain general statements but most people find such generalisations to lack meaning or impact until they see those generalisations expressed in examples. Furthermore, people often use details or examples to help remind themselves of the general principle.

16 Conclusions and Appendices

The *conclusions* are important because they are read last and therefore are likely to be what the reader remembers best.

- Restate the main point of the paper.
- Repeat your main results. There's no reason why you shouldn't use a figure or table to do this.
- Don't introduce any new results.
- Don't worry that you are repeating yourself—this time you are telling it to someone who knows the details of your work.
- Feel free to say how original and valuable your contributions are.
- Make recommendations or speculate about future work if you wish.
- Indicate how others might usefully apply your work.
- A clever closing statement or an apt rendering of something you said in the introduction always looks impressive.

Appendices are the place to put information which only some of your readers will want to refer to.

Suppose your paper includes a formal specification written in the **Z** language. With details of syntax relegated to an appendix, readers familiar with **Z** will not have to wade through unnecessary information, but the paper is still accessible to those who do not know **Z**.

17 Paragraphs

After the first draft or two you should check the design of your paragraphs.

- Each paragraph should have its own theme. You should stick to this theme and avoid being side-tracked into unrelated topics.
- Introduce the paragraph by stating the theme.
- Develop the theme, starting with information familiar to the reader and moving to new information.
- Watch out for clichéd or clunky transitions between related ideas.

The length of a paragraph is normally determined by the complexity of the theme, but you should also consider the following points.

- Short paragraphs tend to make their point more forcefully, and are thus good for highlighting important results.
- Readers tend to become tired or distracted after about fifteen lines of text.
- Numerous short paragraphs, however, give the article a piecemeal feel and make it more difficult for the reader to scan.
- Too much regularity in paragraph structure and length makes monotonous reading.

18 Transitional Sentences

Transitional sentences are used to link ideas together. If you follow the (sensible) rule of one idea per paragraph then a transitional sentence will tell the reader how the second paragraph logically follows from the first. Transitional sentences are particularly valuable in scientific writing because the ideas being dealt with are often complicated.

- Examine each transition between consecutive paragraphs or sections and ensure the reader will not become lost. 'Having considered the sources of performance loss we now see what happens when the clock speed is increased'.

- Choose section and subsection headings that will help the reader navigate confidently through your article (Section 4).

- Try to estimate how much trouble the reader will have in following your thoughts. Be aware of assumptions which you make but which may not be familiar to your readers.

- Do not go overboard, however, in explaining transitions lest you be perceived as patronising.

- Try to avoid those clunky transitions which have now become clichéd.

You should also consider smoothing the transitions between sentences. The following words are often useful:

- *And*, *also*, and *moreover*.

- *But*, and *however*.

- *Finally*, *next*, *then* and *therefore*.

19 Punctuation

Use capital letters at the beginning of sentences and for proper nouns—nowhere else.

Colons introduce definitions and lists, except when the bit before the colon is not a sentence in its own right. I did not use a colon in the preceding sentence because 'colons introduce' does not make sense without the list 'definitions and lists'.

Commas are used in lists of three, four, or more conjoined items. Commas are not usually placed after the penultimate item in poetry or fiction for reasons of rhythm but in scientific writing the extra comma often prevents ambiguity.

The other use for commas is to disambiguate sentences. Otherwise, follow your intuition about the use of commas (but be consistent).

When to hyphenate a word, when not to? Check the dictionary first—if the word is not there then there are no fixed rules. However, you might consider applying the following convention:

- If in doubt omit the hyphen unless the compound word is acting as an adjective before a noun.

  We made an up-to-date study.

  Our study was up to date.

Dashes can replace commas when indicating an aside. Overly zealous use of dashes, however, makes for choppy prose.

Apostrophes are needed in the formation of almost all possessives, including those involving words which already end in *s*. The exceptions are *hers*, *theirs*, *yours*, *ours*, and a few proper nouns.

Semicolons tend to be used by authors who feel some kind of punctuation is needed but are not sure exactly what. Other authors seem to manage without needing semicolons at all.

20 Abbreviations

Abbreviations such as e.g., for example, are often better expanded because visually the period or periods suggest that the end of the sentence has been reached.

If you use an abbreviation that your readers might not know then define the abbreviation the first time you use it.

Consider whether you need all those abbreviations. There is little to be gained by defining an abbreviation that you then use only once or twice.

When you do need to introduce yet another abbreviation (YAA) spell it out first, then give the abbreviation in parentheses.

Whether to use *a* or *an* before an abbreviation depends on the sound of the first letter—only a vowel sound requires *an*. Thus, 'a Master of Science' but 'an MSc'.

The American National Standards Institute have defined a number of abbreviations [3] which may be useful in lists of citations.

-ology	-ol.
Abstracts	Abstr.
Advances	Adv.
American	Am.
Anales	An.
Analytical	Anal.
Annals	Ann.
Annual	Annu.
Applied	Appl.
Archives	Arch.
Association	Assoc.
Australian	Aust.
British	Br.
Bulletin	Bull.
Canadian	Can.
Conference	Conf.
Current	Curr.
Edition	Ed.
Electric(al)	Electr.
Engineering	Eng.
Gazette	Gaz.
General	Gen.
History	Hist.
Institute	Inst.

International	Int.
Laboratory	Lab.
Magazine	Mag.
Mathematics	Math.
Monthly	Mon.
Physical	Phys.
Proceedings	Proc.
Quarterly	Q.
Report	Rep.
Research	Res.
Review	Rev.
Royal	R.
Science	Sci.
Scientific	Sci.
Series	Ser.
Society	Soc.
Special	Spec.
Studies	Stud.
Survey	Sur.
Symposia	Symp.
Symposium	Symp.
Technical	Tech.
Transactions	Trans.
University	Univ.

21 Numbers and Equations

- You need not avoid giving numbers in your article but, for those readers not entirely familiar with the research area, it is good practice to indicate the relevance of the number. 'We measured 192.3 bps, nearly twice the rate of any previous system.'
- Do not start a sentence with a number.
- When revising, check the numbers you have used carefully. Only the author is likely to know for sure when a decimal point is in the wrong place.

Most numbers should be written out in words. When the number has units, spell those out too, e.g. 'one hundred bits per second' and not 'one hundred bps'.

Numbers that should not be written out in words include:

- Negative numbers.
- Numbers with digits after the decimal point.
- Numbers of pages or illustrations.
- Percentages or monetary values.
- Sometimes, numbers with more than two digits.

On some occasions a mathematical *equation* can be used to state a relationship between quantities succinctly. However, you must define the variables and state any assumptions you are making.

You should also restate the equation in words (at least briefly) so that your readers see the point of the equation.

If the equation is complicated you may also wish to illustrate the working of the equation by substituting in some values for the variables. You might, for instance, show that a small change in one variable has a dramatic effect on the output.

22 The Active Voice

Authors of scientific articles have traditionally used the passive voice—'The results were measured.' Perhaps they thought this made their writing sound more objective. You, however, should use the active voice when possible: 'I (or we) measured the results.'

- The active voice will make your writing less boring and more exciting.

- The active voice makes it clear exactly *who* is doing *what* to *whom*.

To help you identify places where you have used the passive voice and need to revise, look for occurrences of parts of the verb *to be*, in particular look for the following words:

- *Am* or *is*.

- *Was* or *were*.

- *Being* or *been*.

- One of the above followed by *by*, followed by a verb ending in *-ed* or *-en*.

Look for places where nouns can be converted into verbs:

The introduction of buffering...	We introduced buffering...
The commitment to...	We were committed to...
The feeling of pain from the the reading of the article...	We felt pain when we read the article...

Q. What do Einstein, Watson, Crick, Curie, Darwin, Feynman, Freud, and Lister all have in common?

A. Apart from being great scientists they all used *I* or *we* in their writing rather than hiding behind such phrases as *the author*.

If you write a paper by yourself, should you use *I* or *we*? I tend to prefer the former simply because it is more accurate. If I said, 'We prefer the latter' then you might well wonder who else the mysterious *we* referred to.

23 Illustrations

Figures, tables, photographs, diagrams, and graphs are worthwhile if they can say something more efficiently and more dramatically that prose. These forms of illustrations are not worthwhile when a few words will do the job instead—a level graph or a table with lots of zeros is just a waste of space.

Very occasionally, illustrations are used in articles with lots of technical detail as a form of white space. Here, the illustration provides something attractive and restful to look at while the reader absorbs the information she has been given.

- Your illustrations must provide the same level of detail as your prose, so don't include intriguing features unless you are willing to explain them in the text.
- Tie your illustration in to your text. Don't just refer to Figure 19—say what Figure 19 *means*.
- Look at each illustration again: what is its most striking feature? Is this the feature you want to emphasise?
- Is one of your illustrations too complicated—would it be better to split it into two separate illustrations?
- Try to put your illustrations on the same (or facing) page as the text that refers to them and orient the illustration vertically so that the reader doesn't need to rotate the page.
- Try to fit illustrations *after* the text that refers to them. Otherwise, readers spend lots of time trying to work out the illustrations, rather than just waiting for the descriptive text.
- Check that the printing process doesn't involve reducing your illustration to the point that information might be lost.
- Do the captions allow a reader to browse the article or are they as unhelpful as 'Summary of data'. Do not, however, try to explain everything about the illustration in the caption. Keep it short and to the point.

When a reader scans an article she looks first at the graphical layout: the illustrations, yes, but also the section headings and paragraph sizes. Review your article looking for pages with nothing but solid text, or pages with too many headings, bits of paragraphs and other assorted *jumble*.

24 Graph and Table Checklist

Graphs are good for showing relationships between different data. They do not show data as accurately as tables do.

- Put textual labels on the axes and show units. Choose your font size so that it will still be readable after any reduction applied during printing.
- Think carefully about the scale you have used: you want to show the important features but not make jitter in your measurements look like features.
- If you start an axis at something other than zero (or if you have a discontinuity in an axis) then make sure this is clearly flagged to the reader.

Tables are good when you have more data to present than can be comfortably described in words. Tables can also be used for structuring complex information. You have several objects with multiple attributes? Stick them in a table.

Many tables can be organised horizontally and vertically—which is best?

- Numbers that will be compared should go in a column. Have you ever tried to add up a *row* of numbers?
- One orientation will often be much more wasteful of space than the other. This is very noticeable when a column has one entry in it which is very much wider than all the others.

When you use numbers in tables remove the non-significant digits so that you do not suggest a spurious precision.

Once you've created your table have a look at the data and ask yourself:

- Does the reader really need all this information?
- Are there rather a lot of similar entries? Several columns mostly filled with zeros?
- Could the table be summed up in less space if I used words instead?

25 Photograph and Diagram Checklist

Photographs are good because they give a sense of realism to the subject. However, photos are notorious for having distracting secondary artifacts. Remember that with diagrams you have complete control of what goes in and what doesn't.

- Should you include something familiar in the photo to show what the scale is? Alternatively, have a scale drawn on the photo so that it stays in proportion regardless of the photo size when printed.
- Do you need arrows or annotations to indicate the important features?
- You may want to indicate to the printer where the photo can be cropped so that reduction in the printing process doesn't cause too much detail to be lost.
- Whatever you do, don't write directly on the photo. Write on some tracing paper and overlay it, or else write on a photocopy of the photo.
- If there could be any doubt then write 'top' on the top of the back of the photo (use a soft pencil).
- Colour photos are not a good idea. They often lose contrast when printed in black and white. If you do want them reproduced in colour then you will usually have to pay towards their printing.

Remember, you have more control over what goes into a *diagram* that what goes into a photo. Some objects just can't be photographed effectively because, for instance, an important structure is hidden under a surface.

With *diagrams* be aware of the symbols you are using. Be aware that even something as simple as making one line thicker than the others may cause your readers to ask 'What's special here? What does a thick line *mean*?'

26 Quotations & Copyright Law

There are a number of times when you might reach for a handy quotation:

- When a choice quotation sums up an idea particularly well.
- When you want to add weight to an argument that wouldn't otherwise be automatically accepted.
- When you want to acknowledge an important contribution by another researcher.

Don't go overboard with quotations, though, otherwise your own voice in the article may be entirely lost.

When you use a quotation:

- Use quotation marks and put any final comma or period inside the closing mark.
- Cite the source in case a reader wants to verify the quotation.
- Quotations from less well known sources need to be supported with some background information about the original work. Otherwise, the reader may give little credence to the quotations.
- Avoid quoting from unpublished works (this includes theses) because they won't, in general, be accessible to your readers.

Copyright Law works as follows. You start by owning the copyright to material that you have created. However, most journals will not publish your work unless you sign away your copyright to them.

If you wish to include material for which you do not hold copyright then you must request and obtain permission from the copyright holder. This applies to tables, figures, and quotations of more than a few lines. Provided that you are not seeking personal financial gain you have a good chance of being granted permission to use the material as long as you acknowledge the original source. An example of such an acknowledgement might be:

Reprinted with permission from Transactions on Computers, copyright 1999 by IEEE.

In practical terms you are unlikely to be sued for using material without permission, but you *are* likely to lose the respect of your peers.

27 Citing Other Work

As with quotations you should not cite unpublished work.

- When you cite another work you must make clear to the reader what relevance that work has to your paper.
- When you cite work that is in the process of being published annotate with 'in press'.
- Although errors in citation lists are less common when tools such as BibTeX are used, you should still give lists a thorough check.
- Different journals have quite different demands as to what goes in the citation list. You should, therefore, be sure to include all relevant information when making the original entries in your BibTeX file.

There are quite a number of alternative formats for citations. Two of the most popular are:

- The 'Harvard System' in which citations include author names and the year, e.g. Smith (1992).
- The number system with citations such as [34].

The Harvard System is good if you don't have an automated tool to generate citation lists because you can add a new citation without having to update the citation list.

The number system is good because it saves page space and, perhaps more importantly, requires less reader effort to skip over when citations are put in the middle of a sentence.

When you cite a work, cite it immediately after the relevant text rather than saving up all those citations for the end of the sentence.

When a paper has many authors the Harvard citations take up a lot of space. You may, therefore, wish to use the following set of rules:

- If there are just one or two authors then include both names in the citation.
- If there are three authors then include all names in the first citation but include only the first name (and *et al*) in subsequent citations.
- If there are four or more authors then include only the first name (and *et al*) in every citation.

- Give all names in the citation list.

You may wish to combine the Harvard and number systems as there are times when you want to refer to an author or year of publication in the body of your article.

How should numbered citations be ordered?

- If the first citation is always [1], the second [2], etc. then it is easy for the reader to take an entry in the citation list and look up its first mention in the text.

- If the citation list is sorted alphabetically by author then it is easier to identify all Smith's papers because they appear next to each other.

Citation lists are used not only to support an article but also by readers looking for interesting papers. Include, therefore, any extra information which may help those readers. Even simple information such as the inclusive page numbers will help readers separate major tomes from brief notes (and to estimate the likely cost of obtaining a photocopy).

28 Technical Words & Jargon

Technical words are great: they allow you to sum up a complex idea succinctly and precisely.

However, when you use a technical word that the reader does not recognise, or when you use a technical word in a non-standard context, then the technical word becomes a jargon word.

Jargon makes readers uncomfortable. They feel excluded, they suspect that maybe you don't know what you are talking about. Style gurus often say that technical writing has much too much jargon in it.

You can restore a jargon word to a technical word by defining the word. Ensure, however, that your definition captures all relevant aspects of the word and is more than just an example of one way the word may be used.

29 Problem Words

There are a number of words which frequently seem to cause problems:

- Verbs involving parts of the verb *to be*. The *to be* verb tends to be used so often that it becomes boring. As we noted in Section 22, verbs based on *to be* often indicate use of the bad passive voice.

- In terms of syntactic correctness, *only* will often fit in more than one place—so double check that the sentence really says what you want it to.

- *Like* is fine as a preposition but not as a conjunction. In the latter case you want *as*.

Incorrect	*Correct*
Like we just showed...	As we just showed...
	Software, like hardware, can fail.

- Phrases involving *case* are over used. *Usually*, *always*, and *never* are often better substitutes.

- The construction *and/or* is disliked by many editors.

- In many instances you will find that *quite* is quite unnecessary.

- *Each* and *every* are often confused.

- *Amount* and *number* are often confused.

- *Varying* and *various* are often confused.

- *While* and *whereas* are often confused.

- *Which* and *that* are often confused. If B is a clause which defines A then use *A that B*. If B is a clause which does not define A but which adds some extra information about A then use *A which B*.

  Problems that cannot be completed in polynomial time are termed NP-complete.

  NP-complete problems, which I studied, cannot be completed in polynomial time.

- Words such as *always*, *good*, and *wrong* are felt by some to be too strong, too absolute. To placate such people you might consider alternatives: *often*, *may*, *generally*, and the like.

30 Pronouns, Plurals and Prepositions

Pronouns are extremely useful but they need to be applied with care.

- Strictly speaking, pronouns always refer to the immediately preceding noun.

Sometimes the pronoun rule can be stretched because an *it* can only refer to a singular noun and a *they* can only refer to a plural noun. Oftentimes authors stretch the pronoun rule far too far and only the readers who already know what the author was trying to say can understand what has been written.

- Data is the *plural* of datum so you must write 'these data are important'.

Data, and many other words ending in *a*, are plurals derived from Latin words. To a reader of Latin *a* signifies a plural in the same way as *s* signifies a plural to a reader of English. Other plurals include: *memoranda*, *bacteria*, *phenomena*, *criteria*, and *strata*.

- If A and B are singular nouns then the following sentences are correct:

  A or B is a good option.

  Either A or B is a good option.

  Neither A nor B is a good option.

- If either A or B is plural, then the following sentences are correct:

  A or B are good options.

  Either A or B are good options.

  Neither A nor B are good options.

Watch out for long sentences with lots of parts joined by *prepositions*. You can highlight problem sentences by drawing a bar through each preposition and then counting the number of bars in each sentence.

31 Tense

It is difficult to give hard and fast rules for what tense to use in different parts of your article. However, here are some suggestions based on respect and modesty:

- Use the present tense when describing other people's work. This shows respect by suggesting that their work is part of current knowledge.

- Use the past tense when describing work you have done. This shows modesty by suggesting that your work is not yet part of the database of current knowledge.

- Make exceptions to the above rules where common sense dictates:

  Smith found (past tense, exception) that system A is faster (present tense, rule) than system B.

  My table 5.4 shows (present tense, exception) that system C was faster (past tense, rule) than system A.

If you follow these suggestions then parts of your abstract, methods and results sections will be in the past tense because you are talking about your work. Much of the introduction and discussion will be in the present tense because you are talking about current knowledge. Don't worry that these suggestions cause you to shift back and forth between tenses.

32 Ten Commandments of Good Writing

1. Each pronoun should agree with their antecedent.
2. Just between you and I, case is important.
3. A preposition is a poor word to end a sentence with. (Incidentally, did you hear about the streetwalker who violated a grammatical rule? She unwittingly approached a plainclothesman, and her proposition ended with a sentence.)
4. Verbs has to agree with their subject.
5. Don't use no double negatives.
6. Remember to never split an infinitive.
7. Avoid cliches like the plague.
8. Join clauses good, like a conjunction should.
9. Do not use hyperbole; not one writer in a million can use it effectively.
10. About sentence fragments.

Reprinted from *How to Write and Publish a Scientific Paper*, Fourth Edition, by Robert A. Day. Used with permission from the author and The Oryx Press, 4041 N. Central Ave, Phoenix, AZ 85012.

Part III

Journals

33 Choosing a Journal

There are several ways in which you can check the suitability of a journal for your article.

- Look on the title page for a statement of purpose.
- Look at the contents pages of a few issues.
- Try to gauge the size and type of readership. Most journals based in the United States have circulation figures at the back of their November or December issues.
- Look in the Journal Citation Reports (part of the Science Citation Index) for information about journal size.
- Consider the reputation of the journal. One article in a big journal may be worth half a dozen in small journals. How often do you see the journal cited in other work?
- How long does the journal take to review and publish work? Many journals have a backlog. Monthly journals tend to move faster than quarterlies. Some journals include a 'received for publication' date on their articles.
- You may have reservations about submitting to a journal which does not do anonymous reviewing.
- Find out whether abstracts from the journal are collected and distributed in other publications. If they are, then you have a much wider audience.
- It is not unreasonable to contact the editor of a journal to sound her out about the suitability of your article. This does not, however, absolve you from the moral responsibility of doing a little research on the journal beforehand.

If you do not select a journal with care you may very well find that several months elapse before you receive a rejection. Or, and perhaps this is worse, you find that your article is published but never read by anybody.

An important point: do not be tempted to submit to more than one journal at a time. If you are found out then no journal is likely to have anything to do with you ever again.

34 Submission Practicalities

Follow the journal's submission guidelines. If you don't make at least a reasonable attempt to do so then the editor may reject the paper outright.

Send your paper in a strong, properly addressed envelope with the correct postage on it. Do not commit your only copy of the paper to the mails. Do not staple your article together—use a paper clip.

Enclose a covering letter stating which journal you are submitting to, how you should be contacted for correspondence and whether the article is a new article or a revision. Unless you are told that you will receive an acknowledgement automatically, consider enclosing a self-addressed, prepaid postcard for the purpose.

If you are submitting to a journal in the United States then spell check your article with an American-English spell checker.

If the journal does anonymous reviewing then make sure your name can be removed from your article relatively easily—don't print your name at the top of each page!

What kinds of editor do you get and what to they do?

- The journal editor has the ultimate responsibility for accepting or rejecting a paper. She will, to a greater or lesser extent, rely on the reports provided by the reviewers that she decides to use. Journal editors are usually distinguished scientists first, and unpaid journal staff second. If you are concerned about the review your paper received then bring the matter up with the editor. Editors are supposed to be on your side so treat them with courtesy.

- The journal managing editor is usually a paid, full-time member of the journal staff. She is responsible for providing the administration and clerical support necessary to run the journal. If the journal loses your paper, complain to the managing editor.

What happens next? You should get an acknowledgement that your article has arrived within four to eight weeks.

Providing that the editor thinks your article is broadly in line with the journal's aims and that your article meets the journal's submission requirements reasonably closely, your article will be submitted for peer review.

35 The Peer Review Process

The editor keeps a list of the Editorial Board—people willing to perform reviews for the journal. A number of the names on the Board will be important scientists (although sadly it is just such people who have least time to spend reading your work).

The editor will send your article to two or three of these reviewers, although you are unlikely to find out which ones as most journals do not release reviewers' names to authors. This phase of the proceedings may take anything from two to six months!

If the reviewers' reports are consistent and favourable then the editor may well accept the article (subject to certain modifications) there and then. Otherwise, if the reports are contradictory then the editor will either send your article out for further reviewing or simply make a judgement based on her own experience.

A very small percentage of papers are accepted 'as is'. In the majority of cases the editor will either reject the paper or accept the paper provided that you modify it.

If you are rejected (and about half the papers submitted are) then have a look at the comments provided by the reviewers. If you feel that there is something to be salvaged then by all means go ahead and do so. It is perfectly acceptable to submit your revised paper to the same journal again. If the reviewers' comments are extremely negative then maybe you should consider dropping the paper lest it really is flawed, does get published, and subsequently damages your reputation.

If you are accepted 'with modifications' then make the best use of the reviewers' comments. In many cases the reviewers really do come up with suggestions that will improve your paper. If some of the modifications seem to be unreasonable then you don't have to follow them. However, the reviewers are likely to be representative of your target audience and thus ought to be placated in some way. If you feel that you have been reviewed unfairly—perhaps because the reviewer holds a position ideologically opposed to your own—then you can request that the editor not resubmit your article to that reviewer the second time around.

A possible, but weak, line of defensive is to write the editor a polite, dispassionate letter stating why you disagree with the reviewers. In this scenario you are probably better to go and look for an alternative journal.

36 List of Authors' Names

When a journal article has several authors, what order should the names be listed in? At least two schemes have been used:

- Alphabetically by surname.
- By size of contribution.

The problem of ensuring that each author is happy with the position of their name is compounded by the fact that it is not always clear which scheme a given journal uses.

- The fairest scheme is to list the people who contributed to the research intellectually, largest contribution first.
- Other people involved with the project, for example the programmers who were asked to provide particular software, are best mentioned in the 'acknowledgements' section.

All authors should be aware that by having their name listed on a paper they become responsible for the contents of the paper. One researcher lost his job when it was discovered that, quite unknown to him, his co-author had tampered with some of the data.

I recommend the following format for names:

- First name, middle name (if any), surname.
- Names in full where possible so that John Smith won't be mistaken for James Smith.
- Do not list the authors' degrees unless the journal specifically requires them.
- Provide an address for at least one of the authors so that readers have some indication of where the research was carried out. Some readers will want to write for reprints too.
- Providing addresses for all authors gives more information about where relevant research is going on and further reduces the chance of two similarly named authors being confused with each other.
- If an author has moved since writing the paper then prefix her new address with 'present address'.
- When, for example, the paper has three authors and two share an address it may be helpful to use superscripts to link author names and author addresses. This saves having to repeat an address.

37 Acknowledgements

I gratefully acknowledge the following authors whose books have provided the material for this guide: Moxley [5], Alley [1], Day [2], and Matkin and Riggar [4]. The first two of these works are particularly recommended for their usefulness and relevance. Day [2] is also worthwhile, and has a refreshingly light-hearted approach.

This document undoubtedly contains errors and omissions and I would be very glad to be told about them, preferably by email to `pmar@comp.vuw.ac.nz`.

References

[1] Michael Alley. *The Craft of Scientific Writing.* Prentice-Hall, 1987.

[2] Robert A. Day. *How To Write and Publish a Scientific Paper.* Oryx Press, 4th edition, 1994.

[3] American National Standards Institute (ANSI) Inc. American National Standard for the Abbreviation of Titles of Periodicals, 1969.

[4] Ralph E. Matkin and T. F. Riggar. *Persist and Publish: Helpful Hints for Academic Writing and Publishing.* University Press of Colorado, 1991.

[5] Joseph M. Moxley. *Publish, Don't Perish: The Scholar's Guide to Academic Writing and Publishing.* Greenwood Press, 1992.