Science Writers' Retreat

Institute for Applied Ecology
University of Canberra, ACT 2601
May 2018

Science Writers Workshop (Non-Award)
This document is part of a short course in scientific writing (Non-Award) run by the Institute for Applied ecology at the University of Canberra. Course enquiries can be directed to the address below.

Copies of this publication are available from:

The Institute for Applied Ecology
University of Canberra ACT 2601
Australia
Email: georges@aerg.canberra.edu.au

University of Canberra

TENTATIVE OUTLINE

Science and Publication

Science is not complete until the results are published. Not until then do the results contribute to the body of contemporary knowledge, becoming widely available for scrutiny, criticism and testing by the scientific community. Too much research goes unpublished, in theses and reports that languish as single copies on a library shelf.

For some, the process of converting their findings to a form that can be accessed by their peers comes easily, and is the most enjoyable aspect of research. For others, it is simply hard yakka, and motivation diminished once the outcome of the research is known.

Those of us who find it difficult to write scientific papers have no difficulty whatsoever in constructing artificial barriers to progress (writer's block), in finding excuses (I'm so busy, I have time for the research, but writing gets put on the back burner), or engaging in displacement behaviour (learning to use a graphics package to create a figure that would have taken minutes to do by hand).

This workshop will bring together a small group of people, each with a paper ready to write, for a collective assault on the barriers to productive writing. By bringing together the experienced with the less experienced in a staged process leading to publication, it will allow sharing of approaches to and views on what makes a good publication and how to bring it about. Like attending the gym, group participation will help to enhance motivation and commitment.

Anticipated Outcomes

The aim of this workshop is to accelerate individual throughput, to increase the quality of final manuscripts submitted for publication, and so to ensure that a greater quantity of the quality research that we do sees the light of day. Although the process might seem protracted, the skills developed during this workshop will pay back the effort many times over when it comes to preparing manuscripts in the future.

What we supply

We will supply you with printed course notes, internet access to the BaseCamp 3 collaborative site (https://3.basecamp.com). You have been supplied with guidelines for accessing Basecamp already.

You should register on Basecamp, update your profile, and introduce yourself and your proposed research paper topic as soon as you receive these course notes. Please do not wait until you arrive at the workshop, because there could be important announcements made via this avenue in advance. Please post a photo of yourself on your profile.

Have a play with Basecamp, and upload any materials you think will be useful (in the appropriate directory, against your name) to get a feel for how it works.

We will provide you with electronic copies of the following books or relevant sections of these books:

Day, R.A. (1994). *How to Write and Publish a Scientific Paper*. 4th edition. Cambridge University Press. [ISBN 0 521 558980]

Magee, B. (1973). *Popper*. Fontana Press, Harper-Collins Publishers, New York [ISBN 0 00 686008 7]. [On Basecamp now]

You will need to bring your own laptop, one that is Wifi capable, together with any software you would normally use in preparing written work.

You should also have at hand a copy of a reference management tool, such as endnote. If you do not have one that you regularly use, I would recommend Zotero (https://www.zotero.org/).

Format

The format is an intensive writing workshop, with several joint sessions to discuss the broader issues, such as our approach to science and to science writing. We then group into writing circles, each of 4 – 5 people, at least one of whom is an experienced writer and publisher. Writing Circles work as units, circulating drafts among the members, and working up the papers.

TENTATIVE SCHEDULE OF EVENTS

DAY 1 SUNDAY

- **Travel to Kioloa by bus**
- **Welcome Session and Introductions**
- **Plenary Session – Prof Deep Saini**
- **Dinner and Campfire**

DAY 2 MONDAY

- **Early Morning Beach Walk**
- **Breakfast**

Session 1: Introduction to scientific writing and publishing

Here we will introduce ourselves and discuss some of the issues surrounding publication in the scientific literature. Why we do it? Which journals should we target? What are the ethical issues? What is the best way to collaborate with fellow authors? What modern tools are available to assist us? What are the barriers to effective writing? What happens to our manuscript after we submit?

- **Morning Tea**

Session 2: Confirmation vs Refutation || Plausibility vs Proof || Revisit your scope document || A Start on the Introduction.

Here we discuss what Popper has to contribute to how we approach our work and how we prepare our manuscripts to maximise their impact on our field. We will then revisit our scope document, draft an Introduction, and firmly establish in our own minds where we would like to see the paper heading. Getting this right will save much anguish later, and remove many impediments to progress.

***Breakout:* Writing the Introduction**

- **Lunch**

***Breakout:* Writing the Introduction**

- **Afternoon tea**

Session 3: Evaluate Drafts of the Introduction.

***Breakout:* Reviewing each others' Introductions**

Here we will provide critique each other's Introductions, having read them and evaluated them against some clearly stated criteria. Revise the Introduction in the light of the comments of others.

- **Dinner**

At the end of Day 2 we should each have a clear vision of where our paper is heading, what central message or key finding is to be communicated, and have roughed out a draft of the Introduction.

DAY 3 TUESDAY

- **Early Morning Beach Walk**
- **Breakfast**

Session 4: Begin Results.

Here we discuss what include in the Results and some common faults. We will draft a Results section, with a keen eye out to presenting the key results and interpretation that will allow us to deliver on our central message ("here we show" statement).

Breakout: **Writing the Results**

- **Morning Tea**

Breakout*:* **Writing the Results**

- **Lunch**

Session 5: Evaluate Drafts of the Results.

Here we will critique each other's Results, again evaluating them against some clearly stated criteria, and discuss what goes into the Materials & Methods section. We will also look forward as we redraft the Results section, making dot-point notes on what we might cover in the Discussion section.

Breakout: **Seeking critique and redrafting the Results**

- **Afternoon tea**

Session 6: Discuss Materials & Methods.

Here we discuss what include in the Materials and Methods and some common faults. We will focus here on the order of topics, what is in, and what is out, and how to achieve the objectives of this section.

- **Dinner**

At the end of Day 3 we should each have a draft of our results section, and a list of items that came to mind for attention in the discussion.

DAY 4 WEDNESDAY

- **Early Morning Beach Walk**
- **Breakfast**

Session 7: The Materials & Methods.

Here we draft a Materials and Methods section, being sure to include sufficient detail for someone to reproduce our results, should they wish to do so. It is a statement of what would need to be done in order to generate the observed results, not everything we did, and not why we did what we did. Leave those last two for the thesis.

Breakout: **Writing the Materials and Methods**

- **Morning Tea**

Breakout: **Finalising the writing of Materials and Methods and providing critique to others in our writing cell.**

- **Lunch**

Afternoon catch-up and R & R

At the end of Day 4 we should each have a draft of our Materials and Methods section, and now be ready to get into the fun part, the discussion.

DAY 5 THURSDAY

- **Early Morning Beach Walk**
- **Breakfast**

Session 8: The Discussion.

Here we draft a Discussion section, at last able to put our stamp on the character of the paper. Here we discuss our key findings in the context of the literature, that is, in the context of what is known from the work that has come before us. We focus on the key advance (again, on the "here we show" statement), but also discuss the finer points of our results where their interpretation and relevance might be of value to the reader. We take great care here to bring our chickens home to roost, by clear and substantive statements about the relevance of our work and how it takes our understanding forward. For this, we need a complete grasp of the literature.

Breakout: **Writing the Discussion**

- **Morning Tea**

Breakout: **Finalising the writing of the Discussion.**

- **Lunch**

Breakout: **Finalising the writing of the Discussion and providing critique to others in our writing cell.**

- **Afternoon tea**

Session 9: Where to from here

In this session, we take time out to discuss where each of us have come, and what we need to do next. We have broken the back of our paper, but there is some more to do. We need to tidy up the references, write an abstract, craft that all important title, and settle on some keywords, then format the paper for our target journal.
In this session we focus particularly on the purpose of an abstract, and how to craft one that is effective within the highly restrictive word limit commonly imposed by journals. We also discuss the importance of the title

Breakout: **Writing the Abstract and crafting a Title.**

- **Dinner**

At the end of Day 5 we should each have a draft of our Discussion section, of our Abstract, and have transformed our working title to one that is attention grabbing and reflective of the content of our paper.

DAY 5 FRIDAY

- **Early Morning Beach Walk**
- **Breakfast**

Session 10: Evaluate Abstract and Title || Adding Polish -- Does it all Hang Together?

Here we will look at putting the whole manuscript together, ready for publication, incorporating the input from a mock editor and mock reviewers.

Here we pull the draft into a mature document, chasing up new literature and leads to broaden appeal, reinforce significance, make the results and conclusions more definitive. It is also a good point to revisit the Introduction, in case the manuscript has wandered a little from what was anticipated.

Breakout: **Putting it all together**

- **Morning Tea**

Session 11: Mock Review

Here we send out draft manuscript out to three colleagues, not necessarily within our writing cell, to provide independent pre-review. They should consider such matters as are the results defensible, given the data and the analysis undertaken, are the major conclusions supported by the data in the context of other literature that may have been brought to bear, is the key message one of significance, and appropriate to the target journal, are their issues with the communication of data, ideas and interpretation?

Breakout: Review by three colleagues

- **Lunch**

Session 12: Final Manuscript Preparation || Party time.

Now we pull it all together. Does the whole document hang together as a coherent whole? What last minute changes are needed? Is everything formatted in accordance with the journal's requirements? Are our figures and tables finalized? Prepare the submission letter.

- **Afternoon tea**
- **Departure for Canberra**

At the end of the Retreat, we should have a mature discussion, a revisited and revised version of our Introduction, a world-beating title, and a draft Abstract.

We should each have a draft of our manuscript,
for circulation to our other authors and/or people willing to give it a final
pre-review for us. The target journal has been selected,
and submission should follow quickly.

University of Canberra
SCIENCE WRITER'S CLUB

USEFUL AUTHORING TOOLS

Elements of Style by William Strunk

http://www.bartleby.com/141

An excellent and well established guide to writing style, including grammar and punctuation. Immensely useful for those whose writing style has deteriorated through years of reading the scientific literature.

Dragon Dictation

https://www.nuance.com/en-au/dragon/dragon-for-pc.html

Dragon Dictation is an easy-to-use voice recognition application powered by Dragon NaturallySpeaking that allows you to easily speak and instantly see your text or email messages. Can be great for getting the central thread of the argument down in plain English, putting the flesh on the bones later. Can especially useful for those moments that inspiration and clarity of expression strikes and accessing a keyboard is not practical. Can relieve that stress when you wake in the morning having had a Stirling idea, the detail forgotten. With Dragon naturally Speaking you can show that it was actually incoherent drivel.

Skype for Windows

http://www.skype.com/

An excellent and well established communication tool including voice, video and screen sharing. Excellent for working remotely with your co-author to discuss how to proceed with a manuscript. Great for synchronous communication. Free.

Basecamp 3

https://3.basecamp.com/

Basecamp is a collaborative tool that provides opportunity for a team to work collaboratively on data analysis and writing. It has features such as messaging, writeboards, file management with version retention, milestones and the like. Excellent for ascynchronous project management and manuscript preparation. Not free.

DropBox

http://www.dropbox.com/

Give mobile and distributed teams anywhere, anytime access to your files for collaborative work.

Word for Windows Tracking Feature

https://www.groovypost.com/howto/microsoft/track-changes-in-word-2010/

Word is probably the most commonly used word processor and has an outstanding word tracking facility that allows multiple users to sequentially modify documents and flag the changes. If you do not use this when collaborating with others, it is certainly worth a try.

Endnote

http://www.endnote.com/

Endnote is a popular indispensible tool for managing bibliographies and eliminating mistakes in manuscripts relating to manageing citations. Can download citations directly from the major biobliographic databases, works as a plug-in with word and does all the hard yakka in terms of formatting and checking that all references cited are included in the reference list and vice versa.

Zotero

https://www.zotero.org/

Zotero is an alternative to Endnote for managing publications and citations. Very portable, very collaborative. Recommended.

Mendeley

https://www.mendeley.com

Another alternative to Endnote that is very popular.

Session 1
INTRODUCTION TO SCIENTIFIC WRITING AND PUBLISHING

Extracts from the Preface of Day (1994)

Extracts from the Preface of Day, R.A. (1994). *How to Write and Publish a Scientific Paper.* 4th edition. Cambridge University Press. [ISBN 0 521 558980] which I hope will prompt you to buy the latest incarnation of this entertaining and informative book.

Preface

> *Criticism and testing are of the essence of our work. This means that science is a fundamentally social activity, which implies that it depends on good communication. In the practice of science we are aware of this, and that is why it is right for our journals to insist on clarity and intelligibility...*
>
> -- Hermann Bondi

Good scientific writing is not a matter of life and death; it is much more serious than that.

The goal of scientific research is publication. Scientists, starting as graduate students, are measured primarily not by their dexterity in laboratory manipulations, not by their innate knowledge of either broad or narrow scientific subjects, and certainly not by their wit or charm; they are measured, and become known (or remain unknown) by their publications.

A scientific experiment, no matter how spectacular the results, is not completed until the results are published. In fact, the cornerstone of the philosophy of science is based on the fundamental assumption that original research must be published; only thus can new scientific knowledge be authenticated and then added to the existing database that we call scientific knowledge.

It is not necessary for the plumber to write about pipes, nor is it necessary for the lawyer to write about cases (except *brief* writing), but the research scientist, perhaps uniquely among the trades and professions, must provide a written document showing what he or she did, why it was done, how it was done, and what was learned from it. The key word is reproducibility. That is what makes science and scientific writing unique.

Thus the scientist must not only "do" science but must "write" science. Bad writing can and often does prevent or delay the publication of good science. Unfortunately, the education of scientists is often so overwhelmingly committed to the technical aspects of science that the communication arts are neglected or ignored. In short, many good scientists are poor writers. Certainly, many scientists do not like to write. As Charles Darwin said, "a naturalist's life would be a happy one if he had only to observe and never to write" (quoted by Trelease, 1958).

Most of today's scientists did not have the chance to undertake a formal course in scientific writing. As graduate students, they learned to imitate the style and approach of their professors and previous authors. Some scientists became good writers anyway. Many, however, learned only to imitate the prose

and style of the authors before them-with all their attendant defects- thus establishing a system of error in perpetuity.

The purpose of this book is to help scientists and students of the sciences in all disciplines to prepare manuscripts that will have a high probability of being accepted for publication and of being completely understood when they are published. Because the requirements of journals vary widely from discipline to discipline, and even within the same discipline, it is not possible to offer recommendations that are universally acceptable. In this book, I present certain basic principles that are accepted in most disciplines.

For those of you who share my tremendous admiration for *How to Write and Publish a Scientific Paper,* let me tell you a bit about its history. The development of this book began many years ago when I taught a graduate seminar in scientific writing at the Institute of Microbiology at Rutgers University. I quickly learned that graduate students in the sciences both wanted and needed practical information about writing. If I lectured about the pros and cons of split infinitives, my students became somnolent; if I lectured about how to organize data into a table, they were wide awake. For that reason, I used a straightforward "how to" approach when I later published an article (Day, 1975) based on my old lecture notes. The article turned out to be surprisingly popular, and that led naturally to the publication of the First Edition of this book.

Without meaning to knock the competition, I should observe that my book is clearly a "how to" book, whereas most other books on the subject of scientific writing are written in more general terms, with emphasis on the language of science. This book was written from the perspective of my many years of experience as a managing editor, as a publisher, and as a teacher. Thus, the contents are intended to be specific and practical.

In writing this book, I had four goals in mind. First, I delayed writing and publishing it until I was reasonably sure that I would not violate the managing editors' creed: "Don't start vast projects with half-vast ideas." Second, I wanted to present certain information about the scientific paper itself and how to cook it. (Yes, this is a cookbook.) Third, although this book is in no sense a substitute for a course in English grammar, I do comment repeatedly on the use and misuse of English, with such comments interspersed throughout a number of the chapters and with a summary of the subject in a later chapter. (Readers wanting a whole book on this subject, rather than a summary, should read my *Scientific English: A Guide for Scientists and Other Professionals,* Oryx Press, 1992). Fourth, because books such as this are usually as dull as dust, dull to read and dull to write, I have also tried to make the reader laugh. Scientific writing abounds with egregious bloopers (what the British sometimes call "bloomers"), and through the years I have amassed quite a collection of these scientific and grammatical monstrosities, which I am now pleased to share. I have tried to enjoy writing this book, and I hope that you will enjoy reading it.

Note that I say "reading it," even though earlier I described this book as a cookbook. If it were simply a book of recipes, it would hardly be suitable for cover-to-cover reading. Actually, I have tried to organize this material so that it reads logically from start to finish, while at the same time it provides the recipes needed to cook the scientific paper. I hope that users of this book might at least consider a straightforward reading of it. In this way, the reader, particularly the graduate student and fledgling writer, may get something of the flavour of just what a scientific paper is. Then, the book can be used as a reference whenever questions arise. The book has a detailed subject index for this latter purpose.

I do not have all the answers. I thought I did when I was a bit younger. Perhaps I can trace some of my character development to the time when Dr. Smith submitted to one of my journals a surprisingly well-written, well prepared manuscript; his previous manuscripts had been poorly written, badly organized

messes. After review of the new manuscript, I wrote: "Dr. Smith, we are happy to accept your superbly written paper for publication *in the journal."* However, I just couldn't help adding: "Tell me, who wrote it for you?"

Dr. Smith answered: "I am so happy that you found my paper acceptable, but tell me, who read it to you?"

Thus, with appropriate humility, I will try to tell you a few things that may be of use in writing scientific papers.

In the Preface to the First Edition, I stated that I would "view the book as a success if it provides you with the information needed to write effective scientific papers and if it makes me rich and famous." Having since achieved neither fame nor fortune, I nonetheless continue to hope that this book is "a success" for you, the reader.

Finally, I hope that those of you who have used earlier editions of this book will notice improvements in this edition. One thing I'm sure of. I'm not as big a fool as I used to be; I've been on a diet.

Robert A. Day

PREPARATION – THE WEEK PRIOR

Reading

Day, R.A. (1994). *How to Write and Publish a Scientific Paper*. 4th edition. Cambridge University Press.

- Preface
- Chapter l: *What is Scientific Writing*
- Chapter 2: *Origins of Scientific Writing*

Magee, B. (1973). *Popper*. Fontana Press, Harper Collins Publishers, New York.

- Chapter 1: Introduction
- Chapter 2: Scientific Method – the traditional view and Popper's view
- Chapter 3: The criterion of demarcation between what is and what is not Science

Think about these questions when reading Popper's book.

- What is Popper's view of the demarcation of science and non-science? Do you agree with this, and if not, where exactly do you disagree?
- What are the conflicting views on how science progresses, as outlined in Magee's book? What is your position on this?
- In a succinct statement, what do you think Popper would say by way of advice for the young aspiring scientist?
- How would an appreciation of Popper's view on how science progresses influence your approach to writing a paper?

Actions

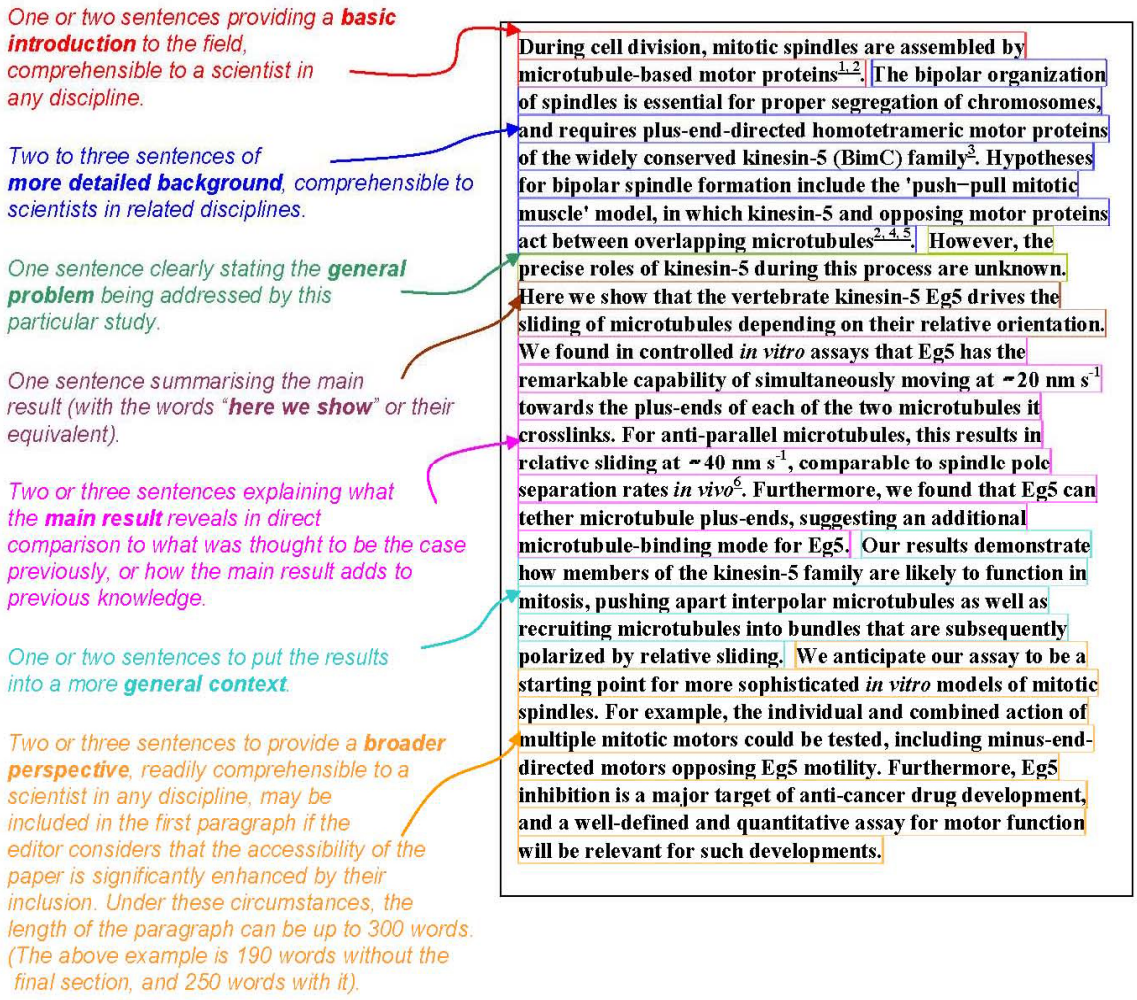
- Choose a discrete piece of work to publish, one for which the analysis is complete.

  A data set fully analysed with the results summarized and interpreted in the form of some descriptive paragraphs, which you believe is significant enough to form the kernel of a free-standing publication in a refereed journal, is essential. Substantial analysis durning the workshop will be very counter-productive during writing.

- Prepare draft paragraphs describing the results and interpreting trends.
- Prepare mock-ups of any figures and tables.
- Identify two key papers that establish the relevance of the work you propose to publish to your field. Be prepared to draw on these when introducing your proposed paper to the workshop.

- Think about how to scope out your paper in advance of the workshop. We will spend some time on this, but give it a try also in advance. Scope out your paper using the guidelines below.

Annotated example taken from *Nature* **435**, 114-118 (5 May 2005).



- Choose a journal in which to publish, tentatively.

Postings

Log into the Basecamp site on https://3.basecamp.com, select the "Writers Retreat 2018" entry, select messages, and post an entry against the "Introduce Yourself" thread. Include in your entry

- a brief description of yourself and your interests;
- where you are from;
- a draft title for your paper;

- what the central message is; and
- where you are going to send it.

Finish by saying what you hope to get out of the workshop.

Be Prepared

Be prepared, when you first attend the workshop, to give some brief background to your paper, identify any other authors, then answer the specific questions:

- Why was the work worth doing? Support your case by citing one or two key articles that either stimulated you to do the work or that you plan to use to establish the significance of the study. You will be asked to dispel the potential thought among your colleagues -- Why bother? Draw from your scope document.

- What is the central message (Here we show …) to be developed or the key finding(s) to be presented in the paper, and why are they of significance.

- In what journal to you plan to publish, and why did you choose it?

Be Committed

Success in this workshop requires that you put preparing a paper up with your number one priorities during this workshop and until the paper is submitted.

Session 2
GETTING STARTED

Introduction

Why are we here? We are here because we have something to say, in writing, to our scientific colleagues. However, we find that we are required to follow a very traditional and formal process if we are to have an impact on the thinking of our peers and the directions taken by our field. This workshop is about scientific publication.

Why Publish?

Science is not complete until the results are published. Not until then do they contribute to the body of contemporary knowledge, becoming widely available for scrutiny, criticism and testing by the scientific community. This peer scrutiny is essential for your work to become accepted as part of scientific knowledge, and contributes to the pressure to strive for excellence in the research that you undertake. Unfortunately, too much research goes unpublished, in theses and reports that languish as single copies on a library shelf.

Hard Yakka

For some, the process of converting their findings into a form that can be accessed by their peers comes easily, and is the most enjoyable aspect of research. For others, it is simply hard yakka, and motivation diminished once the outcome of the research is known. Those of us who find it difficult to write scientific papers have no difficulty whatsoever in constructing artificial barriers to progress (writer's block), in finding excuses (I'm so busy, 1 have time for the research, but writing gets put on the back burner), or engaging in displacement behaviour (learning to use a graphics package to create a figure that would have taken minutes to do by hand).

Approach

This workshop will bring together a small group of people, each with a paper ready to write, for a collective assault on the barriers to productive writing. By bringing together the experienced with the less experienced in a staged process leading to publication, it will allow sharing of approaches to and views on what makes a good publication and how to brine, it about. Like attending the gym, group participation will help to enhance motivation and commitment.

Anticipated Outcomes

The aim of this workshop is to accelerate individual throughput, to increase the quality of final manuscripts submitted for publication, and so to ensure that a greater quantity of the quality research that we do sees the light of day. Although the process might seem protracted, the skills developed during this workshop will pay back the effort many times over when it comes to preparing manuscripts in the future.

Let's Get Started

Let's go round the table and each introduce ourselves and our proposed paper. Begin by giving some brief background, then answer the specific questions:

- Why was the work worth doing? Support your case by citing one or two key articles that either stimulated you to do the work or that you plan to use to establish the significance of the study. Dispel the potential thought among your colleagues -- Why bother?
- What is the central message to be developed or the key finding(s) to be presented in the paper, and why are they of significance?
- In what journal to you plan to publish?

Setting One's Sights High

Let's now consider your target audience. We need to appreciate that the difference in quality among scientific publications, and the quality of journal in which they appear, often depends not so much on the quality of the data and analysis presented, but on how well the author has couched the results in the broader scheme of things.

Presenting the results in a broad theoretical framework, and showing how the results might influence that framework, can make all the difference between a high impact article and a "run of the mill" article. Setting your sights high, and obtaining a familiarity with the broader aspects of your field of study and how your results relate to it, may be the only difference between publishing in Evolution rather than Australian Wildlife Research.

How can we achieve this, and so increase the audience attracted to read and to act upon our findings?

One way is to put yourself in the place of the international reader, or the generalist reader, neither of whom have a taste for the parochial or for matters of local interest. Brainstorm in the most free-wheeling way on linkages between your findings and the broader scheme of things. Order these linkages from the general to the specific, then use this list as a basis for the first paragraphs of the Introduction. Later, when your colleagues look at your draft, there will be further opportunities to brainstorm on issues of broad relevance.

Selecting a Journal

Many considerations come into play in selecting a journal, including speed from submission to publication, readership composition and impact factor (an index to the number of times articles in a journal are cited -- https://clarivate.com/essays/impact-factor/). These considerations are of course related, and for many, impact factor has come to dominate. Thinking "it is my results and what I say that is important, not where I say it" is folly in a world where competition for academic attention is becoming more acute. It is becoming increasingly difficult for scientists to read everything that might be relevant to their work.

Maybe you do not agree? Opinions differ, so what do you think? Should impact factor drive the decision on where to send your work, or are there other considerations?

Regardless of whether you want other considerations to moderate your decision, name what you consider to be the highest impact journals in your field, based on gestalt (gut feeling). How does your list compare with the rankings of ISI based on impact factors?

Now that you have heard from your colleagues, and benefited from the discussion above, think again about what journal you might publish the paper in and give reasons for your choice? Has your position changed?

Table 1. Selected Journals Listed by Impact Factor.

ISI Web of Knowledge℠

Journal Citation Reports®

WELCOME | HELP | RETURN TO LIST — 2012 JCR Science Edition

Marked Journal List

Sorted by: Journal Title | SORT AGAIN | JOURNAL TITLE CHANGES

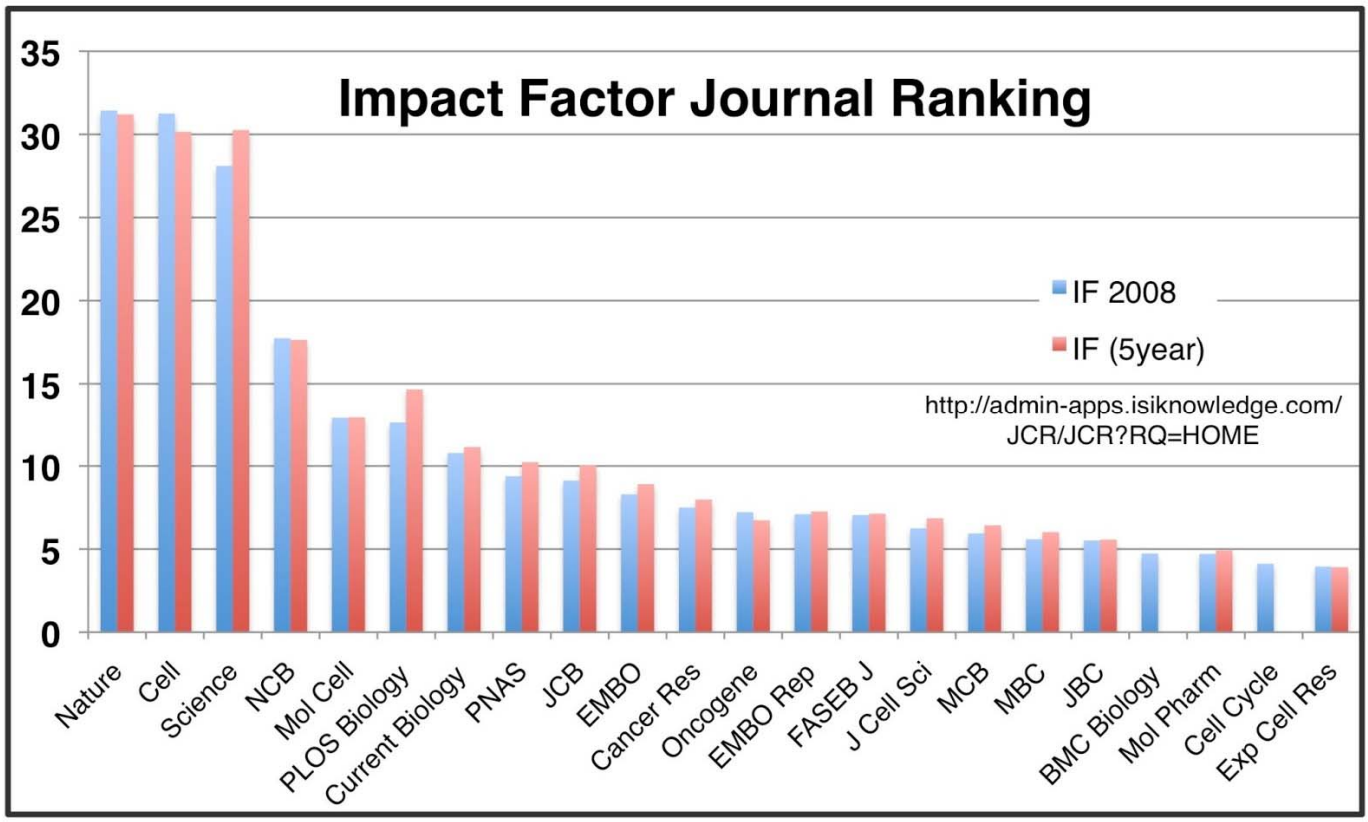
Journals 1 - 20 (of 210) [1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10] Page 1 of 11

CLEAR MARKED LIST | UPDATE MARKED LIST | SAVE TO FILE | FORMAT FOR PRINT

Ranking is based on your journal and sort selections.

Mark	Rank	Abbreviated Journal Title (linked to journal information)	ISSN	JCR Data						*Eigenfactor*® Metrics	
				2012 Total Cites	Impact Factor	5-Year Impact Factor	Immediacy Index	2012 Items	Cited Half-life	*Eigenfactor*® Score	*Article Influence*® Score
☑	1	AEROBIOLOGIA	0393-5965	865	1.333	1.612	0.220	50	9.2	0.00113	0.424
☑	2	AEROSOL SCI TECH	0278-6826	4808	2.780	2.808	0.768	125	8.2	0.01002	1.028
☑	3	AGR ECOSYST ENVIRON	0167-8809	10733	2.859	3.673	0.530	266	7.2	0.02066	1.090
☑	4	AIR QUAL ATMOS HLTH	1873-9318	176	1.979	1.800	0.433	30	2.6	0.00102	0.649
☑	5	AMBIO	0044-7447	4211	2.295	3.248	0.952	104	9.5	0.00812	1.227
☑	6	ANN AGR ENV MED	1232-1966	1177	3.060	2.283	0.310	142	5.4	0.00139	0.300
☑	7	ANNU REV ENV RESOUR	1543-5938	1402	4.968	7.250	0.000	18	6.5	0.00482	3.283
☑	8	ANTARCT SCI	0954-1020	1830	1.630	1.779	0.141	64	8.8	0.00397	0.698
☑	9	APPL CATAL A-GEN	0926-860X	27726	3.410	3.910	0.506	524	7.6	0.04332	0.929
☑	10	APPL ECOL ENV RES	1589-1623	200	0.586		0.105	38	5.2	0.00046	
☑	11	AQUAT CONSERV	1052-7613	2097	1.917	2.239	0.324	68	6.9	0.00478	0.681
☑	12	AQUAT ECOSYST HEALTH	1463-4988	529	0.767	1.129	0.242	62	5.9	0.00125	0.318
☑	13	AQUAT SCI	1015-1621	1548	2.602	2.436	0.603	58	8.0	0.00343	0.893
☑	14	ARCH ENVIRON CON TOX	0090-4341	5917	2.012	2.145	0.346	133	9.9	0.00804	0.571
☑	15	ARCH ENVIRON OCCUP H	1933-8244	1926	1.194	1.147	0.172	29	>10.0	0.00081	0.323
☑	16	ARCH ENVIRON PROT	0324-8461	127	0.506	0.435	0.024	41	3.8	0.00030	0.073
☑	17	ARCT ANTARCT ALP RES	1523-0430	2476	1.429	1.776	0.239	46	>10.0	0.00358	0.655
☑	18	ARCTIC	0004-0843	1614	1.208	1.557	0.804	51	>10.0	0.00166	0.490
☑	19	ARID LAND RES MANAG	1532-4982	247	0.420	0.602	0.148	27	8.3	0.00036	0.169
☑	20	ATMOS ENVIRON	1352-2310	35771	3.110	3.787	0.670	836	7.3	0.07196	1.119

Up to date data on citation rank for specific journals can be obtained from
https://jcr.incites.thomsonreuters.com/
but this may need password access through your library. Most journals publish their latest impact factor on their web pages


Impact Factor Journal Ranking
35
30
25
20
15
10
5
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IF 2008
IF (5year)
http://admin-apps.isiknowledge.com/JCR/JCR?RQ=HOME
Nature
Cell
Science
NCB
Mol Cell
PLOS Biology
Current Biology
PNAS
JCB
EMBO
Cancer Res
Oncogene
EMBO Rep
FASEB J
J Cell Sci
MCB
MBC
JBC
BMC Biology
Mol Pharm
Cell Cycle
Exp Cell Res

Session 3
CONFIRMATION VS REFUTATION
PLAUSIBILITY VS PROOF

Introduction

Most papers are not cited at all, and the authors must wonder if their work is making any contribution to the directions taken and progress made in their fields. It is not enough that your paper appear in one of the journals with a high impact factor -- it may well be the worst house in the best street.

For a paper to have impact, it must come from somewhere, and more importantly, it must take us somewhere. A common failing, especially among those lacking confidence or just entering a career in research, is to present the paper in a "confirmatory" context -- the focus of the introduction and discussion is on establishing that the work agrees well with previous findings, perhaps the implication being that it must therefore be good science.

Confirmatory science, though an important element of scientific endeavour, smacks of pedestrian science, and one would not want the focus of life's work to be confirmatory. Indeed, it is important to get a good balance between confirming existing understanding and challenging existing understanding in each and every paper we write. Confirmation of previously established results is likely to have far less impact than a well-supported challenge to current understanding. These views stem from an understanding of on School of thought on how science progresses, and we will now spend a little time on understanding what Popper had to say on this subject.

Popperian Science : Open Discussion

- What is Popper's view of the demarcation of science and non-science? Do we agree with this, and if not, where exactly do we disagree?
- What are the conflicting views on how science progresses, as outlined in Magee's book? What is our position on this?
- In a succinct statement, what do you think Popper would say by way of advice for the young aspiring scientist?
- How would an appreciation of Popper's view on how science progresses influence our approach to writing a paper?

Be liberated by the knowledge that the game is not to publish the final word on a subject, to be defended until death, for ultimately anything you publish will be shown to be wrong or incomplete. The game is about contributing to science with an interpretation that is fully consistent with all available facts, and from which you extract new conceptual insights or make

bold but supported predictions that may subsequently be put to the test. Be bold, even provocative. Do not be repressed by the belief that it is pretentious to aspire to be up there with the key players in your field.

Do not retreat to the safety of confirmation. Focusing on confirmation rather than refutation in a paper is a failing, and one likely to relegate the paper to obscurity. Where possible, the focus of your discussion, indeed the thrust of your whole paper, should be on where your data are in conflict with current understanding.

A second failing, and this is related to the first, lies in the tendency to confuse plausibility with proof. This applies especially in ecology, where it is possible to take a result accompanied by a completely plausible explanation, reverse the result, and devise an equally plausible explanation. Focusing on "explanation" in discussion is a recipe for being ignored when in print, or worse, prompting that rejection letter. Devising a plausible explanation does not necessarily take us forward.

Lessons in Popper for Writing a Paper

In the introduction, we need to develop a clear story along the following lines.

- Provide sufficient contextual background to enable the reader to fully appreciate where the current work sits in relation to the body of contemporary knowledge, the significance of the work in extending that knowledge, and to understand the objectives of the study.

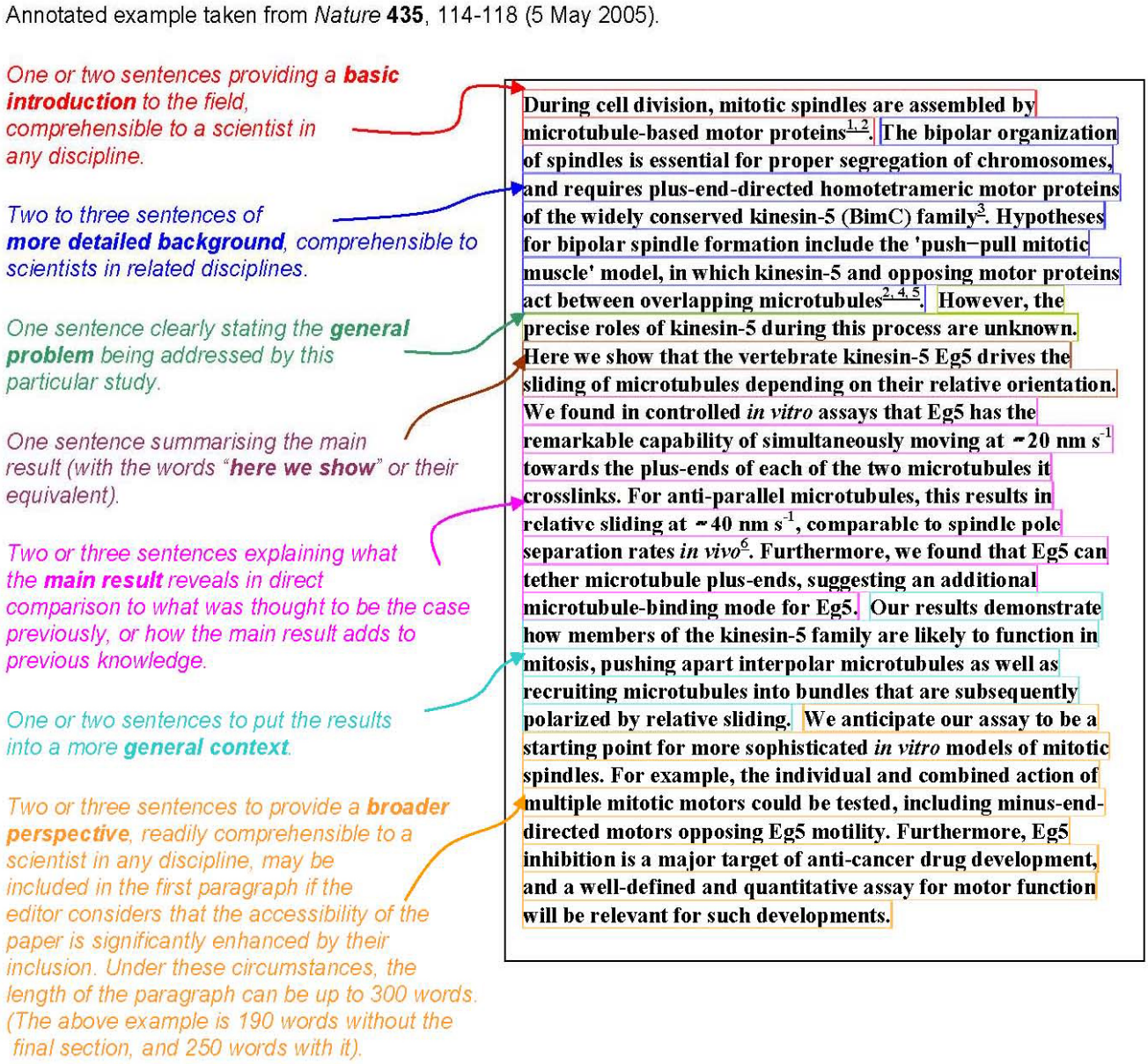
- Clearly establish what is known of the subject at hand and what is not known -- establish the boundary between knowledge and ignorance. At the very least, the current paper should take us onto new ground. In outlining what is known, focus should be on conflicting information in addition to what is firmly established, with emphasis on where this conflict will be resolved or partly resolved by the current work. Outlining what is firmly established is signalling to the reader that this is an area that will be the focus of the study. Highlighting areas where current knowledge conflicts sets the scene for the contribution this paper will make.

- Where possible, focus on where the current work will gather information that is likely to conflict with current understanding, not confirm it. The focus should not be on confirmation, even if confirmation is the primary outcome of the work.

- Clearly establish in stating the objectives, how this paper will shift, or attempt to shift, the boundary between knowledge and ignorance. The objectives of the study should target this boundary, to challenge not confirm, our current knowledge or understanding. State the objectives in specific terms, ones that can conceivably not be achieved. Achieving them is then seen to be an advance. Saying that you will learn more about the ecology of a poorly known species is not good -- how could you conceivably fail to achieve this?

- In alluding to an outcome of the work in the introduction, choose an outcome that challenges existing understanding over a confirmatory outcome.

This way of thinking is encapsulated in the advice given by a leading journal on how to couch your work to have the greatest impact.



Note the focus on explaining how the main result is in direct conflict with what was thought to be the case previously and so how it adds to previous knowledge. Do that, and you will have the kernel of a good paper.

Where to Start

Opinions vary on where to begin writing a paper. Some authors begin at the beginning and end at the end, but to do this you need to have a very clear idea of the paper before you begin. Others

prefer to write the Results section first, the Materials and Methods second, Discussion third, Introduction fourth and the Abstract last. This is the "working from the inside out" model.

We are going to approach the problem by scoping out the paper, then expand the scope to create a first draft of the Introduction, brainstorming as widely as possible on relevant context and carefully developing the argument central to any good introduction.

Clarify Your Directions

You should by now, indeed before coming to the workshop, have scoped out a concise statement that clearly establish in your mind and those in your writing circle of where you would like to see the paper heading. This scope may or may not come to be included in the paper, but some of the words will, depending on how our ideas change during the course of writing.

Breakout: Refine your scope document and share it with your circle

It is time now to break up and refine your concise statement, along the lines shown above and in no more than 300 words, that outlines the scope of your work, as a prelude to expanding this to a full introduction. Discuss it in your circle, post your scope up on the BaseCamp and we will come back as a group to hear what you have come up with.

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Session 4
DRAFTING AN INTRODUCTION

Preparatory Reading

- *How to Write the Introduction*, Chapter 7 of Robert Day's *How to Write and publish a Scientific Paper.*

In this Session, you will .....

- Prepare and outline of your Introduction building out from our scoping document which provides the focus and tells us where you are heading, then draft the Introduction section.
- Circulate the draft to all members of your group for feedback.
- Review and provide written constructive criticism on the circulated drafts of your colleagues using the criteria listed below. Do NOT provide editorial comment.
- Revise our draft introductions

Key Elements

So what are the key elements of a good introduction? To answer this, we need to look at the objectives of an introduction.

1. **To introduce the reader to the pertinent literature**, so that they are later able to appreciate the objectives of the study and its significance for the relevant field of study.

   Remember, the difference in quality among scientific publications, and the quality of journal in which they appear, often depends not so much on the quality of the data and analysis presented, but on how well the author has couched the results in the broader scheme of things. Put yourself in the place of the international reader, or the generalist reader, neither of whom have a taste for the parochial or for matters of local interest.

   In introducing the reader to the pertinent literature, clearly establish in the reader's mind, what is known and what is not known, so that the contribution the current paper makes in shifting the boundary between knowledge and ignorance becomes patently clear.

2. **To define the problem** that is to be addressed in the paper, where possible focusing on where our current understanding is in conflict, or better, devising and testing a serious challenge to our current understanding.

   Of course, it is not always possible to do this, if say the focus of the study is primarily descriptive. In such cases, it is important to clearly define the scope of the study.
   At the very least, do not leave the reader thinking "Why bother?" In other words, have you identified an interesting and manageable problem?

3. **To state the objectives of the study**, avoiding the tendency to present only general aims. Objectives need to be specific enough that they might conceivably NOT be achieved. Stating the objectives goes a long way to establishing in the reader's mind, where the paper is heading.

4. **To allude to the key findings or conclusions,** or the central message to be developed in the paper, so removing any possibility that the reader will not know where the paper is heading in order to follow the development of the evidence.

Develop an Argument

These objectives of the Introduction need to be nested in a cogent and well-developed argument, each paragraph leading into the next. Imagine that you have taken the reader by the hand, and are leading them down a complex path. If you let go of their hand, even for a moment, they may wander off at a tangent, and become lost. Do not distract them from the way forward with irrelevancies, asides, unnecessary padding or literary delights. All of these have a home in a fictional novel, not a scientific paper.

In this context, linkages are all important:

- The lead-in sentences and background information provide the reader, who may be on the periphery of your field with sufficient information to proceed to understand and appreciate what you are about to describe and its significance.
- These early paragraphs should lead in naturally to a statement of the problem to be addressed in the paper, and establish it as a problem worth pursuing.
- The objectives should outline specifically what you hope to achieve in addressing the problem, and their relevance to the problem outline in the preceding paragraph(s) should be immediately evident. Stating a problem area, then stating objectives that are peripheral to it will make no sense, and risks losing the reader.
- Having stated the objectives, do not leave the reader hanging. Allude to the major findings, or the central message to be developed. In addressing the objectives, what was the outcome?

The logical path should be clear, and there should be no possibility that the reader will become lost, or receive a message that is different from the one intended.

Breakout: Draft an Introduction

- Read the sample outline and the example of where the outline is populated with text.
- Note the advice given in good beginnings, bad beginnings, with regard to working the literature.
- Draft your introduction and circulate it to your group either in printed form or via the basecamp.
- Review the introductions of your colleagues using the *Criteria for Assessing an Introduction* that have been supplied.

Finish up

If all is going to schedule, we should each have drafted and circulated our introduction sections, and critiqued the Introductions that we have received against the criteria provided.

For each draft, we consider whether the key criteria of a good introduction have been addressed and how the author may improve the draft? By way of roundtable, each participant should give feedback in the form of substantive constructive items to the author. Written comments are to be passed to the author at the end of this meeting, so less substantive items can be skipped for the moment. Discuss perceived deficiencies collectively before moving on to the next participant.

Please focus on substantive issues of content and argument. Do not pass on minor editorial or grammatical suggestions -- these will be dealt with later.

THE INTRODUCTION SECTION: A SAMPLE OUTLINE

Fluctuating temperatures and the outcome of sexual differentiation in the marine turtle *Caretta caretta*.

Lead-in

- Outline the profound influence environment has on a range of developmental attributes in reptiles.
- Establish that the phenomenon of temperature-dependent sex determination is now well accepted as widespread among turtle species.
- Describe the phenomenon and introduce terms.

Boundary of Knowledge and Ignorance

- Establish that the focus of studies has been in the laboratory under constant conditions with relatively few studies under field conditions where temperatures fluctuate daily.
- Outline the circumstances under which laboratory findings will be less than useful in the field.
- Give examples.
- Outline the current interpretation of these results: Accelerated development at high temperatures overcompensates for that at low temperatures.

The Problem

- State the problem that is to be addressed in the present paper: Is it proportion of development at a temperature that matters or duration of exposure, in determining sex.
- State the approach to its solution: This has been modelled mathematically to yield clearly testable hypotheses.

Objectives of this study

- Introduce and present the objectives of the present study: Outline the predictions of the model and state the objective of testing those predictions.

Allude to Key Findings

- The experiments presented in this paper establish that it is proportion of development at a temperature that matters not duration of exposure, in determining phenotypic outcomes.

THE INTRODUCTION SECTION: SAMPLE OUTLINE TO DRAFT

Fluctuating temperatures and the outcome of sexual differentiation in the marine turtle *Caretta caretta.*

Lead-in

Outline the profound influence environment has on a range of developmental attributes in reptiles. This sets the paper in a broad context, inviting interest from a wide range of readers.

Recent studies have demonstrated a remarkable range of interactions between environmental conditions and developmental attributes in reptilian eggs. Rate of embryonic development and length of incubation period (Ewert, 1985), yolk reserves remaining at hatching (Allstead and Lang, 1995), hatching size and morphology (Osgood, 1978), colouration (Murray et al., 1990; Etchberger et al., 1993) sex (Bull, 1980) and post hatching behaviour (Lang, 1987; Burger, 1991; Janzen, 1993) may all be directly influenced by incubation environment.

Establish that the phenomenon of temperature-dependent sex determination is now well accepted as widespread among turtles species. This provides essential background information for comprehending what is to come.

In particular, the influence of temperature on the outcome of sexual differentiation in reptiles is now well established, having been demonstrated for turtles in eight families (though not Chelidae or Trionychidae), for crocodilians and for some lizards (reviewed by Bull, 1980, 1983; Ewert and Nelson, 1991).

Describe the phenomenon and introduce terms. This also provides essential background information for comprehending what is to come.

For most species of turtle, females are produced at high temperatures and males at low temperatures. The reverse is usually true of crocodilians and lizards. Typically, a very narrow range of temperatures, referred to as the threshold temperature, produces both males and females and divides the male producing temperatures from the female producing temperatures (Bull, 1983). A few species have upper and lower thresholds with females produced at both extremes (Yntema,

1976; Gutzke and Paukstis, 1984; Webb et al. 1987). the critical period for sex determination, during which embryonic sex can be irreversibly influenced by temperature, occurs during the middle third to the middle half of incubation (Yntema, 1979; Pieau and Dorizzi, 1981; Yntema and Mrosovsky, 1982; Ferguson and Joanen, 1983; Webb et al., 1987).

Establish the boundary between knowledge and ignorance

Establish that the focus of studies has been in the laboratory under constant conditions with relatively few studies under field conditions where temperatures fluctuate daily.

Most studies of sex determination have been conducted in the laboratory and less effort has been directed at field studies involving more than a few nests (but see Vogt and Bull, 1984; Bull, 1985; Schwartzkopf and Brooks, 1985). As a result, the influence of temperature on sex ratios in natural nests is poorly understood.

Outline the circumstances under which laboratory findings will be less than useful in the field.

In broad terms, studies of sex determination in the field agree with those involving constant temperature experiments in the laboratory; that is, hot exposed nests produce female turtles and cool shaded nests produce males (Bull, 1985). However, wide daily fluctuations in nest temperature, thermal gradients within nests, seasonal variation in nest temperatures, and stochastic events such as rainfall which temporarily depress nest temperatures, can all be expected to complicate the influence of environment on sexual differentiation in natural turtle nests (Reed, 1980; Georges, 1994).

Give Examples.

Mean daily temperature in natural nests of freshwater turtles with temperature-dependent sex determination is a poor predictor of hatchling sex ratios when nest temperatures fluctuate. For nests of the European Pond Turtle, *Emys orbicularis,* that spent more time each day at male-inducing temperatures below the threshold temperature of 28.5C than at female-inducing temperatures produced, with one exception, predominantly

female hatchlings (Pieau, 1982).
Hatchling sex ratios in natural nests of *Chrysemys picta* are most closely related to time spent between 20.OC and 27.5C, the upper and lower threshold temperatures, and not mean temperature (Schwartzkopf and Brooks, 1985).

Both the mean and variance in temperature were required to account for sex ratio differences among nest s of map turtles in the genus *Graptemys* (Bull, 1985). A sin-le mean nest temperature was inadequate as a threshold temperature for natural nests of *Graptemys* because the mean temperature that best discriminated male and female nests decreased as temperatures fluctuated more widely.

Outline the current interpretation of these results: Accelerated development at high temperatures overcompensates for that at low temperatures.

By way of explanation, several authors have noted that because embryonic development rates are greater at higher temperatures than at lower temperatures (within limits), more development will occur above the mean than below it (Bull and Vogt, 1981; Pieau, 1982; Mrosovsky et al, 1984; Bull, 1985). An embryo incubating under a daily sinusoidal cycle of temperature will spend 50% of its time at temperatures above the mean but much more than 50% of development will occur during that time.

The Problem

State the problem that is to be addressed in the present paper: Is it proportion of development at a temperature that matters or duration of exposure, in determining sex.

It has not yet been determined whether the outcome of sexual differentiation depends on the relative time spent at temperatures above and below the threshold temperature or on the relative proportions of development taking place at temperatures above and below the threshold temperature.

State the approach to its solution: This has been modelled mathematically to yield clearly testable hypotheses.

In an attempt to restate these observations in the form of a testable hypothesis, Georges (1989) derived a model based on the assumption that females will be produced if more than half of embryonic development

occurs at temperatures above the threshold temperature and that males will be produced if more than half of daily embryonic development occurs below the threshold temperature.

Objectives of this study

Introduce and present the objectives of the present study: Outline the predictions of the model and state the objective of testing those predictions.

This model predicts that a) overall developmental rate, and therefore incubation period, will be unaffected by diel fluctuations in temperatures, and that b) hatchling sex ratios will be affected by diel fluctuations. A quantitative relationship for predicting hatchling sex ratios under fluctuating regimes is an integral component of the model. In this paper, we test these model predictions using eggs from the marine loggerhead turtle, *Caretta caretta.*

Allude to Key Findings

The experiments presented in this paper establish that it is proportion of development at a temperature that matters not duration of exposure, in determining phenotypic outcomes.

The experiments presented in this paper establish that it is proportion of development at a temperature that matters not duration of exposure, in determining phenotypic outcomes.

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GOOD BEGINNINGS, AND BAD BEGINNINGS

Take the Bad First

Diet of the Australian Freshwater Turtle *Emydura krefftii* (Chelonia: Chelidae), in an Unproductive Lentic Environment. Copeia 1982:331-336.

> The diets of Australian freshwater turtles have only recendy been the subject of detailed study. Parmenter(1976) described the diet and feeding behaviour of the carnivorous *Chelodina longicollis,* and Chessman (1 978) compared its diet with those of *Emydura macquarii* and *Chelodina expansa.* Legler (1979) reported the feeding habits of *Elseya dentata, Emydura australis* and an unnamed species of *Emydura* from Kookabookra (New South Wales). There are no detailed reports on the diet *of Emydura krefflii.*

This beginning suffers from several very common faults. The most serious is an attempt to justify the study on the grounds that very little attention has been paid to the subject in the past. This is a very weak justification, because nothing is said of why the information is needed, either by the field of scientific endeavour or in application. It may well be that little attention has been given to it because greater attention is not warranted. A second major fault is that the focus of the introductory paragraphs is too narrow, indeed parochial. For an article that appeared in an international journal, it seems a wasted opportunity to launch into the introduction with a narrow Australian focus. The third major fault is that the reader is referred to the literature, but nothing is said of the findings presented there. The author should have said what was found, not simply that so-and-so looked at the problem.

Then the Good

Diet of Two Freshwater Turtles, *Chelodina rugosa and Elseya dentata* (Testudines: Chelidae) from the Wet-dry Tropics of Northern Australia. Copeia 1996.

> Food is a primary link between an animal and its environment. Hence, knowledge of a species' diet may provide an explanation for observed population declines (e.g. Dodd, 1988, 1990) or insights into the potential consequences of habitat modification (e.g. Goerges and Kennett, 1989; Georges and Rose, 1993). Animals that specialise on a narrow range of prey items are potentially more vulnerable to habitat alteration that affects food availability than are generalist or opportunistic feeders. For example, increased water turbidity and heavy siltation from mine runoff has contributed to serious population declines in *Sternotherus depressus,*

> *a* species that feeds primarily on molluscs (Dodd, 1988, 1990). Similarly, runoff from mine tailings may be seriously impacting *Rheodytes leukops, a* species that appears to specialise on .....

This beginning has many good points. The author has stepped back from his subject, and placed it in the broadest possible context. It starts with a short punchy sentence. The relevance of the dietary study is established in terms of the utility of the information for understanding population declines. The literature is introduced with substance, not simply that Dodd related diet to population declines in turtles. This is a good start to the Introduction.

Session 5
RESULTS AND MATERIALS & METHODS

Preparatory Reading

- *How to Write the Materials and Methods Section*, Chapter 8; *How to Write the Results Section*, Chapter 9, of *Day's How to Write and Publish a Scientific Paper*

In this Session, you will .....

- Draft the Results and Materials & Methods sections.
- Circulate your Results and Materials & Methods sections to all members of your group for criticism.
- Review and provide written constructive criticism on circulated drafts of the Results and Materials & Methods sections of your colleagues. Do NOT provide editorial comment.
- Redraft the sections and discuss what you have learned with the broader group.

The Results Section

What's In and What's Out

In the Results section you present your findings. Present the data, digested and condensed, with important trends extracted and described. Here we must decide what to put in and what to leave out. This can be a most difficult decision for those who have just completed a thesis. Having fought hard to obtain the results presented in the thesis, the thought of leaving some of them out of the paper can be unattractive indeed. How do we decide what is in and what is out?

This is where you need a clear focus on the key contribution the paper is to make, and why drafting the introduction first was so important. Now you can distinguish between results that contribute to the central message to be conveyed by the paper, and those that are peripheral to it. Results that are peripheral to the central message and those that are equivocal with regard to establishing that central message are strong candidates for omission.

Simple and to the Point

Because the results comprise the new knowledge that you are contributing to the world, it is important that your findings be clearly and simply stated. The results should be short and sweet, without verbiage. Do not say

> "It is clearly evident from Fig. 1 that bird species richness increased with habitat complexity".

Say instead

> "Bird species richness increased with habitat complexity (Fig. 1)".

However, do not be too concise. The readers cannot be expected to extract important trends from the data unaided. Few will bother. Combine the use of text, tables and figures to condense data and highlight trends. In doing so be sure to refer to the guidelines for preparing tables and figures.

Interpret, do not Discuss

In a nutshell, present your data and interpret them fully in the Results section, especially where such interpretation has a bearing on the objectives and conclusions of the paper. Do not discuss your results in terms of their relevance to the findings of others, or in terms of hypotheses they might suggest and, do not engage in any speculation in the Results section. This comes later.

The Materials & Methods Section

Resolving Conflicting Studies

Once the Results section is written, preparing the Materials & Methods is straight-forward. The primary reason for providing a detailed description of the materials used and the methods employed in your study it to enable a rational assessment of the potential causes of conflict between your results and those of others. If someone finds that their results are at odds with yours, the first place they will look to resolve it is at your Materials & Methods section. Assuming the results of your study and theirs are true accounts, the conflict between them must have arisen through the differing circumstances attending each study. It is the difference in these circumstances, as outlined in the respective Materials & Methods sections, that will provide the focus for future study to resolve the conflict.

Reproducibility

A second reason for providing a detailed description of the materials used and the methods employed is to ensure that the work is reproducible. Reproducibility is an important criterion for distinguishing between science and non-science. Irreproducible results make little or no contribution to science. Look at the fate of the discovery of cold fusion. Even though your study may never be reproduced, you have an obligation to ensure that it is reproducible, should someone choose to do so.

Facilitating Scientific Progress

A third reason is that no phenomenon is entirely general, true regardless of circumstances. It is very important when describing a phenomenon or formulating a theory to explain certain observations, that the full circumstances attending that phenomenon or those observations are fully documented. According to Popper, science progresses through challenging existing frameworks of understanding in as rigorous a fashion as possible. Devising a serious challenge often requires extending theory to cover circumstances beyond those used to collect the data

upon which the theory rests. This way forward is only clear if scientists strictly document the circumstances under which they collect their data.

Study Site Description

Often in field-based studies, there is a need to describe the study area in greater detail than is possible in the Introduction. Usually authors will describe the study region in general terms in the Introduction or Title and then describe the study site and climate in detail in the Materials and Methods section. The sub-headings "Study Site", "General Methods" and "Analysis" may be useful, in that order. Some journals will allow a separate section on study site between the Introduction and Materials & Methods.

Materials

Equipment and materials available off the shelf should be described exactly (Licor underwater quantum sensor, Model Ll 192SB) and sources of materials should be given if there is variation in quality among supplies. Modifications to equipment or equipment constructed specifically for the study should be carefully described in detail. The method used to prepare reagents, fixatives, and stains should be stated exactly, though often reference to standard recipes m other works will suffice.

Order of Presentation

The usual order of presentation of methods is chronological, however related methods may need to be described to-ether and strict chronological order cannot always be followed. If your methods are new (unpublished), you must provide all of the detail required to repeat the methods. However, if a method has been previously published in a standard journal, only the name of the method and a literature reference need be given.

Measurement Error and Statistics

Be precise in describing measurements and include errors of measurement. Ordinary statistical methods should be used without comment; advanced or unusual methods may require a literature citation.

Breakout: Draft an Results then a Materials and Methods

- Read the criteria for assessing a Results section and a Materials and Methods section as outlined below.
- Refer back to the advice given above. In the Results, describe your results and any trends, but do not discuss; in the Materials and Methods, describe the materials you used and the methods you employed only where necessary to reproduce what you have presented in Results.
- Draft your Results and Materials and Methods and circulate it to your group either in printed form or via the BaseCamp.

Finishing up

If all is going to schedule, we should each have drafted and circulated our Results and Materials & Methods sections, and critiqued the Results and Materials & Methods sections that we have received against the criteria provided.

For each draft, we consider whether the key criteria of good Results and Materials & Methods sections have been addressed and how the author may improve the draft? By way of roundtable, each participant should give feedback in the form of substantive constructive items to the author. Written comments are to be passed to the author, so less substantive items can be skipped for the moment. Discuss perceived deficiencies collectively before moving on to the next participant.

Please focus on substantive issues of content and argument. Do not pass on minor editorial or grammatical suggestions -- these will be dealt with later.

TABLES AND FIGURES

When Constructing Tables

DO include a caption and column headings that contain enough information for the reader to understand the table without reference to the text. The caption should be at the head of the table.

DO organize the table so that like elements read down, not across.

DO present the data in a table or in the text, but never present the same data in both forms.

DO choose units of measurement so as to avoid the use of an excessive number of digits.

DON'T include tables that are not referred to in the text.

DON'T be tempted to "dress up" your report by presenting data in the form of tables or figures that could easily be replaced by a sentence or two of text. Whenever a table or columns within a table can be readily put into words, do it.

DON'T include columns of data that contain the same value throughout. If the value is
important to the table include it in the caption or as a footnote to the table.

DON'T use vertical lines to separate columns unless absolutely necessary.

When Constructing Figures

DO include a legend describing the figure. It should be succinct yet provide sufficient information for the reader to interpret the figure without reference to the text. The legend should be below the figure.

DO provide each axis with a brief but informative title (including units of measurement).

DON'T include figures that are not referred to in the text, usually in the text of the results section.

DON'T be tempted to "dress up" your report by presenting data in the form of figures that could easily be replaced by a sentence or two of text.

DON'T fill the entire A4 page with the graph leaving little room for axis numeration, axis titles and the caption. The entire figure should lie within reasonable margins (say 3 cm margin on the left side, 2 cm margins on the top, bottom and right side of the page).

DON'T extend the axes very far beyond the range of the data. For example, if the data range between 0 and 78, the axis should extend no further than a value of 80.

DON'T use colour, unless absolutely necessary. It is very expensive, and the costs are usually passed on to the author.

Session 6
DRAFT THE DISCUSSION

Preparatory Reading

- *How to Write the Discussion*, Chapter 9 of Robert Day's *How to Write and Publish a Scientific Paper.*

In this Session, you will .....

- Draw up an outline of the Discussion, identifying all the key points to be made and their linkages.
- Draft the Discussion.
- Circulate your draft to all other members of your group for criticism.
- Review and provide written constructive criticism on circulated drafts of the Discussion sections.
- Redraft the sections and discuss what you have learned with the broader group.

Interpret in a Broader Context

The Discussion is the section in which you interpret the results of your work in the context of contemporary knowledge. This means that you must relate your findings to those of others and that you can bring to bear not only your own findings, but those of others in reaching conclusions. The significance of the results must be fully explored in relation to the current literature.

Integrate, do not Re-iterate

While it is appropriate to summarise the key results in the Discussion, do not restate the results in detail. Continually refer to your results, but do not repeat them. The reader is looking for a synopsis, whereby all the linkages between discrete elements of the results brought together in support of substantive conclusions.

Challenge, do not Confirm

For a paper to have impact, it must come from somewhere, and more importantly, it must take us somewhere. A common failing, especially among those lacking confidence or just entering a career in research, is to present the paper in a "confirmatory" context --the focus of the introduction and discussion is on establishing that the work agrees well with previous findings, perhaps the implication being that it must therefore be good science. Confirmatory science, though an important element of scientific endeavour, smacks of pedestrian science, and one would not want the focus of life's work to be confirmatory.

Indeed, it is important to get a good balance between confirming existing understanding, and challenging existing understanding in each and every paper we write. Confirmation of previously established results is likely to have far less impact than a well supported challenge to current understanding.

So it is a definite failing to focus on "explanation" of results in the sense of shown -- that they fit with or confirm current understanding rather than focusing on where the results are at odds with current understanding. Confirmation has its place, but the focus of discussion should be on where the results conflict with or challenge our current understanding.

Speculation has its place

A second, related failing lies in the tendency to confuse plausibility with proof. This applies especially in ecology, where it is possible to take a result accompanied by a completely plausible explanation, reverse the result, and devise an equally plausible explanation. Focusing on "explanation" in discussion is a recipe for being ignored when in print, or worse, prompting that rejection letter. Devising a plausible explanation does not necessarily take us forward. How do we avoid this pitfall?

- "Explanations" often read like rampant speculation or "arm waving". They can be made more acceptable by couching them in terms of hypotheses to be tested by future work, rather than explanations established by the current work.

- It is probably too late to consider this at the time of writing, but focus on devising competing hypotheses and gathering or using data to unequivocally distinguish between them.

- Recognise speculation for what it is, and do not push too hard on it. Remember, plausibility is not a form of proof.

Bring your chickens home to roost

It is very important to bring home all the substantive discussion points with finality. The reader must see clearly what you have concluded, before you move on to the next idea. Think of how scientists use papers in supporting their own work. Give them something definitive to take away.

Establish clear ownership of your contributions. The distinction between what you have found and contributed to science as opposed to what was already established by others must be patently clear. This is in part achieved by a good introduction, but now is not the time to be modest. Say "This is the first time this has been demonstrated for any vertebrate group", if in fact that is the case.

Do not Over-Extend

You should milk your data for what they are worth, but do not milk them for more than they are worth. Do not extend your conclusions beyond that supported by the data into the realms of unsupported speculation.

While it is legitimate to draw upon the results of others and combine them with your results to draw a conclusion, all of your conclusions and all of the supporting discussion must be clearly linked to one or more of your findings. Do not wander too far from that which is supported by your own data.

Weave a connected story

The discussion needs to hold together as a single entity, not a series of unconnected points or conclusions. This can usually be achieved with the aid of a few well placed connecting sentences and a clear focus on the objectives of the study and the central message rather than on the results themselves. Begin with the most substantive general result or conclusion then move on to the more specific. Finish with a summary statement or by alluding to future work. Do not leave the reader hanging at the end of the discussion by finishing on a low note or an unsubstantive conclusion.

Breakout: Draft a Discussion

- Read the criteria for assessing a Discussion section as outlined below.
- Refer back to the advice given above. In the Discussion, you need to establish the significance of your findings in the broader context of the literature, what is known and what is not known.
- Draft your Discussion and circulate it to your group either in printed form or via the BaseCamp.

Finishing up

If all is going to schedule, we should each have drafted and circulated our Discussion sections, and critiqued the Discussion sections that we have received against the criteria provided.

For each draft, we consider whether the key criteria of a good Discussion have been addressed and how the author may improve the draft? By way of roundtable, each participant should give feedback in the form of substantive constructive items to the author. Written comments are to be passed to the author at the end of this meeting, so less substantive items can be skipped for the moment. Discuss perceived deficiencies collectively before moving on to the next participant.

Please focus on substantive issues of content and argument. Do not pass on minor editorial or grammatical suggestions -- these will be dealt with later.

Session 7
DRAFT THE ABSTRACT AND TITLE

Preparatory Reading

- *How to Write the Abstract*, Chapter 6 of Robert Day's *How to Write and Publish a Scientific Paper.*

In this Session, you will .....

- Draft the Abstract and Title, drawing upon the initial scoping paragraph.
- Redraft the Introduction if necessary. The direction of the paper may have drifted.
- Put the manuscript together as a single integrated whole and read it through to identify omissions and to ensure it flows well
- Polish the overall manuscript to final form (including tables and references, but not figures). Ensure the manuscript meets the requirements of the Journal as outlined in the Guide to Authors.
- Provide a critical review of the manuscripts you receive as a Referee, and prepare a written referee's report on the form supplied. Pay particular attention to the Abstract and Title, which have not yet been subject to scrutiny.

The Abstract

Short, Punchy, Concise

A well prepared abstract should enable the reader to identify the basic content of a document quickly and accurately, to determine its relevance to their interests, and thus to decide whether to read the document in its entirety. The abstract should concisely state the principal objectives and scope of the investigation where these are not obvious from the title. More importantly, it should concisely summarise the results and principal conclusions. Do not include details of the methods employed unless the study is methodological, i.e. primarily concerned with methods.

The abstract must be concise, not exceeding 250 words. If you can convey the essential details of the paper in 100 words, do not use 200. Do not repeat information contained in the title. The abstract, together with the title, must be self-contained as it is published separately from the paper in abstracting services such as Biological Abstracts or Current Contents. Omit all references to the literature and to tables or figures, and omit obscure abbreviations and acronyms even though they may be defined in main body of the paper.

Refer back to your scoping paragraph and you might find that your Abstract is essentially done.

The Title

Attract attention, foreshadow content

The title is the first exposure that any potential reader will have to your paper. Indeed, the title may be the only hook you have to attract the interest of researchers combing the literature looking for work relevant to their own. It is also the signpost that directs readers to the content of your paper.

The purpose of the title is therefore, twofold. It is to attract attention, providing an advertisement for the research, while telling the reader what they can expect to find in it. Combining these two goals in a handful of words is challenging.

The best titles are those that get your attention and inform you about the content of the paper. Titles can also tell you what the key finding is, although that is not everyone's cup of tea.

Four types of Title

Titles tend to fall into one of four categories.

The **Descriptive** title describes the general form of the research but not but the findings or the implications of those findings.

> *The effect of habitat fragmentation and livestock grazing on lizard communities in remnants of gimlet, Eucalyptus salubris, woodland*

The **Statement** title incorporates the key finding and sometimes its implications.

> *Surveys of fragmented and grazed gimlet, Eucalyptus salubris, woodland reveal long-term declines in the diversity of lizard communities*

A title posed as a **Question** has the underlying thesis posed as a question rather than a statement, leaving the answer to be uncovered in the paper.

> *Are homologies in vertebrate sex determination due to shared ancestry or limited options?*

The **Mystery** title attracts interest by presenting meaning as exciting but possibly unclear.

> *Four Facts Every Conservation Biologists Should Know about Persistence*

Often titles may be combinations of two or more of these types.

A famous example of a combined statement/descriptive title is
Molecular structure of nucleic acids: A structure for the deoxyribose nucleic acid
the 1953 paper by Watson and Crick for which they later won the Nobel prize. This simple title makes clear the content but disguises the rare elegance of the finding and gives no clue as to the enormous implications that this work would have. Indeed the paper itself is somewhat understated opening with the line: "We wish to suggest a structure for the salt of deoxyribose nucleic acid (DNA). This structure has novel features which are of considerable biological interest".

Accurate in Few Words

Whatever type of title you choose, you will need to work at it. A title should be the fewest possible words that accurately describe the content of the paper. Omit all waste words such as "A study of...", "Investigations of...", "Observations on..... etc. Indexing and abstracting services depend on the accuracy of the title, extracting from it keywords useful in cross-referencing and computer searching. An improperly titled paper may never reach the audience for which it was intended, so be specific. If the study is of a particular species, name it in the title. If the inferences made in the paper are limited to a particular region, then name the region in the title.

The Keyword List

An Aid to Searching

The keyword list provides the opportunity to add keywords, used by the indexing and abstracting services, in addition to those already present in the title. Judicious use of keywords may increase the ease with which interested parties can locate your article.

Breakout: Draft a Title and Abstract, Pull it all together

- Draft up an Abstract, drawing on the scope prepared earlier, and drawing from the text already written in other sections. Remember, do not introduce any new data or ideas in the abstract.
- Think of a good title that reflects the major finding of the paper – catchy but not corny.
- Pull the whole kabooz together, as a mature draft and circulate it to your group either in printed form or via the BaseCamp.

Session 8
PREPARE A MATURE DRAFT

Preparatory Reading

- Remaining chapters of Robert Day's *How to Write and Publish a Scientific Paper*, and in particular, those dealing with the publication process.

In this Session, you will .....

- Consider the comments you have received from pre-review.
- Redraft the manuscript if necessary.
- Finalise all figures and tables consistent with the requirements of the journal.
- Prepare a covering letter.

Put the manuscript together as a single integrated whole as required by the journal and submit. There is a good chance that this work will need to be done out of session, after the workshop is over, but please attend to this as a priority in the days or weeks following the workshop, while it is all fresh in your mind and motivation is high.

Consider Reviewer's Comments

If all is going to schedule, we should each have drafted and circulated our near-final drafts to our groups. Their comments should have been considered and points of disagreement identified.

By way of roundtable, each participant should outline briefly the feedback they have received, and put on the table those issues with which they are having difficulty, both substantive and of a grammatical nature.

What remains to be done?

Final Revision

All that remains now is for a final revision of the manuscript, incorporating the comments of mock referees and editors, and the constructive comments that may have emerged during discussion at this meeting.

This will probably be done post-workshop.

A cover sheet must be prepared, along the lines of the example provided unless the journal has specified otherwise.

Covering Letter

A covering letter has to be prepared, and a sample is attached to assist you in this.

Figures

Now that the referees have looked at the paper, and are happy with the number of figures and the proposed layout of figures, roughs can be submitted to the graphics artist for preparation. The Applied Ecology Group uses the Zoo Illustrative Group and has a standing order with them to cover costs.

Submission

When the figures return, submit the number of copies requested by the journal including any other materials required (photo plates, original figures, disk copies of the manuscript, disk copies of the figures).

Session 9: Post-workshop
FINALIZING THE MANUSCRIPT

Finalizing the Manuscript

Polish, Polish, Polish

Now that the paper is written, all that it needs is polish. Now we must look more closely at editing what we have e written and at the Guidelines for Authors issued by the publishers. This can be the most tedious part of preparing the manuscript, but it is also very important if you do not wish to aggravate the editor. A list of generic things to check is provided, but you must also refer to the specific Guidelines to Authors.

Style and Grammar

- Is the manuscript grammatically sound, and free of spelling errors and errors of punctuation? Are all unnecessary words or phases been eliminated, or unnecessarily long phrases been shortened?

- Do the ideas and arguments flow well, within paragraphs, across paragraphs within sections, across sections? Are the sentences active, within the constraints of scientific style.

- In revisiting the Introduction, you should ask yourself "Has what is promised in the Introduction been delivered in the Discussion?"

References

- Are all the references cited in the text listed in the References section, in alphabetical order (with a few journals as exceptions). Are all references in the Reference section present somewhere in the manuscript?

- Do the references conform to the standard set out by the journal, both in the reference list and in the text?

- Are all unoriginal assertions and references to the findings or data of others, accompanied by a citation? Is the primary source cited? Avoid the written version of the entertaining game "Chinese Whisper".

- Are there citation chains -- reduce citations on a single point to no more than three. Chronological precedence in contribution should used to make a decision.

Format

- Is the manuscript double spaced throughout, including tables and references.
- Are the margins adequate to allow editorial annotation (3 cm left margin, 2 cm top, bottom and right hand side).
- Is the first sentence of all paragraphs indented to avoid confusing the typesetter. Have all hyphenations at the end of lines been removed for the same reason?
- Have standard SI unit abbreviations been used throughout.

Selecting Mock Editors

In order to gain feedback on editorial matters, we will each now select a mock editor from among our group for each paper to go through it from an editors point of view, not that of a peer. They will be looking at grammar, punctuation, spelling, style and format. They will not be looking at the quality of the science presented.

Selecting Pre-Reviewers

It is always wise when preparing a manuscript to pass it by one or more colleagues, because you, the author, are often too close to it to make a fully reasoned assessment of the manuscript and the science it contains. We will be doing this also, and will nominate to people to pre-review each manuscript. These people need not be from within the group, but the timetable for completing this workshop will need to be considered when approaching a potential reviewer. They will not spend much time on grammar and the like, focusing instead on flaws of logic and quality of the science.