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Conservation research ... with bite

How to write a scientific paper

22 10 2012



(<https://coreybradshaw.files.wordpress.com/2012/10/confused-signage.jpg>) Several years ago, my long-time mate, colleague and co-director, [Barry Brook](http://bravenewclimate.com/about/) (<http://bravenewclimate.com/about/>), and I were lamenting how most of our neophyte PhD students were having a hard time putting together their first paper drafts. It's a common problem, and most supervisors probably get their collective paper-writing wisdom across in dribs and drabs over the course of their students' torment... errhm, PhD. And I know that every supervisor has a different style, emphasis, short-cut (or two) and focus when writing a paper, and students invariably pick at least some of these up.

But the fact that this knowledge isn't innate, nor is it in any way taught in probably most undergraduate programmes (I include Honours in that list), means that most supervisors must bleed heavily on those first drafts presented to them by their students. Bleeding is painful for both the supervisor and student who has to clean up the mess – there has to be a better way.

Yes, there are books on the issue (see, for example, [Day & Castel 2011](http://www.amazon.com/Write-Publish-Scientific-Paper-ebook/dp/B005JRMK5C/ref=dp_kinw_strp_1) (http://www.amazon.com/Write-Publish-Scientific-Paper-ebook/dp/B005JRMK5C/ref=dp_kinw_strp_1), [Hofmann 2009](http://www.amazon.com/Scientific-Writing-Communication-Proposals-Presentations/dp/0195390059/ref=la_B003DFBMZG_1_1?ie=UTF8&qid=1350863973&sr=1-1) (http://www.amazon.com/Scientific-Writing-Communication-Proposals-Presentations/dp/0195390059/ref=la_B003DFBMZG_1_1?ie=UTF8&qid=1350863973&sr=1-1), [Schimel 2011](http://www.amazon.com/Writing-Science-Papers-Proposals-Funded/dp/0199760241/ref=la_B005H5603Y_1_1?ie=UTF8&qid=1350864024&sr=1-1) (http://www.amazon.com/Writing-Science-Papers-Proposals-Funded/dp/0199760241/ref=la_B005H5603Y_1_1?ie=UTF8&qid=1350864024&sr=1-1)), but how many starting PhDs sit down and read such books cover to cover? Hell, I can barely get them to read the basic statistics texts.

So as is classic for Barry, he came up with his own approach that I like to call 'La Méthode Brookoise' (a tribute to another clever *jeu de mots* (<http://www.janszta.com/library/Jansz%20ad%20Oct%202010%20parlez>). This short-cut guide to setting up a scientific paper is simple, effective and intuitive. Sure, it was designed with ecology in mind, but it should apply to most scientific disciplines. It appeals to most of our students, and we have both been asked for copies by other supervisors over the years. Our original intention was to write a paper about writing papers to flesh out the full *Méthode*, but that has yet to happen.

Therefore, for the benefit of the up-and-comings (and perhaps to a few of those longer in tooth), behold *La Méthode Brookoise* for writing papers:

STEPS

-1. Conduct your research in an adequate, well-planned and sufficiently replicated manner. Research methods are NOT the topic of the *Méthode*.

0. **Mind map** (jot thoughts down on a whiteboard or paper) and 'group plan' with collaborators (face-to-face or via email or video-conference). As first author, make notes, collate discussion. YOU are the one primarily responsible for deciding what goes into the paper and what doesn't. Don't worry about self-censoring during this 'mind mapping' step.

1. Write down your **main message** in 25 words or less (adhere to this limit, 26 words are too many). You may have multiple lines of evidence in your paper, but you should have one main message. If you can't think of just one, you are either not focussing enough, or you have more than one paper to write.

2. Write a **working abstract**. It should answer the following, explicitly:

- Why are you doing this? [context and aim]
- What did you do? [methods]
- What did you find? [core results – say something useful – no motherhood statements or deference to the main text!]
- What does this mean? [interpretation in context]
- What is it good for? [application]

No one will bother to download and read your full paper (or cite it) if they are not interested by the abstract.

3. Based on your main message and working abstract, **write down your title**. Or perhaps 3 alternatives if you can't decide. A good title should lure the casual browser to read further. In most cases, especially for primary data papers, give your main result in your title – hence, a direct link to your main message. No one will bother to read your abstract if your title is boring or lacks relevance.

4. **Send** your main message, working abstract and proposed title(s) to your co-authors. After their feedback, revise them and send back. Iterate until everyone is happy (this is, of course, a relative emotion).

5. Decide on **display items**. Impose a strict **upper limit of 6** (any mix of figures and/or tables, multi-panel figures are acceptable if they relate to the same theme). If you have more than 6 items, rank in order of importance and move the lowest ranked ones to the online supplementary information. You may have fewer than 6.

6. **Create the figures and tables**, and write the legends for each. Ensure that each legend is **stand-alone** from the main text.

7. **Circulate** your choice of (up to) 6 display items with legends to your co-authors. Revise accordingly, iterate until everyone is happy with selection and presentation.

8. Plan the **paper's skeleton** (this requires careful thinking, and might take you up to a day to do properly – but believe us, it is time well spent!):

- Decide on length of main text. Our strong suggestion is to follow the criteria specified by *Proc R Soc Lond B* (<http://rspb.royalsocietypublishing.org>), *Ecol Lett* ([http://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1461-0248;jsessionid=FCC450D9C47A5BBA305A546D48F6D778.d01t04](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1461-0248;jsessionid=FCC450D9C47A5BBA305A546D48F6D778.d01t04)), and *Ecology* (<http://www.esajournals.org/loi/ecol>) (reports, not articles). That is, 20 double-spaced manuscript pages, or 6 printed pages (as it would appear in the journal). How long is this? Approximately 850 words of text per journal page, or 50 references, or 4 display items. So, roughly 3.5 pages of text, 1.5 pages of display items, and 1 page of references for an average primary data paper. That's $850 \times 3.5 = 3000$ words of main text. If you need to write more (e.g., detailed methods), it must go in the supplementary information.
- Work out the relative size of each section (Introduction, Methods, Results, Discussion, Conclusion). A rule of thumb split is 600, 900, 500, 800, 200, but it varies depending on how much context setting is required, how many lines of evidence you are using, etc. Yet, despite this, it surprisingly often works out at roughly this ratio.
- For each section, plan the paragraphs. Each paragraph should be about 50 to 250 words, but at this stage, do only this: write out each paragraph's main message in 15 words or less (similar to the concept of the paper's main message – remembering that each paragraph should be about only one thing). Then, play around with the arrangement of the paragraphs until you are satisfied with the logical flow.
- If you wish, add to each paragraph some additional notes, key words, indications of reference to cite, display items to refer to, etc. Helps elaborate on the 15-word main message.
- Circulate the skeleton to co-authors and invite critical feedback. Emphasise that this is the appropriate time to fix problems with flow, ideas/content, thrust towards main message, etc. Iterate the skeleton's revisions until co-authors are happy (or at least some consensus has been reached). Often you'll get no feedback except "that's fine". No problem – this indicates that you've planned well.

9. Write the paragraphs! You can do this in any order you like because you know your structure and flow are already established. This is a great advantage, because some parts of a paper are inevitably easier to write than others (and getting more and more final text down is a psychological boost). This also punches through writer's block, and also permits you to work on discrete units of your paper to avoid mental burn-out (don't try to spend all day writing – take a break with email, a walk, some analysis or coding, etc). DO try to set goals for a day (e.g., 5 paragraphs for a day, with an hour on each). Add the references (via Endnote or similar) as you go.

10. Revise the working abstract into a final draft form, based on the final structure and content of the paper. This now becomes your paper's abstract.

11. Circulate the finished draft ms to your co-authors and give them sufficient time (say 2 weeks) for feedback. You'll find they'll be happy to meet this time-frame, as they've already been embedded in the ms development project quite a bit (even if it's just to say "great!" at each juncture in which they're asked for feedback).

Some other points

- It takes discipline to follow these 11 steps. But persist, even when you think "*Ahhh, stuff this, I'll just follow my nose, it'll come together!*". Don't give up. The structured method works and the unstructured method results in a lot more time wasting (and poorer-quality manuscripts) – we say this from hard-won experience.
- Strategic repetition of your main message in the Intro, Results, Discussion and Conclusion is very important. Strategic repetition means saying the same things using different words (be clever and your readers won't even be aware that you're doing this).
- Lead with your main points (a.k.a. you are not composing *Boléro* (<http://en.wikipedia.org/wiki/Boléro>)). This is especially important for the Results and Discussion. Your most important result should come first, your least important last. Your Discussion should start, in the first paragraph, with a strategic repetition of your main message.
- You can be working on later steps whilst you await feedback from co-authors, but try to limit this to stuff you will do anyway (e.g., reference collation, reading, etc.). It may help to be working on more than one manuscript at a time, to avoid time wasting (not that any of you should be doing that!).
- Never *demand* feedback from your co-authors. Request it, and make the point that it's optional for any stage except comments on the final draft. If they give none at a particular stage, it might just be that they're entirely happy with what you've done.
- Avoid superfluous/tortured language and 'verbiage' (<https://conservationbytes.com/2009/02/09/dont-torture-your-readers/>).
- Stick strictly to your overall main text word limit (3500 words for a primary research paper), try to limit to 50 references; NEVER more than 6 display items. Within the structure, some paragraphs may end up being longer or shorter than you'd planned, but don't make

it a habit. If your finalised structure is good, you'll know what goes into each.

- Feel free to ask questions – be sure to reply to all.

Actions

- Comments RSS
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Information

- Date : Mon, 22 Oct 2012
- Tags: Academic Papers, Academic publishing, Barry Brook, Doctor of Philosophy, research, writing
- Categories : conservation, research, science communication, scientific publishing, scientific writing, writing tips

36 responses

30 06 2017

How to respond to reviewers | ConservationBytes.com (10:08:27) :
[...] like there are many styles to writing scientific manuscripts, there are also many ways to respond to a set of criticisms and suggestions from reviewers. [...]

Reply

5 08 2016

Lou (19:51:09) :

That is really great advice. I followed each step of this structure to write my first paper from my PhD thesis and I'm now ready to submit it! My supervisor is great, but he just told me to "start writing" without any indication on where to start from. Now he keeps telling me that I'm making great progress on my drafts. Thank you so much!!

Reply

4 06 2016

What "On the..."? | Brave New Climate (22:22:25) :

[...] struck me as simultaneously pretentious and uninformative. These days I usually try to give the main result in a paper's title, or at least, make it clever, or humorous... (Another irk is when people introduce a speaker [...])

[Reply](#)

20 05 2016

[Better science writing – Chrissie Painting](#) (06:04:40) :

[...] Gavin's talk was based on this piece by Corey Bradshaw, not to be confused with Carrie Bradshaw from Sex & the City who I'm [...]

[Reply](#)

19 02 2016

[activeoceans](#) (19:23:38) :

Reblogged this on [Active Oceans](#) and commented:

It is often at this time of year, as my postgraduate students are madly trying to finish writing papers, that I'm reminded of this post by Prof. Corey Bradshaw on how to write a paper. The method works. It is worth a read. Follow it to success!

[Reply](#)

19 02 2016

[How to write a scientific paper | Active Oceans](#) (19:20:06) :

[...] Source: How to write a scientific paper [...]

[Reply](#)

18 02 2016

[Abigail McQuatters-Gollop](#) (20:00:55) :

Reblogged this on [Plankton and Policy](#) and commented:

Excellent article from @ConservationBytes on how to write a scientific paper. Really helpful when you just can't seem to get started!

[Reply](#)

21 01 2016

[rowan](#) (18:53:46) :

Thanks for this. It would be good to also have an indication of what goes in each section.

[Reply](#)

2 10 2015

[The sticky subject of article authorship | ConservationBytes.com](#)

(06:24:44) :

[...] problems by discussing them well beforehand is a good way to avoid woe later on. If you follow our paper-writing protocol and circulate to all potential authors from the outset of the idea, you will also avoid many of the [...]

[Reply](#)

15 08 2015

[How to give a scientific presentation | ConservationBytes.com](#)

(08:13:02) :

[...] like preparing to write a scientific paper, you have to get your main message straight in your own mind first. I like to use what I call the [...]

[Reply](#)

27 07 2015

Écologie en France | ConservationBytes.com (13:55:31) :

[...] be presenting, including Why Scientists Should Blog, Why Every Scientist Needs an Online Profile, How to Write a Scientific Paper, How to Engage with the Media, and many more related topics. I promise it'll be a fun and [...]

Reply

5 12 2014

The 12 Steps to Writing a Paper and Staying Sane « The Health Research Journey (13:45:58) :

[...] Massive thanks to Barry Brook and CJA Bradshaw for sharing this method! The original post (<https://conservationbytes.com/2012/10/22/how-to-write-a-scientific-paper/>) had a sciencey spin so we have copied this brilliance and adapted it to suit our styles and more [...]

Reply

30 09 2014

How to review a scientific paper | ConservationBytes.com

(12:50:05) :

[...] one of the most popular posts on ConservationBytes.com, as well as in response to several requests, I've decided to provide [...]

Reply

13 06 2014

Back in the field | Urban Phosphorus Ballet (01:57:28) :

[...] twitter I also came to read three good posts about writing science papers (here, here, and here), and one about creating a good presentation [...]

Reply

4 03 2014

Aaron (23:03:37) :

Reblogged this on Micro Hack.

Reply

3 03 2014

February highlights from the world of scientific publishing | sharmanedit (21:23:13) :

[...] was alerted to a very good old post (from 2012) by @conservbytes on how to write a scientific paper, focusing on getting the paper [...]

Reply

8 04 2013

Η περιπέτεια ενός paper | Κόντρα στον άνεμο (00:39:20) :

[...] Υ.Γ. Μερικές ωραίες οδηγίες για το πως να γράψεις ένα paper: <https://conservationbytes.com/2012/10/22/how-to-write-a-scientific-paper/> [...]

Reply

22 01 2013

Ten “crack that paper” commandments | Skipton Woolley's**Research** (16:28:24) :

[...] Hopefully Pia will provide an updated link to her of slides. But in the mean time here are some useful links to look at when thinking about publishing your work: Joern Fischer's writing blog:

<http://writingajournalarticle.wordpress.com/> and Corey Bradshaw's:

<https://conservationbytes.com/2012/10/22/how-to-write-a-scientific-paper/>. [...]

Reply

22 11 2012

7 Tips for Scientific Writing | Study at GSEB and experience**Amsterdam!** (21:50:25) :

[...] How to write a scientific paper (conservationbytes.com) [...]

Reply

22 11 2012

How to Ace an Essay | Mola Mola (03:11:58) :

[...] seen a few posts recently on 'how to write' for scientists, from the technical (this on how to write a paper) to the more general (this on how to write clearly). So here's my [...]

Reply

5 11 2012

how to write a scientific paper « isn't it a wonder, how life came to be (18:57:58) :

[...] article on how to write a scientific paper is really handy. even if it is just a lit review or a small research project, this outline will [...]

Reply

31 10 2012

Recommended Reading | October 2012 | Cindy E Hauser

(07:50:27) :

[...] La Méthode Brookoise for writing scientific papers. [...]

Reply

24 10 2012

Gary Luck (16:26:13) :

Before giving Barry all the credit for these ideas it is worth looking at the following paper where the 'mind map' and '25 word main message' etc were originally(?) presented – Brown et al. (1993) RIGHTING SCIENTIFIC WRITING: FOCUS ON YOUR MAIN MESSAGE! Rangel. J. 15(2), 183-89.

Reply

24 10 2012

CJAB (16:35:29) :

Thanks, Gary. I'm not sure Barry has read that, but I'll ask.

Reply

31 10 2012

Thiago G. Souza (22:00:36) :

Could someone send me the pdf of the referred manuscript (Brown et al. 1993)? Thanks a lot.

Reply

31 10 2012

CJAB (22:10:21) :

You can find the Brown et al. (1993) paper here.

21 01 2016

rowan (18:50:23) :

Ooh, I did a paper writing workshop with him back in 2007, and I've just got my first paper published! Thanks for the summary.

7 11 2012

Barry Brook (19:14:06) :

I cited Brown et al 1993 heavily in my original write-up for the postdocs and students – Corey obviously forgot, or else didn't read Brown as I demanded (tsk, tsk). It was introduced to me back in 1995 when I was writing up my honours thesis, by my supervisor Dick Frankham.

Reply

23 10 2012

The last of summer (randoms) « elsewhere. journal. (23:54:00) :

[...] This music. – Apples. And butternut squash. – I finally found some useful advice on how to write an academic paper. I may not go crazy after [...]

Reply

23 10 2012

Rochelle Steven (15:55:58) :

Hi,

This sort of information is great!!! As a PhD student I have been lucky enough to be mentored over the last few years by some amazing people. One of which (Associate Professor Catherine Pickering) has dedicated a lot of time to encouraging students to get on the path to publication as soon as possible. As a result, I had my first paper published before the end of my undergrad. Though a little longer than the helpful piece given here, some may be interested in accessing this document she wrote earlier this year:

[Click to access Writing-Ecology-Research-Papers-July-2012.pdf](#)

Many thanks to all of the academics making it a priority to nurture us on our way to literary success. We really do appreciate it :-)

Reply

23 10 2012

Thiago G. Souza (@thiagotoyoyo) (01:37:40) :

A must read post. Congrats.

Reply

22 10 2012

zoidberg (23:52:54) :

love it! makes me want to start writing right NOW! :)

Reply

22 10 2012

Chris (16:48:03) :

Thank you!!! I am sitting on my first article and I didn't know where to begin!! Let's see how that goes!!

Reply

22 10 2012

antilopine (11:46:12) :

A great topic. There is also another wonderful resource to help with this:

<http://writingajournalarticle.wordpress.com/>

Euan

Reply

22 10 2012

CJAB (11:47:02) :

Thanks, Euan.

Reply

22 10 2012

Tina (14:32:56) :

great advice!!!

Reply

