

ELOQUENT SCIENCE

*A Practical Guide to Becoming a Better
Writer, Speaker, and Atmospheric Scientist*

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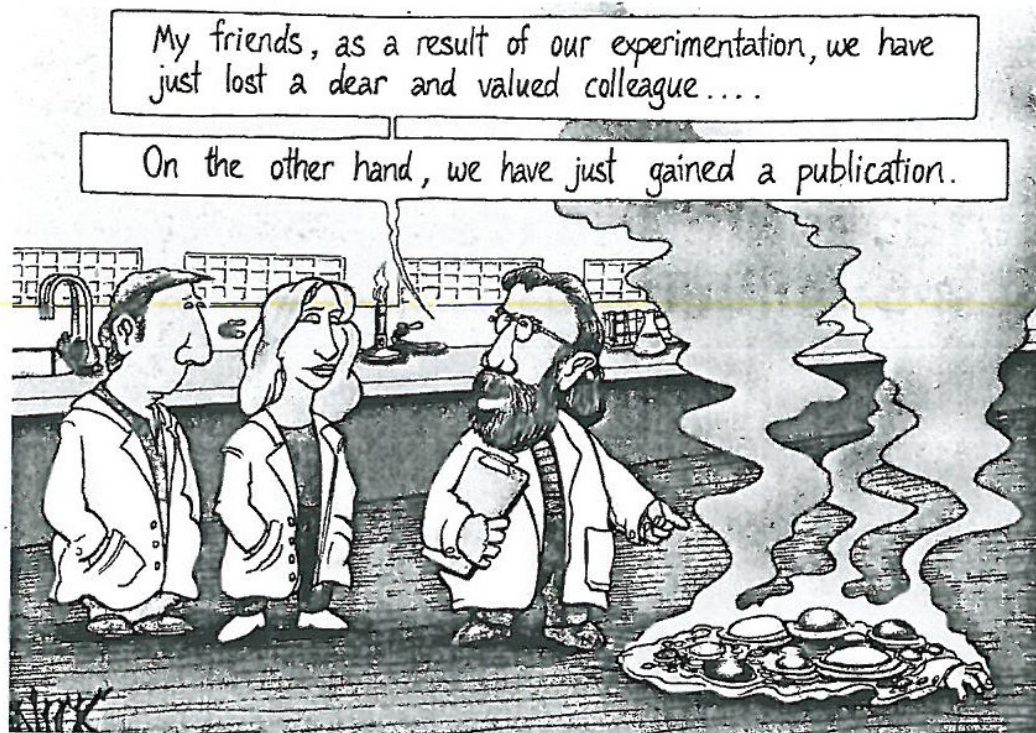
AUTHORSHIP AND ITS RESPONSIBILITIES

Nearly everyone who publishes will collaborate with others on their research. Working with others can be a satisfying or a frustrating experience. One potential difficulty can be determining who will be listed on the paper as coauthors. This chapter describes guidelines for determining authorship and authorship order, the responsibilities of the corresponding author, and the responsibilities of all coauthors.

One active scientist can typically write one or two papers a year. In contrast, a group of people can increase this output tremendously. Therefore, the opportunity to collaborate with people on research can be good for your career and productivity.

Science is becoming increasingly interdisciplinary, perhaps because of the increasing complexity of the problems needing to be solved. One measure of this rise in interdisciplinarity is the increasing number of authors per article over time. For 19 atmospheric science journals, Geerts (1999) found that the average number of authors per article increased from 1.2 in 1950, to 1.5 in 1965, to 2.0 in 1980, to 2.9 in 1995. Articles with tens or even hundreds of authors are common in some disciplines such as biology, medicine, and high-energy physics. For example, the first papers published by the members of the Human Genome Project announcing that they had sequenced the human genome had over 200 coauthors. One can imagine the headaches of coordinating 200 different authors for such an article—sometimes coordinating with just one coauthor is problematic enough!

Authorship is one of the most significant decisions that may be made about a manuscript. The author list is the first item in the citation and the reference, and people who contributed the most to the research should receive the most credit. For example, at some journals (e.g., *Proceedings of the National*



Does this liquified colleague have a right to be listed as a coauthor? Cartoon by Nick D. Kim.

Academy of Sciences), the role of each author to the creation of the manuscript is published on the front page of each article. Unfortunately, authorship is one of those things that is rarely openly discussed among the contributors. What are the rules for determining the author list and its order?

14.1 DETERMINING AUTHORSHIP

In principle, determining authorship should be quite simple, yet no formal rules exist across all scientific disciplines. One codification of these rules was provided by the International Committee of Medical Journal Editors (ICMJE) in 2003, who stated that all authors of a manuscript must satisfy all three of the following criteria:

1. Substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data;
2. drafting the article or revising it critically for important intellectual content; and
3. final approval of the version to be published.

ICMJE (2003) continue, "Acquisition of funding, the collection of data, or general supervision of the research group, by themselves, do not justify authorship." This statement by ICMJE (2003) is arguably the most concise and clear definition of authorship. These criteria can also be used in reverse, too. If a person aims to be a coauthor on a scientific paper, he or she must

contribute to the scientific content of the manuscript, help draft or revise the manuscript, *and* approve the final version. Someone failing to be involved at all three levels should be removed from the author list.

Unquestionably, two people trading favors by adding their names to each others' manuscripts to increase their publication statistics is not acceptable. Equally inappropriate is adding a prominent name to an author list to elicit greater attention to the manuscript. Furthermore, scientists who think that their names have been added to manuscripts for which they did not contribute work at the level discussed above should demand their names be removed from the manuscript. Unfortunately, such an action may have to occur after the manuscript has already been submitted. Scientists should use such situations to educate others about the rules of authorship, hoping to avoid similar future occurrences.

The morality is clear. *If a coauthor is willing to take credit for the article, that coauthor should be prepared to accept responsibility for it as well.* In fact, all authors listed on an article should be prepared to accept responsibility for everything within the article, not just their own contributions. If there are parts of the paper in which you have not directly participated, it is incumbent upon you to learn more about them and the techniques and methods involved, even if you never rise to the level of expert on par with your coauthors. (After all, sharing expertise is one of the joys of collaborating with individuals with different skills than you have.) You may even ask a trusted colleague, who is not a coauthor, for comments on the paper if you lack confidence in the material. Regardless, such informal peer review can only strengthen the paper.

To understand better why these issues of authorship should be taken so seriously, consider the following situation. Suppose you are fifth author out of six on an article published two years ago. Allegations surface that the lead author had manipulated data to arrive at a better linear correlation in the principal figure in the article. Although the figure looked bizarre to you when you read a draft version of the manuscript before submission, you were too busy to raise the issue with the lead author who was eager to submit. Although the lead author was wholly responsible for the unethical behavior, *all authors* suffer under the same cloud of discredit. Consequently, the legitimacy of all your articles may be questioned. To avoid such scenarios, all coauthors must take their role seriously and only commit to manuscripts that they can express total confidence in.

14.2 DETERMINING AUTHORSHIP ORDER

Determining authorship order can be almost as contentious as who is on the author list. Imagine if the issue was whether you would be first author or second author in a three-author paper. Would you rather see for perpetuity the

paper listed as You et al. or Someone-Else et al.? Even two-authored papers can be challenges. In one article published by the AMS, a footnote on the first page of the article read, “the authors contributed equally to this study.”

How to deal with the order of the authors on multiple-authored papers can be difficult. Let’s begin with the lead author. Lead authorship could result if an author meets one or more of the following criteria:

- ❶ Outstanding contributions—the lead author has demonstrated leadership during the study to make the manuscript come to fruition.
- ❷ Major intellectual input—the lead author had the scientific insights to make the manuscript possible.
- ❸ Active participation in work—the lead author did the most work throughout the course of the study.
- ❹ Most contribution to writing—the lead author did most of the writing.
- ❺ Major feature of the manuscript—the lead author developed the principal feature of the research.

Given that more than one author may have contributed to the paper on these levels, several schools of thought exist in determining author order. The most common interpretation is that the first author is the one that did the most work, the one that wrote the majority of the paper, or the one that oversaw the group developing and writing the manuscript. Subsequent authors are those that did progressively less work.

A second approach occurs in some laboratories where multiple-authored papers are commonplace. The last name on the author list, rather than being the person who did the least amount of work, is reserved for the leader of the laboratory (assuming, of course, that the laboratory head also satisfies ICMJE’s three criteria for authorship). After the first two positions on the author list for such papers (usually a student and the direct supervisor), the last position is actually regarded as one of the most prestigious.

A third approach occurs in some papers where the first few authors are the ones that did all the work, then at some point, the author list proceeds alphabetically to indicate that the effort of the remaining authors is comparable. For example, such an alphabetical list may appear in some field program reports to indicate the people involved in the planning and execution of the field program, but played a relatively small role in the manuscript.

A fourth approach is to perform a quantitative assessment of each person’s contributions in several different categories such as project design, implementation, writing (e.g., Schmidt 1987; Ahmed et al. 1997; Devine et al. 2005; Tschardtke et al. 2007). Numerical ranking of the scores can then indicate the author order.

Clearly, many different models for authorship exist, and each research group must decide on their own approach. Sometimes the author list or author order may change as work proceeds on the paper, responsibilities evolve, people leave or join the research group, or substantive comments from colleagues affect the research or writing. Trying to implement a uniform standard for authorship order across science, let alone just atmospheric science, is simply not feasible.

One issue that frequently arises is how to deal with coauthorship on articles resulting from a student thesis written up for formal publication by the advisor. This scenario is common for students who wrote their thesis and graduated, but did not continue in science, yet the advisor wants the research published. In such scenarios, some advisors will assume lead authorship because they performed the bulk of the effort required to produce the manuscript, which otherwise would not have been published. Although a reasonable supposition, others may interpret this scenario as the advisor stealing the students' work. This perception is avoided by advisors who are adamant that, because the research was done by the student, the student should be the lead author, even if the advisor was responsible for the production of the manuscript. In all situations, students and advisors should openly discuss publication issues early during the collaboration. Students are often understandably uncomfortable discussing this issue. The advisor therefore needs to initiate the discussion.

Because of the different scenarios for authorship and the intensely personal feelings that may arise from these issues, I suggest the following rules about authorship be involved in each multiple-authored paper:

1. Authorship should be discussed among all those involved. The lead author, corresponding author, most senior person on the author list, or head of the research group should explain why all authors are listed on the paper in the proposed order, being open to concerns from all authors.
2. Whatever rules of authorship are employed should be consistent throughout the research activities of the group or the series of papers on the particular topic.

As your career evolves and you consider a new job opportunity, ask the supervisor about their group's authorship standards, inquire from the other employees about their experiences, and seek out the group's publications to see that appropriate credit is given. If the standards of this group do not meet yours, consider a different position. Your ability to have the career you want depends on you receiving the credit you deserve for the work you did.

14.3 OBLIGATIONS OF AUTHORS

With the list and order of authors determined, each author has responsibilities to the manuscript. The American Geophysical Union (2006), emulating a similar document by the American Chemical Society, developed the following list of such obligations for authors:

1. An author's central obligation is to present a concise, accurate account of the research performed as well as an objective discussion of its significance.

2. A paper should contain sufficient detail and references to public sources of information to permit the author's peers to repeat the work.

3. An author should cite those publications that have been influential in determining the nature of the reported work and that will guide the reader quickly to the earlier work that is essential for understanding the present investigation. Information obtained privately, as in conversation, correspondence, or discussion with third parties, should not be used or reported in the author's work without explicit permission from the investigator with whom the information originated. Information obtained in the course of confidential services, such as refereeing manuscripts or grant applications, cannot be used without permission of the author of the work being used.

4. Fragmentation of research papers should be avoided. A scientist who has done extensive work on a system or group of related systems should organize publication so that each paper gives a complete account of a particular aspect of the general study.

5. It is unethical for an author to publish manuscripts describing essentially the same research in more than one journal of primary publication. Submitting the same manuscript to more than one journal concurrently is unethical and unacceptable.

6. An author should make no changes to a paper after it has been accepted. If there is a compelling reason to make changes, the author is obligated to inform the editor directly of the nature of the desired change. Only the editor has the final authority to approve any such requested changes.

7. A criticism of a published paper may be justified; however, personal criticism is never considered acceptable.

8. Only individuals who have significantly contributed to the research and preparation of the article should be listed as authors. All of these coauthors share responsibility for submitted articles. Although not all coauthors may be familiar with all aspects of the research presented in their article, each should have in place an appropriate process for reviewing the accuracy of the reported results. A deceased person who met the criteria described here may be designated as an author. The corresponding author accepts the responsibility of having included as authors all persons who meet these criteria for authorship and none who do not. Other contributors who do not meet the authorship

criteria should be appropriately acknowledged in the article. The corresponding author also attests that all living coauthors have seen the final version of the article, agree with the major conclusions, and have agreed to its submission for publication.

14.4 OBLIGATIONS OF CORRESPONDING AUTHORS

Because each coauthor has responsibility to read and approve the manuscript at each step in the submission process, the corresponding author has the following additional obligations to *all* coauthors:

- ④ Tell all coauthors that they are being considered as an author as early in the research process as possible. (Do not laugh—manuscripts have been submitted and authors did not know they were listed as such.)
- ④ Provide all coauthors a reasonable amount of time to comment on the manuscript *before* it is submitted.
- ④ Get the signatures of all coauthors on the copyright forms, if required.
- ④ Send reviews to all coauthors.
- ④ Inform all coauthors of the manuscript status throughout the process.
- ④ Involve all coauthors in responding to the reviewers.
- ④ Manage all comments by coauthors and resolve differences among them, if needed.
- ④ Tell all coauthors the final deadline for comments on the final version of the manuscript before submission.
- ④ Offer all coauthors an opportunity to comment on the page proofs.
- ④ Send reprints (either digital or paper copy) to all coauthors when the article is published.

Being corresponding author may mean balancing differing viewpoints or different levels of attention to detail. Simply put, the corresponding author should ensure that papers are held to the highest standard among all the coauthors.

After publication, the corresponding author is often the person contacted from readers interested about the manuscript, wanting data, asking questions, etc. Thus, the corresponding author should be prepared to accept these requests as well.

Scientific Writing and Communication

PAPERS, PROPOSALS, AND PRESENTATIONS

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Generally, journals that are published more frequently have a faster turnaround time between acceptance and publication. Some may publish articles online first before publishing them in print, as may some universities after your paper has been accepted.

The ever increasing international readership in science today seeks both an electronic version as well as a prestigious ranking. Beware, however, of journals that publish only electronically, as many of these electronic journals do not put their articles through a rigorous review process and thus are not as prestigious as journals with printed versions. Beware also of new journals; their circulation may be very small.

Instructions to Authors

GUIDELINE 2:

Obtain *Instructions to Authors* and follow them.

When you have decided on a target journal, you should obtain the journal's specific *Instructions to Authors*. Read these instructions. Mark important details such as length of abstract, sections/headings of an article, writing style, format of references, and electronic format. Follow the instructions carefully when you are writing, and compare your format to recently published articles in your target journal. Reading these articles will give you an even better idea of the style and format of papers in this journal.

Instructions to Authors are generally available on the Web site of your target journal as well as in printed volumes of the journal. Web sites that list *Instructions to Authors* for many different journals include the following:

<http://mulford.meduohio.edu/instr/> (for biological and medical journals)

<http://www.icmje.org> (core set of instructions for many biomedical journals)

<http://www.inter-biotec.com/biowc/uniform/uniform.html> (uniform requirements for manuscripts submitted to biomedical journals)

<http://www.ch.cam.ac.uk/c2k/cj/alpha.html> (for chemistry journals)

<http://www.lib.auburn.edu/scitech/resguide/chemistry/chemjn.html> (for chemistry journals)

<http://www.ch.cam.ac.uk/c2k/cj/physical.html> (for physics journals)

7.3 AUTHORSHIP

GUIDELINE 2:

Decide on authorship before starting to write.

One of the most common concerns of young scientists is who to include as an author on a publication and in which order. Every person that contributed substantially to the research, to the experimental design, and

to writing the paper should be included as a coauthor. People that only assist in data collection or manuscript editing should not be included as coauthors.

Having coauthors can be beneficial but also problematic. Coauthors can help in designing the experiments and in seeing them through as well as in interpreting the data and in writing the paper. Disagreement over authorships, however, can easily result in wrecked friendships. A good piece of advice is to always decide on who is going to be an author as soon as you can—if possible, *before* you start writing the paper (if not before you start the research itself to divide the work).

Deciding on the order of authorship can be difficult. Most people want to be first author (or as close to the first author position as possible) because typically only the name of the first author appears in citations and reference lists. Generally, the person who contributed the most to the research is the first author; the head of the laboratory is typically the last author. The person who did most of the writing is usually also the first or last author, and one of them is usually identified as the corresponding author, the author to whom all correspondence should be directed. Being the corresponding author does not give you much recognition, and if you decide to become the designated corresponding author, you should ensure that you can be reached through your corresponding address.

Aside from the first and last author, other authors are normally listed in the order of their contribution to the study. If more than one person contributed equally to the work, authors may be listed in alphabetical order or may be identified as having contributed equally by a footnote. If more than one paper arises from the study, the reverse order of authors can be used in the second paper. The order of authors, however, may also depend on the policy or preference of the laboratory head.

You may run into people, at worst a senior researcher (investigator or head of department), who ask you to include in the author list a person who has not contributed to the research, possibly even himself or herself. You can try to avoid this, for example, by diplomatically stating that there are stringent requirements put forth by your target journal. However, you may be forced to include that person for political reasons. If that happens, at the very least, ask that person to contribute to writing the article.

In some departments or foreign countries, it may be common practice to always include the head of the department on a paper. In other cultures, the principal investigator may always want to be placed in the first author position, possibly due to financial or political reasons. Know though that you should give the first author place preferably to a student or postdoctoral fellow. These young people usually not only did most of the work but also still have to establish themselves and will have a much better chance of doing so if they receive the recognition due to them. Furthermore, people in your field will know who the principal investigator is, and those not in your field will expect to find that principal investigator's name at the end of the author list.

Potential conflicts can arise when more than one person is writing the manuscript. Problems that arise from multiple authors writing

a paper may include not only inconsistencies in language and style but also weak transitions and illogical formats. An example of a paragraph that has been written by more than one author—and in two very distinct styles—is shown in Example 7-1:



Example 7-1 Structured abstract

Numerous antibiotic classes, including macrolides, the streptogramins, and the oxazolidinones, bind to the 50S ribosomal subunit, demonstrating that this is an excellent target for antibiotic drug discovery. Biochemical studies had previously determined that the site of action for all these antibiotic classes was the peptidyl transferase center of the 50S. The crystal structures, however, brought light into the center: they delineated how different antibiotic classes bind to or engage distinct, though often overlapping or adjacent spaces, making the 50S ribosome a “target of targets.” Consider the opportunities! Suddenly, one could determine an appropriate position on and a trajectory from an existing antibiotic scaffold to boost affinity or overcome target-based resistance. Likewise, one could study the spaces between two adjacent binding sites and either bridge the two or utilize that as a starting point for a new scaffold. At once, ribosomal drug hunters were freed from the me-too approach of tuning ever-so-slightly the same molecular scaffolds. And so, it was back to the future, targeting the ribosome.

[With permission from Future Medicine Ltd]

It is best to designate one writer (preferably the first author or best writer) for doing all of the writing or revisions. Alternatively, one person could be designated as the coordinator. This person should oversee the logical framework of the paper as well as its style and consistency. All coauthors should at least read and approve the final version before submission to a journal. Coauthors also have to agree to any changes made before publication, and the primary author should confer with the coauthors as to the correct spelling of their names.

7.4 DRAFTING A MANUSCRIPT

General Format

GUIDELINE 3:

Follow the IMRAD format.

Scientific papers have a set format, the Introduction, Methods, Results, and Discussion (IMRAD) format. This format reflects the order of the core sections in academic journal articles, which usually include:

Title page
Abstract