

# Conventions of Scientific Authorship

By [Vijaysree Venkatraman](#) | Apr. 16, 2010 , 8:00 AM

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Pardis Sabeti published her first scientific paper when she was an undergraduate at the Massachusetts Institute of Technology. Her name had appeared in acknowledgment sections before, but that was the first time she was listed as an author—and she was first on the author list. It was an important milestone in the development of her scientific career.

Sabeti has moved on. These days, as assistant professor in genomics and systems biology at Harvard University, she usually is listed last on papers that come out of her lab. Although students have to earn their way onto the lab's papers, Sabeti admits to being instinctively inclusive when it comes to authorship. Inclusiveness is appropriate, she says, because her students "are always intellectually involved—not just a pair of hands in the lab."

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**If scientists want to convey this information by the way their names are ordered, the method is similar to sending smoke signals, in code, on a dark, windy night.**

—*Drummond Rennie*

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In another lab on the same campus, Stephen Kosslyn, a professor of psychology, employs a more elaborate and specific strategy for assigning authorship. Fifteen years ago, a dispute between a postdoc and a graduate student alerted Kosslyn to the contentiousness of some authorship decisions. Once he explained his rationale to his disgruntled junior colleagues, they agreed that his decision made sense. He decided to spell out his system for future collaborators.

Kosslyn employs a points system, which is explicated on his lab [website](#). Anyone who works with him on a project that results in a paper can earn up to 1000 points, based on the extent of their contribution to six different phases of the project: idea, design, implementation, conducting the experiment, data analysis, and writing. The first and last phases—idea and writing—get the most weight. Those who make a certain cutoff are granted authorship, and their score determines their order on the list. Those who earn less than 100 points are acknowledged in a footnote. "It's very, very rare that there's any sort of issue," he says.

## Authors galore

Outside of Kosslyn's lab, the apportionment of credit in an author list—typically the prerogative of the lab head—is rarely straightforward. Although most decisions are uncontroversial, inexplicable omissions

and unjustified exclusions are commonplace. Everyone in the scientific community knows stories of authors who shouldn't have been, and non-authors who should have been, Sabeti says.

Science historian Mario Biagioli, the co-editor of the anthology *Scientific Authorship: Credit and Intellectual Property in Science*, says author attribution has always been a tricky issue. He mentions Robert Boyle, the 17th century chemist whose anonymous employees emerged from the shadows only when he blamed them for things that went wrong, such as explosions. Biagioli says that Boyle's leaving his employees names off his papers wasn't violating any ethical rules, because authorship protocols hadn't stabilized yet.

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### Author Order in a Recent *Science* Paper

A recent *Science* paper, **Iron-Clad Fibers: A Metal-Based Biological Strategy for Hard Flexible Coatings**, provides a case study in assigning authorship. The paper lists five authors, including:

- Matthew J. Harrington and Admir Mašić, postdocs in the Department of Biomaterials, Max Planck Institute of Colloids and Interfaces, Potsdam. Harrington and Mašić share "first" author status, indicated by an asterisk and a footnote.
- Niels Holten-Andersen, now a postdoc at the University of Chicago, listed second.
- Herbert Waite, head of a lab in the Department of Molecular, Cellular, and Developmental Biology at the University of California, Santa Barbara, listed fourth. Waite was the Ph.D. adviser for Harrington and Holten-Andersen. He is the senior scientist in the collaboration and the scientist most closely identified with this field.
- The last author, Peter Fratzl, is the director of the Department of Biomaterials, Max Planck Institute of Colloids and Interfaces and, hence, the head of the lab where the two first authors are postdocs.

Waite says that deciding who will be the last author can be "a delicate issue." "Authorship etiquette varies greatly among different labs," he says. "It can be a bloody rotten situation when everyone or even a few want the limelight. But in this case, there was collegial give and take."

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Today, reputable journals in every scientific discipline have guidelines for authorship, but the protocols still haven't exactly stabilized, and they rarely address author order. (An exception is high-energy particle physics, where the names of authors—frequently a cast of hundreds—are listed alphabetically.) Authors are free to negotiate their position in the author list with their co-authors, says Sonja Krane, managing editor of the *Journal of the American Chemical Society*, in an e-mail.

That order matters greatly for scientists in academia, especially scientists who aren't yet established in independent careers. Publication records weigh heavily in hiring, funding, and promotion

decisions, and departments, hiring managers, and personnel committees want to know how, and how much, a candidate contributed to a collaborative project. Often, all they have to go on is their position in the author list.

"In the score-keeping that scientists do, first author is the most coveted slot," says Janet Stemwedel, who teaches ethics in science at San José State University in California and writes the *Adventures in Ethics and Science* blog. Primary authorship is highly valued because it usually indicates who had the idea, who was the "main mover" in the work, or both, Kosslyn says. And because of the way work gets cited (e.g., "First Author, et al., 2010") the first author's name is the most visible to readers. Sometimes more than one author can be "first," indicated by an asterisk or other typographical symbol and an explanatory note. But the person listed first is always the most visible.

With credit comes responsibility: Who is to blame if something's wrong? Typically—but not always—the author listed last is the head of the lab that hosted most of the research. Ideally, this senior author has inspected all the original data analyzed and reported in a paper, notes Randy Schekman, editor-in-chief of the *Proceedings of the National Academy of Sciences* (PNAS). Consequently, the last author often gets the most grief if things go wrong—and much of the credit when things go right. "The proverbial buck stops there," Schekman says.

Having one person ultimately responsible for everything in a paper is a fine idea. Yet, in collaborative projects involving diverse disciplines and institutions, it's unrealistic to expect one person to be able to vouch for every piece of experimental data, says Bruce Alberts, editor-in-chief of *Science*, the parent publication of *Science Careers*. Some journals now require a senior author from each lab to review all of the data generated by their labs and its interpretation. The result is that in complex projects, there can be more than one "last author" just as there can be more than one "first" author; this, too, is usually indicated with typographic symbols and explanatory footnotes.

In addition, almost every scientific article specifies at least one "corresponding author," indicated by a typographic mark and a footnote. The corresponding author is the point of contact for editors, readers, and outside researchers who have questions about the contents of the paper. Often, the corresponding author is also the last author, but she or he may be listed first or even in the middle of the author list.

## Gift authorship

For a student who has been left off an author list, it can be especially maddening to see someone included who obviously doesn't deserve it. Also called "honorary," or "guest," authors, gift authors don't make a significant contribution (or sometimes any contribution at all) to the paper, Stemwedel says. Motivations for gift authorship vary; the principal investigator (PI) may think he's doing the recipient a favor, or she or he may think that adding the name of a well-known scientist will improve the odds of getting published in a top journal. Gift authors can

appear anywhere on the author list, but usually they're listed in the middle.

Gift authorship is especially damaging when the recipient is a senior author, says Drummond Rennie, deputy editor of the *Journal of the American Medical Association (JAMA)*. Anyone who doesn't realize that the authorship is honorary—that is, almost everyone who reads the paper—will wrongly assume that this well-known scientist has performed his or her role in ensuring the integrity of the data. "Sadly, the paper which had so many fathers till then—as indicated by the author list—suddenly becomes an orphan," Rennie says. Sometimes authorships are even "gifted" without the recipient's knowledge.

## Contributor, not author

As collaborations become interdisciplinary and author lists grow longer, who did what becomes even less discernible to readers. "If scientists want to convey this information by the way their names are ordered, the method is similar to sending smoke signals, in code, on a dark, windy night," Rennie says. An unpublished 1995 survey conducted by AAAS—the publisher of *Science* and *Science Careers*—found that even editors of clinical journals couldn't agree on the meaning of author order. In a culture that requires precise communication, the traditional means of communicating author's contributions is "scarcely scientific," Rennie says.

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### New policies at *Science*

In a **New Year's Day editorial**, *Science's* Alberts introduced new rules for *Science* contributors. The editorial announced that in order to combat honorary authorship, contributors to *Science* -- as well as to *Nature* and *PNAS*, who shared in the development of these principles—would have to describe their contributions to the article prior to acceptance. This is similar to the policies Rennie promoted at *JAMA*, except that at *Science* the information is kept on file but not routinely published. Furthermore, in order to improve accountability, a senior author from each laboratory or group participating in the collaboration must now certify that she or he has reviewed the original data and its representation.

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So in 1996, Rennie proposed a solution: Each manuscript should contain a clear description of each author's contribution. The team should identify a leader to reassure readers and editors that someone is accountable. Because they describe their roles in print for all to see, the authors can't change their stories later. Top medical journals such as *JAMA*, *The Lancet*, *British Medical Journal*, and *Radiology* adopted Rennie's proposal.

From an accountability standpoint, the *JAMA* system would seem to have few disadvantages; Biagioli says the move from "author" to "contributor" has been by far the most innovative step toward

transparency in publishing research results. There can be no ethical argument against such explicit authorship, Stemwedel of San José State agrees. Yet the built-in ambiguity of the present system might hold appeal for some, depending where they are in the power structure. For instance, if the last author is a big name, readers could easily assume that the senior scientist provided the intellectual firepower, even if the first author did the heavy lifting, Stemwedel says. Furthermore, agreeing who came up with which fraction of a big idea can be difficult, she adds.

## Meanwhile ...

The shift toward a more explicit listing of authorial roles seems likely to continue, but the situation may never completely clarify. Authorship conventions may forever remain specific to the ecologies of particular disciplines, Biagioli says. Schekman adds that journals may never standardize authorship conventions. New entrants to the world of research likely will continue to grapple with the ambiguities of the current system, negotiating for an appropriate spot on the author list.

"Working out relative importance of each person's contribution to the research will still be a judgment call," Stemwedel says. Documenting each author's contribution to the project is good practice, even if a journal doesn't require it, Biagioli advises. A bit of introspection can make the process go more smoothly, says Stemwedel, so "don't wait to for a manuscript to be drafted. At the very beginning of the project, sit down with the members of the team and the PI to discuss which part you plan to take responsibility for." "Revisit this idea at periodic intervals," Biagioli says, so that no one will be surprised to find themselves left off the list, or listed in the middle on a project that they once thought of as theirs.

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