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Bud Abbott and Lou Costello made disagreements about order in baseball the stuff of comedy legend.

AUTHORSHIP

Who's on first?

When scientists collaborate on an experiment and a paper, it can be hard to decide who gets the credit and how much.

BY AMBER DANCE

Stephen Kosslyn first started to consider how author lists come together when he found himself mediating a dispute. A postdoc and a graduate student each wanted to be listed as the first author on a study. “They both had a case,” recalls Kosslyn. “It got heated.”

Disagreements often happen when contributors put in similar amounts of effort on different aspects of a project, says Kosslyn, a psychologist at Stanford University in California. For example, one person might have developed the idea for the project and the other performed most of the data analysis. “The force of the dispute usually revolves around the feeling that whatever they did was more

important than what the other person did,” says Kosslyn.

Such disputes are common. “As authorship is our academic currency, it tends to be a hot-button topic,” says Karen Peterson, scientific ombudsman at the Fred Hutchinson Cancer Research Center in Seattle, Washington. She says that one-fifth of the disputes she adjudicates concern authorship. Similar conflicts are among the most common issues mediated by the Committee on Publication Ethics (COPE), says Virginia Barbour, the organization’s chairwoman and chief editor of *PLoS Medicine* in Cambridge, UK.

Authorship disagreements can be mitigated with careful discussions, explicit lab guidelines and a good understanding of authorship practices in one’s field. There is no

perfect approach, but deciding on who gets an authorship credit, and how they are ranked, is a crucial part of doing science responsibly.

Precise statistics on authorship disputes are hard to come by, says Mario Biagioli, a science historian at the University of California, Davis, who has studied authorship. Scientists may be reluctant to admit that they have demanded undeserved authorship or otherwise subverted the system, and the US Office of Research Integrity does not track such disagreements because they are not considered scientific misconduct, says Biagioli, who co-edited the book *Scientific Authorship: Credit and Intellectual Property in Science* (Routledge, 2002). However, in a 2005 survey¹ of researchers who had received a grant from the US National Institutes of Health (NIH), 10% of respondents admitted to assigning authorship “inappropriately”.

CREDIT CONFUSION

Questions of who deserves credit for a paper are a fairly recent phenomenon, says Biagioli. Once upon a time, a paper had one author, maybe two. But with modern big science and large collaborations, a study might have hundreds or even thousands of authors — as in the case of the ATLAS experiment² at the Large Hadron Collider at CERN, Europe’s particle-physics laboratory near Geneva, Switzerland.

And what authorship means varies by scientific discipline. For example, in particle physics, hundreds of researchers may contribute to the development and maintenance of a single piece of equipment, such as an accelerator. At big physics labs such as CERN, everyone who was working at the lab when the discovery was made gets a slot on the author list — even if they haven’t seen the paper, says Biagioli. The authors are usually listed alphabetically, regardless of how much they contributed.

In the biological sciences, by contrast, the author list is often strictly ranked. The top spot is at the end of the list, where the principal investigator gets credit for running the lab. The student or postdoc who actually did the work goes first. As for the authors in the middle, it is hard to tell whether they participated a lot or a little, says Biagioli.

The International Committee of Medical Journal Editors (ICMJE), headquartered in Philadelphia, Pennsylvania, has developed authorship guidelines that are used by many journals and institutions. These rules state that to be listed as an author, each researcher

► must meet three key criteria: they must have been involved in designing the project, collecting data or analysing the results; they must have participated in drafting or revising the manuscript; and they must have approved the final, published paper. Many universities that have their own guidelines base them on the ICMJE's wording, says Biagioli.

Kosslyn has his own definition: the crucial element, he says, is creativity. For example, a researcher could work with study participants in the lab, but just be following a protocol. "Anybody could have run the subjects, so running the subjects is not enough," says Kosslyn. To earn authorship, the researcher would be intellectually engaged: they might point out a feature of the data that leads the team to reshape the experiment. The paper wouldn't look the same without them.

THE AUTHOR IN QUESTION

COPE recommends that researchers decide who will be an author and what order they will be listed in before they even conduct experiments, and that the group revisits the author list as a project evolves. A handshake isn't enough to seal the deal — researchers should keep author agreements in writing.

Whenever they occur, authorship discussions need not be confrontational (see 'Aggravation-free authorship'). Mark Groudine, deputy director of the Hutchinson Center, says that the parties in a dispute should sit down and try to talk the matter over. "People get so locked into their positions that they don't make the effort to understand the other person's point of view," he says, "and therefore they don't understand why it's a dispute."

If talking doesn't work, Groudine suggests asking the opinion of an unbiased third party. For example, on one project he collaborated with another principal investigator. When it came to writing up the paper, both wanted



Ombudsman Karen Peterson says that one-fifth of the disputes she handles are about authorship.

to be senior author. They invited two trusted colleagues to mediate.

The jury awarded the senior slot to Groudine, but he felt uneasy about it. He suggested that the other investigator be the corresponding author, who communicates with the journal and any scientists who enquire about the work. "I consider corresponding author as equivalent, almost, to senior author," says Groudine. Co-senior authorship is also an option, he adds.

But sharing credit too broadly can be risky. Sometimes authors are listed more as a courtesy than because they made a key contribution, says Chris Sneden, an astronomer at the University of Texas at Austin, who will step down from his post as editor of *The Astrophysical Journal Letters* at the end of this year. Accepting courtesy authorship is a "double-edged sword", he says. If the paper becomes famous, "every author gets to claim credit". But if it becomes infamous, everyone gets a share of the blame. Researchers need to be aware of the potential risks of adding their names to manuscripts that

they know little about (see 'Ghosts and guests').

Gerald Schatten, a stem-cell researcher at the University of Pittsburgh in Pennsylvania, learned that lesson when he lent his good name to a high-profile but eventually discredited stem-cell paper by Woo Suk Hwang, then at Seoul National University. Schatten was investigated by his university, which cleared him of misconduct, but chastised him for 'research misbehaviour' because he failed to check the quality of the science³.

The decision to accept courtesy authorship is a matter of preference, says Sneden. "Personally, if I haven't actually contributed something to the specific paper, I just won't have my name on it," he says. In that case, he politely tells his colleagues that he shouldn't be on the list. "I make sure they understand that it's not a negative reflection on the paper," he says.

TAKEN IN VAIN

Sometimes, the recipient of this courtesy may not get the chance to bow out. A researcher who has been added to the author list without their permission might be surprised to see their name when the paper comes out, says Sneden, or even angry if they don't agree with the conclusions. Those who find themselves unexpectedly an author on a paper that they would prefer not to be associated with should contact the editor of the journal, he recommends. The editor will get in touch with the study's corresponding author, and decide whether a corrigendum is necessary to explain that the author in question was not involved with the work.

These kinds of conflicts shouldn't occur. Corresponding authors are expected to have the approval of their co-authors — but some don't realize it. "People, do you read the publication agreement that you sign?" Sneden asks his colleagues. (Often, the answer is no.)

Increasingly, journals are attempting to keep authors in line by asking for details on who did what. In cases of fraud, those descriptions should lay the blame at the right person's door.

Biagioli agrees that delineating each person's contribution should help, but he says that the descriptions are frequently too brief. As an example, he cites the study published this month in *Nature* by the ENCODE Project Consortium⁴. It ascribes generic tasks such as "data analysis", "writing" or "scientific management" to large sets of authors, making it impossible to tell, for example, who analysed which data. When scientists sit down to plan a project — and ideally draft the author list — they should also decide how to describe everyone's contributions, says Biagioli. The relevant details will probably vary by discipline, he adds.

In his own lab, Kosslyn has instituted a scheme to make authorship requirements explicit from the outset. As he listened to his student and postdoc arguing their cases several years ago, he started to develop what eventually

CONFLICT RESOLUTION

Aggravation-free authorship

When many scientists work together, determining authorship isn't always easy. Here are some tips for settling the line-up.

- Make sure that you choose collaborators with whom you can work well.
- Discuss authorship early, and keep doing so often as a project evolves. Put it in writing.
- When there are disputes, first try to talk it out amicably and understand the other person's point of view. For example, try to work out how the idea first came about.
- If you must approach your supervisor about an authorship decision that you don't like, keep the tone inquisitive, not accusatory. Explain that you want to understand how authorship was decided.

- If a contributor's authorship is in question, it can help to consider what the paper would have looked like without their efforts, and whether someone else could have made the same contribution.
- Familiarize yourself with your institution's or journal's authorship guidelines, or those of the International Committee of Medical Journal Editors. Use them to back up your case.
- Be prepared to compromise or share credit.
- If you can't agree among yourselves, engage a supervisor, trusted colleagues or an ombudsman to investigate the matter and make a recommendation. **A.D.**

COMMERCIAL PAPERS

Ghosts and guests

Authorship can be misused when there is money to be made. Medical journals contain a mixture of original scientific findings and veiled advertisements for drugs, and scientists and physicians must read papers critically to understand a medicine's true merits, says Alastair Matheson, a biomedical-research consultant in Toronto, Canada.

Some pharmaceutical companies make drugs and run clinical trials, then engage medical writers to draft manuscripts. These contributors are often ghostwriters not listed as authors on the paper. Instead, the company's marketing team finds a big academic name to headline the project — even if this guest author makes no contribution to the paper apart from scanning the final version. Companies sometimes use the same technique to produce reviews promoting their latest medicines, says Joseph Ross, a physician who studies health policy at Yale University in New Haven, Connecticut. One survey⁵ found that guests and ghosts haunted 21% of papers published in six leading medical journals in 2008.

"This vast production line of information about drugs is passed off as the work of academics rather than the work of industry," says Matheson. The companies get to advertise their products; the ghostwriters receive a pay cheque; and the academics get another line on their CVs. But the patients and the integrity of science all lose out, says Matheson.

For example, Merck, a pharmaceutical company based in Whitehouse Station, New Jersey, minimized reporting of the risks observed for its painkiller Vioxx (rofecoxib) until the drug was taken off the market in 2004. Ross was a

consultant to people who had taken Vioxx and developed heart problems, or their families, in two court cases against Merck, and he saw some of the company's internal documents⁶. "We were sort of shocked to find pretty rampant evidence that a lot of the trials were ghostwritten," says Ross. "We would stumble across a full draft of a manuscript that just said, 'external author?'"

There are ways to identify traces of guests and ghosts in a manuscript: "Check the small print," says Matheson. That is where a medical writer or communications company may be acknowledged. Funding from a drug-maker is another tell-tale sign. "These are pointers to the likelihood that this is something originated and planned by industry prior to the involvement of the headline authors," says Matheson. Author disclosures are less helpful, he adds, because academic authors may list several affiliations and it is difficult to tell which commercial relationship is relevant.

With commerce and medicine intimately intertwined, it would be impractical for academics to cut ties with companies, says Matheson. But, he adds, when academics are offered guest authorship, "I would advise them, for the sake of their reputation, to do two things". First, he says, be more than a guest: make sure that your contribution is author-level. Second, insist that company employees involved in the study are also listed as authors.

Matheson says it is the responsibility of journals to make participation by drug-makers more apparent. He would like to see papers marked right at the top with 'commercial article'. He also suggests that journals use labels to indicate who funded the study, and what drug it supports. **A.D.**

became a 1,000-point system. The researchers who come up with the idea get 250 points, split between them according to their contribution; writing the paper is worth the same. A further 500 points are available for designing and running the experiment and analysing the data. Researchers who score at least 100 points make the author list, with each person's point total determining their rank.

Disagreements still occur; in those cases, Kosslyn decides how the points are allocated. When the balance of contributions is unclear, he does his best. However, it rarely comes to tallying points. "Usually it's very obvious what the order's going to be," he says.

In recent years, no disputes have ever risen to the level of the argument that led to the

point system. "That," says Kosslyn, "was the last heated dispute we had in the lab." ■ **SEE WORLD VIEW P.475**

Amber Dance is a freelance science writer in Los Angeles, California.

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POSTGRADUATES

Career-planning course

The University of Pittsburgh in Pennsylvania has launched a course on career planning for graduate students, one of the first to offer degree credits. Planning for Scientific Success aims to help students to identify and develop skills based on their interests and values, and to create a lifelong career-development plan. Steven Wendell, a molecular biologist and assistant director of the postdoctoral office at the university, proposed the course. "The career problems I hear from graduate students and postdocs are based in their lack of a clear, authentic career vision," he says. The course lasts for two semesters and is required for oral-biology graduate students at the University of Pittsburgh dental school, but is open to all graduate students at the university. Each semester is worth one credit.

GRADUATES

Trouble with tracking

Universities across Europe want to improve how they track graduates' career progression, says the European University Association (EUA) in Brussels. In *Tracking Learners' and Graduates' Progression Paths*, published on 13 September, the EUA finds that if institutions follow career outcomes, they can take steps to improve them, such as revising curricula or establishing strategies to improve communication skills. But of 23 institutions surveyed, 77% did not systematically track PhD-holders' careers. Study co-author Michael Gaebel, head of higher-education policy at the EUA, says institutions should create a student database and team up to standardize data collection.

CITATIONS

Nobel prizes predicted

On 19 September, Thomson Reuters announced its annual 'citation laureates', whom it deems likely to win a Nobel prize. Since 2002, 26 of the predictions have come true. "We're trying to demonstrate that there is a strong correlation between citation at high frequency and peer esteem in science," says David Pendlebury, lead analyst for citation-laureate selection based in Eugene, Oregon. Each year, Reuters chooses up to nine candidates in each of the fields of chemistry, economics, physics and medicine. The 2012 laureates include researchers in genetic regulation, quantum teleportation and reducing the speed of light.