Arbitration is needed to resolve scientific authorship disputes

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Abstract

Authorship of publications is the main way scientists received credit for their academic research. But as scientific research projects have become larger and more collaborative, the number of contributors has increased, and so has the potential for disputes over authorship. There is rarely detailed accounting of effort to justify authorship inclusion or placement. Instead, authorship is often negotiated by research team members, which is complicated by there often being large power differentials between team members. Existing recommendations are to try to get authors to work out disputes between themselves, which is unlikely to occur. There is an urgent need for an independent body that can offer binding arbitration for scientific collaborators and journals, like practices in other collaborative disciplines.

Problems of authorship

Academic career advancement depends on authorship credit

Authorship is a limited and valuable resource, so it is unsurprising that conflicts arise over who gets to be an author on a paper. Authors are pressured to add individuals who made minimal contributions (Fong and Wilhite 2017). First authorship is even more limited and valuable for career advancement (van Dijk et al. 2014), so conflicts are expected to be even worse over the coveted first author credit.

While the adage “Publish or perish” is old and familiar to academics, publishing practices have been changing, making issues of publication more complicated. The number of authors on journal articles has been increasing in many different fields (Duffy , Shapiro et al. 1994, Rennie et al. 1997, Simpson 2012, Branch and Linnell 2016, Barlow et al. 2018). The current record-holder, in particle physics, is a paper with 5,154 authors (Castelvecchi 2015). Particle physics

papers have a history of having larger numbers of authors than other disciplines, but biology papers have also cracked the 1,000 author mark (Woolson 2015). With so many contributors, it seems unlikely everyone would have made equal contributions to the paper. As collaborations have increased, the problems of ascertaining and assigning credit (or, if the paper is flawed, blame) (Swedberg 2008) and subsequent disputes (Wilcox 1998) have increased.

In particle physics, one of the first fields to deal with large numbers of authors, the current practice is to list all authors alphabetically (Birnholtz 2008, Venkatraman 2010). This practice is simple but biased against authors whose names are near the end of the alphabet (Einav and Yariv 2006, Tschoegl 2008, Weber 2018). In other fields, authorship is much less cut and dry. In life sciences (McKneally 2006), the first author is generally assumed that to be a student who has done the largest portion of the experimental work and the writing, and who deserves most of the credit. The last author is generally assumed to be a professor who is providing overarching intellectual questions, funding, and writing, but has not necessarily been directly involved in data collection. Authors in all other intervening positions are generally deemed to have made more minor contributions. Empirical research generally supports these interpretations (Shapiro et al. 1994), and some research projects use last authorship as a proxy measure for career stage (van Dijk et al. 2014, Marschke et al. 2018), with the author of one study describing being listed last as, “the pinnacle of the research career and has a lot of status that goes along with it” (Grabmeier 2018).

Authorship practices are highly variable

There are no widely accepted criteria for what constitutes authorship (Venkatraman 2010, Dance 2012, Teixeira da Silva and Dobránszki 2015). Currently, the closest guidelines that approach a widely accepted standard are recommendations for paper authorship in biomedicine

from the International Committee of Medical Journal Editors (International Committee of Medical Journal Editors 2017), also known as the Vancouver guidelines. The guidelines are that for an individual to be an author, he or she must have collected and/or analyze data, substantially contributed to writing the paper, be able to approve the work in the paper, and be accountable for it. Many authors do not know these guidelines for authorship, even in biomedical research, the field for which they were developed (Hoen et al. 1998). There are many cases where listed authors made no appreciable contributions to papers (Shapiro et al. 1994, Johal et al. 2017). Researchers either don't know about (Hoen et al. 1998) or disagree (Mainous III et al. 2002) with those guidelines.

The Vancouver guidelines (International Committee of Medical Journal Editors 2017) only try to answer, "Who should be an author?" They provide no guidance for other contentious points regarding authorship. For multi-author papers, there are at least three designations that are viewed as more important than others: first author (Shapiro et al. 1994), last author (also sometime called senior author), and corresponding author. Because these designations are more valuable, people have used creative ways to spread the benefit of being one of these three authors. Some use author's notes to designate equal contributions (sometimes known as "co-first" or "co-senior" authors), but it is not clear whether anyone besides the authors pays attention to these asterisks. The record for greatest number of "equally contributing" authors is unknown. A cursory search of recent issues of journals quickly found a paper with seven authors (out of 44) listed as having made equal contributions, and none were first author (Kronenberg et al. 2018). One article with four authors designated that all contributed equally (creating the linguistic puzzle of whether they should be called "co-first" authors or "co-senior" authors) and listed all as corresponding authors (Chung et al. 2015).

Contribution notes notwithstanding, authors who contributed equally are almost certainly not viewed equally by readers. Many journals use “author, year” formatting for references, and list only the first author when there are three or more. Thus, the very first author’s name becomes the most associated with the paper, to the point where the first author’s surname and year becomes a shorthand for referring to the paper in conversation. Using “et al.” sweeps away whatever is conveyed by fine print about equal contribution (Albert and Wager 2003, Birnholtz 2008, Venkatraman 2010). Nor do scientific databases (e.g., Web of Knowledge) include “equal contribution” notes, either.

Penders (2016) argues that such vagueness is useful, but vague guidance combined with limited resources makes conflict over a completely predictable outcome of current authorship practices. The Retraction Watch database (Retraction Watch 2018) shows that papers are routinely retracted because of authorship disputes after publication. At the time of this writing, 349 papers in the Retraction Watch database are tagged with “Concerns / issues about authorship” (Retraction Watch 2018) . There are cases of researchers who feel they were unfairly omitted entirely. Papers were published by students without knowledge of faculty (Hao et al. 2017), and papers were published by senior faculty without knowledge of the student (Anonymous 2016). There are also cases where authors are included on the paper, but disagree on author placement (Dai et al. 2016). It is difficult to get a sense of the frequency of authorship disputes, because many authorship disputes could happen before papers are submitted. It is difficult to knows how many projects have been stillborn because of unresolved authorship disputes, although it is certainly not zero (Tschoegl 2008). Our understanding of how authorship disputes affect publications of research and career advancement is data deficient.

Authorship disputes are difficult to resolve

The ideal solution for authorship disputes, and the one recommended by the Committee on Publication Ethics (COPE) (Albert and Wager 2003), is for the authors to resolve their differences on their own. But if communication was good, there would probably have not been an authorship dispute in the first place. There are many problems with trying to resolve such disputes internally. There is a huge power differential between trainees and senior scientists, and senior faculty are most likely to be bullies (Raineri et al. 2011). The potential to dictate authorship credit is ripe for abuse by senior researchers. I hypothesize that people who belong to underrepresented groups are more likely to be caught in disputes, and less likely to have disputes resolved to their satisfaction. Loss of credit due to authorship may be a little recognized factor driving underrepresented individuals out of scientific careers.

There is no guarantee that internal discussion will resolve the problem, despite clear incentives to do so. One paper was retracted because the authors were unable to come to a resolution about the author order (Deacon et al. 2017). This is a “scorched earth” solution where nobody wins. None of the authors win, because nobody gains credit for a retracted paper. Nor do readers win, since there was no implication that the science was unsound.

If that internal discussion fails to resolve the issue, there are few avenues to seek help in resolving it.

A trainee might inform an administrator, like a department chair or college Dean, who oversees the principal investigator of the project. But when faculty from multiple departments or institutions are involved in collaborative projects, it may not be clear who is the relevant administrator to discuss the dispute with. Administrators may have no authority to act even if they are willing to step into an authorship dispute. Similarly, ombuds offices (Wilcox 1998) at

institutions could conceivably play a role, but not every institution has an ombuds office. Research compliance offices might be relevant if misconduct was involved, but authorship disputes can arise that involve no misconduct. Because the standards for authorship placement are so vague, any administrator or office charged with ensuring compliance might reasonably ask what standards the researchers are supposed to be complying with.

Authors might ask journal editors to resolve authorship disputes. By submitting a manuscript to a journal, authors implicitly recognize the editor's authority to decide what goes into a journal. But a Committee on Publication Ethics guide opines that editors are unlikely to get involved (Albert and Wager 2003), although the committee has a recommended procedure for editors to follow if asked to add authors to a published paper (Committee on Publication Ethics 2006), which would be appropriate for some authorship disputes. But if the authors don't agree, the guidelines toss the ball back into the court of the institution (Committee on Publication Ethics 2006), which is, as noted above, problematic. It is unclear if the committee's recommendations for journals to add authors (Committee on Publication Ethics 2006) also apply to changing author order or some other kind of authorship dispute. It seems unfair and unwise to expect journal editors to resolve authorship disputes on their own. There are too few standards across the community (see discontent over Vancouver Guidelines (International Committee of Medical Journal Editors 2017)). Editors probably do not have the local knowledge (Albert and Wager 2003, Wager 2009) or resources to investigate the facts of a dispute thoroughly.

Solutions

As currently practiced, authorship tends to conceal differences in effort, but there are several proposals to change how credit to scientific contributions is assigned. Some journals now require explicit contribution statements about who performed what tasks on a paper, and there

are proposals to standardize contribution statements (McNutt et al. 2018). A system of badges indicating the type of contribution has is used by a few journals (Chawla 2015). Another proposal discounted papers by the number of co-authors (Fong and Wilhite 2017). But such innovations typically take years to percolate through academic publishing systems, if at all. For example, (Rennie et al. 1997) suggested replacing the term “author” with “contributor” 20 years ago, which has not spread through the research community. Many authors in the middle of disputes need solutions now.

There are many collaborative arts where creator and authorship credit is contentious, and that might be used as models for science. For example, many popular comic characters were created by teams of writers and artists, who were often denied any credit for years (Rogers 2016). Batman was first drawn by artist Bob Kane, but writer Bill Finger wrote many stories that defined the character, who never received credit until after his death (Nobleman 2012, McMillan 2015, Argott and Joyce 2017). Spider-Man is sometimes credited as the creation of writer Stan Lee, prompting pushback from artists Jack Kirby (Groth 1990, McMillan 2009), who said he created the character, and Steve Ditko (Robby , Imes 2018), who said he co-created the character (which Lee generally agreed with (Robby , Imes 2018)). The question of who created these iconic pop culture characters is more than a point of debate for comic book historians. These characters earn huge amounts of money from comics, licensing, film, and television, and creator credit can ensure artists receive some of it. The financial stakes involved has meant that creator credit has been the subject of lawsuits or other legal action by writers, artists, or their estates (Gardner 2014, Rogers 2016), and such legal action is not unique to comics (McKinley 1998). But using courts to resolve on authorship credit on scientific papers is unlikely to happen, given

the financial costs, delays in making decisions, and the lack of clarity about professional practices and ambiguous outcomes of one type of authorship credit over another.

Another collaborative field where there are routinely credit disputes is screenwriting for television and movies in the United States. There are similarities between screenwriting and academic writing. First, both movie scripts and scientific articles often pass through the hands of many writers. Thirty-five people were involved writing in *The Flintsones* movie, but only three names appeared on the screen when the film was released (Brew 2015). Second, in both movie scripts and scientific articles, credit is complex and cryptic to outsiders (Brew 2017). For instance, the writing credits for the movie *Lethal Weapon 3* read, "Screenplay by Jeffrey Boam and Jeffrey Boam & Robert Mark Kamen. Story by Jeffrey Boam." Why is Boam listed twice? Why are the names joined with the word "and" in one case, and an ampersand in another? How is a screenplay different than a story? These credits are baffling if you are unfamiliar with the conventions. Unlike some of the cases with comics, however, disputes over screen credits usually go to arbitration rather than court. Usually, the Writer's Guild of America is the final arbiter (Brew 2015, Brew 2017). The Writer's Guild of America has established rules for determining who gets credit (America 2010), albeit with room for interpretation, like what "substantial" means. This model might prove a better one for resolving authorship disputes than court action.

How might arbitration work?

A major difference between screenwriting and science is that screenwriters are part of a single unionized workforce, while scientists lack any such central authority to compel them to respect arbitration. The only authority that would be relevant to all authors of a manuscript, which they implicitly recognized by submitting the manuscript, is the journal's editorial staff.

The tacit recognition of editorial authority could easily be made explicit. Journals could make authors agree to arbitration as a condition for publication by a journal. For example, when a journal accepts a paper, the editors could require authors to sign a form agreeing that by having this paper published in this journal, they would submit to binding arbitration if a dispute arises. Many journals already have such processes in place for copyright transference, payment of page charges or open access fees, and so on. Journals that do not want to make this a requirement for publication at the time of acceptance could still recommend arbitration if disputes arise. If the authors did not agree to arbitration, they would be free to try to resolve the problem internally within a set time rather than face an editor's decision by fiat.

That a journal requires or recommends arbitration does not mean that the journal's editorial staff would conduct investigation of disputes or make recommendations for authorship. Rather, arbitration could be independent agencies staffed by people of diverse backgrounds who are experienced with scientific publishing, investigation, and dispute resolution. Such agencies could provide services to many journals, not just one. These agencies might be operated "in house" by a publisher, a scientific society, an existing agency or council (e.g., Committee on Publication Ethics), or a new independent business or non-profit organization. This would be analogous to how some journals have editorial staff that handles copy editing and proofreading, while at the same time there are independent editorial businesses that assist with writing and editing (often for authors writing in languages that they are not fluent in).

The simplest scenario is one in which a dispute arises after a paper has been submitted to a journal. Depending on the journal's specific policy, they would either recommend arbitration, or simply initiate the process by contacting the arbitration agency. The arbiters would investigate, applying the generally accepted practices of the field, which would be known to

authors in advance. E.g., in biology, the author who performed the most tasks would be first, and the author with the greatest seniority would be last. The arbitration process might be similar in some ways to a peer review system. There may be multiple arbiters who investigate the claims and facts of the dispute, perhaps with some specifically assigned to act as advocates for the different individuals, rather like how court cases have both prosecution and defense attorneys. The arbitration agency would deliver recommendations to the journal's editor-in-chief, who would be responsible for implementing the decision.

Arbitration could be supported by funds from publishers and journals, as part of their commitment to ethical publishing practices. Many academic publishers are highly profitable (Matthews 2018) and developing an arbitration system would be long-term investment in their products (Ponte et al. 2017). Assistance in resolving disputes could become a mark of excellence as a service that high-quality journals are expected to offer, like enlisting and coordinating the efforts of peer reviewers, editing, typesetting, copyediting, and promotion.

While the description above focuses on arbitration initiated by the journal, an independent agency could also offer arbitration services directly to authors. This may be a way of resolving disputes before manuscripts are submitted to journals, which would prevent confusing errata or retractions.

An advantage of this proposed scheme is that it can be implemented quickly. All that is needed is a decision by the editorial board or publisher to implement an arbitration process and recruit individuals to run the agency. Another advantage of an arbitration system is that it increases transparency by providing a clear pathway for dispute resolution. It is likely that many authors who are inexperienced with the complexities of scientific publishing are completely lost and have no idea who to turn to if they believe that have been treated unfairly. Guides on author

disputes exist (Albert and Wager 2003), but are little known and mostly put the burden on authors. The existence of arbitration may encourage improved record-keeping, since clear documentation of the project's progress would be essential to having an arbitrated decision favour one author over another. The more authorship disputes go to arbitration and are resolved through that process, the more likely that authors will become aware of the need to talk to each other about their expectations for authorship, much like how early fights by comic creators changed practices in that industry.

Conclusion

Nobody conducts science expecting fights to emerge between collaborators. But disputes are not exceptional events, so rare that they cannot be anticipated or ameliorated. Early career researchers who are unfamiliar with publication practices should be advised to have frank discussions early and often with other trainees, their supervisors, and other faculty about how authorship will be determined (Albert and Wager 2003).

Long term changes in publication practices – such as detailed and specific credits for contribution and avoiding simple measures like "number of first author papers" for assessment – would solve many problems besides reducing the number of fights between scientists. But early career researchers should not have to wait and see if reforms happen. There is an immediate need for journals to provide to clear policies on what their expectations for authorship are: not only who gets to be an author, but where in the order, "equal contribution" statements, and "corresponding author" designations. Journals should describe what authors should do if disputes happen. While authorship disputes may have been rare enough in the past that journals could have no policies, handle disputes on a case-by-case basis, or (more likely) wash their hand of disputes, the trends of more papers, and more researchers contributing to papers, means that

authorship disputes will only increase. Arbitration – facilitated by journals but not run by them – could help fix this problem.

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