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Authoring scientific papers: a perspective from the trenches

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It has taken a while, but the Swiss Academies of Arts and Sciences (SAAS) have come out with a valuable booklet on authorships of scientific manuscripts [1]. This recommendations, published now also as a special article in the Swiss Medical Weekly [2], aspire to serve as a practical guide for principal investigators confronted with the task of assigning authorships to the individuals contributing to scientific manuscripts. This undertaking is very valuable and timely – particularly when considering that disputes over authorships are extremely common. Such disputes are often very disruptive and can escalate to extreme levels, leading to lifelong feuds and animosities. Indeed, the task of assigning authorships is generally not associated with positive feelings.

To some extent this is understandable and, perhaps, unavoidable, as authorships are *de facto* the currency of academia. Funding agencies rely primarily on authorships to rank their applicants and for young scientists the prospect of an independent good job at any prestigious academic institution and, increasingly, in private companies, is crucially dependent on authorships. The importance of authorships is not limited to senior scientists, but extends to the appropriation of fellowships by PhD students and postdoctoral fellows. For the most prestigious fellowships, such as the European Molecular Biology Organization (EMBO) long-term fellowships and those of the Human Frontier Science Foundation, applicants are disqualified upfront if they do not present at least one first-author publication. Hence the proper assignment of authorships is an extremely important exercise with huge reverberations on the livelihood and the professional prospects of those involved.

In the following sections, I will comment on the guidelines laid out by the SAAS in the light of my 25 years of experience as a laboratory scientist. Admittedly, in the course of publishing a few hundred scientific papers, I have made every conceivable mistake that could be made in this area (however, I hasten to add that I strove to make each mistake only once) – a fact that may perhaps endow me with the justification to elaborate these matters in some detail.

Give credit where credit is due

SAAS should be commended for stating *"Failure to give due credit in the byline to junior scientists for their research or writing efforts contravenes the rules of scientific integrity. Anyone who fulfils the criteria for authorship must be listed."* This principle may seem self-evident, but reality shows otherwise. The most egregious infractions are rarely committed by laboratory directors (who, in the overwhelming majority of cases, behave honourably), but rather by journal editors and publishers. These circumstances are particularly deplorable because journals often pose as the wardens of scientific ethics – particularly when it comes to blaming authors for whatever might have gone wrong. I vividly remember a highly emotional discussion with the editor of *The Lancet*, when Nicolas Kopp and I reported the first case of variant Creutzfeldt-Jakob disease occurring outside the United Kingdom. The editor of *The Lancet* wanted to publish our paper [3], yet categorically refused to list more than five authors – although additional scientists did indeed qualify as authors according to the SAAS's criteria. What ensued was an emotionally charged discussion, in which my coworkers threatened to resign and I, conversely, threatened to withdraw the article in question. The Lancet eventually caved in – but this does not redeem them from having attempted to force an unethical decision upon their authors. Other journals should take notice and refrain from the untenable practice of arbitrarily limiting the number of authors of any publication.

So-called "self-plagiarism" is another issue where journal publishers often grandstand as the custodian of highfalutin ethics, whereas in reality they simply enforce their own financial interests at the cost of the sacrosanct right of authors to their own words. With the open-access movement gathering momentum, many journals have stopped the dishonourable practice of forcing authors to relinquish the copyright to their work. Yet others still insist on unfair and nonsensical requests to hand over the copyright to published works. It is time to expose the motives behind these requests and clarify that, from the viewpoint of morality and scientific integrity, there is no reason why authors should not utilise their own words as they see fit.

The limits of attribution

Much of what the SAAS writes amounts to common sense and will be agreed upon by anybody with a firm moral compass, but the devil lies in the detail. Consider, for ex-

ample, the following recommendation: *"A person is listed as an author if he or she has personally made an important scientific contribution to the planning, conduct, evaluation or control of the research work."* This sounds entirely reasonable, but prospective authors may hold diverging opinions on what exactly an important contribution may consist of. Does, for example, the provision of an antibody or of a genetically modified mouse qualify for authorship? In my opinion, this is not necessarily so. In practice, I would argue that provision of a crucial reagent should be recognised by a coauthorship if the reagent in question had never been published before. Since the primary purpose of all scientific publications is to enable others to reproduce one's findings, the distribution of published reagents should be entirely open and free of any attached strings – and should definitely not be conditional on a request for authorship. Sadly, in reality many scientists withhold all kinds of materials, or make their release dependent on unrealistic and potentially unethical requests.

In a particularly obnoxious example of authorship running amok, the head of a centralised facility at the University of Zurich invoiced differential fees to the facility's users: those who included him as a coauthor of their papers enjoyed a 50% rebate. Such aberrations are clearly abusive and in my view are best combated by "naming and shaming".

Some authors are more equal than others

An issue with huge conflict potential is the order of names in a list of authors. This is because author lists determine the prestige of the contributors, and are often even used to rank applicants during academic job searches. In my laboratory, I strive to adhere to a very simple and transparent principle: the person who has made the greatest effort to advance the project shall be named as the first author. The person who made the second-largest effort will be the second author, and so on. If there is disagreement, the effort will be equated to the number of working hours spent on the project – a parameter that is imperfect but easily measurable. The principal investigator, who typically proposed and initiated the project in question (and hopefully wrote sizeable chunks of the paper), shall be the last author. If the paper is the result of two or more laboratories collaborating with each other, the principal investigators of the respective laboratories will occupy the second-to-last, third-to-last, and similar positions in the author list.

The theory above seems logical and straightforward, but again the reality can be less clear. The constraints imposed by the order of the author list can threaten to poison the collaborative spirit that is fundamental to any teamwork. Coworkers may feel demotivated by being assigned a slot deemed inferior, or they may make their cooperation contingent upon unreasonable authorship requests. However, I have found that the "equal contribution" paradigm is a powerful instrument, which can improve fairness in the distribution of kudos while enabling optimal teambuilding. "Equal contribution" means that two or more authors are declared to have contributed equally to a paper and they all should be considered "first authors". I have been making increasingly liberal use of this instrument, and by now most of the papers from my laboratories sport multiple first authors. Equal authorship is a compromise (the first slot is still the most prized one), but I have found it to significantly improve the fairness of the process, and consequently the satisfaction of my colleagues and the productivity of my laboratory.

It is sometimes difficult to draw a precise line between a contribution that deserves an authorship and one that may instead be more appropriately belong in the Acknowledgments section. Here, the guidelines of the SAAS (*"Activities such as measuring objects or collecting literature are not deemed to be scientific if they are performed on the instructions of a third party without an appreciation of the underlying scientific question or the need to exercise personal judgement. However, if these activities involve analysis, evaluation, interpretation or a similar intellectual effort, or if they require special skills, they constitute scientific work and may justify authorship"*) are well-meant but are too generic to offer concrete help. There is no doubt that a laboratory technician who has conceived and executed a relevant experiment should be offered a full authorship. But what about a postdoctoral fellow who may have spent a few days teaching a method to an undergraduate – who then applied that method to an ambitious project? Does the introduction to a generic laboratory practice entitle the postdoc to coauthorship on the resulting paper? Conversely, consider the case of a laboratory rotation student spending 3 weeks in a laboratory learning how to generate clone recombinant DNA plasmids. With some luck, the student may generate a reagent that others will utilise for a subsequent publication. Would that qualify for a coauthorship?

In my experience, these common dilemmas cannot be resolved with a set of generic rules. Conferment of authorship crucially depends on "soft" criteria, such as whether the postdoc has been regularly devoting time to educating younger colleagues (hence displaying a generosity that needs to be properly rewarded), whether the method in question was invented by that postdoc, and whether the student has gone beyond the mere execution of a learning assignment, e.g. by contributing to the design of the experiment. Even then, the views of those involved (the postdoc devoting time to a younger colleague, the laboratory rotation student and – last but not least – the head of the laboratory, who has the task of assigning the authorships) may dramatically diverge, and the equitable resolution of such divergences can be anything but easy.

Another interesting passage of the SAAS document reads: "*To avoid disappointments and disputes, the listing of authors should be discussed by all concerned as early as possible and decisions should be recorded in writing.*" Yes, this is all true – but things can change during the course of a project. The intended primary author may lose all enthusiasm for the project (and sometimes may even decide to leave the laboratory prematurely), whereas the intended second author can become the *de facto* first author. These eventualities need to be accounted for, and they usually cannot be predicted at the outset of a study.

Finally, the SAAS paper discusses the concept of "contributorship", which relies on detailed descriptions of individual contributions. In my view, this is a very good idea, which has the potential to render justice and properly attribute

the efforts of coauthors who might otherwise get lost in a long list of individuals. Taken to its extreme, contributorship may even supplant the distinction between authorship and certain usages of the Acknowledgments section, inasmuch as it precisely enumerates each contribution and each contributor.

The case studies described above may generate the perception that authorship management is a grim and painful exercise, akin to handing down criminal sentences and slightly less enjoyable than root canal therapy. And sometimes this is exactly how it feels. On the other hand, the assignment of authorships can also be an opportunity for a research laboratory to practice fairness, to motivate coworkers, to create a collaborative atmosphere where the laboratory members will understand that teamwork beats individual egoism, and to demonstrate that hard work will be properly credited and rewarded.

Receiving notice of acceptance of a scientific manuscript, particularly after several rounds of tough peer-reviewing, is always an exhilarating experience that creates joy and bonding between all authors. The fair and transparent assignment of authorship helps ensuring that the day of publication will be positively remembered by all scientists involved.

Disclosures: The author is the Editor in chief of the Swiss Medical Weekly and sits on the Editorial Board of Science.

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