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The Authorship List in Science: Junior Physicists' Perceptions of Who Appears and Why

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Description

This article that focuses on how authorship is distributed in everyday research collaborations with perspectives from junior faculty and post-doctoral graduates.

Body

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Abstract

A questionnaire probing the distribution of authorship credit was given to postdoctoral associates ("postdocs") in order to determine their awareness of the professional society's ethical statement on authorship, the extent of communication with their supervisors about authorship criteria, and the appropriateness of authorship assignments on submitted papers.

Results indicate a low awareness of the professional society's ethical statement and that little communication takes place between postdocs and supervisors about authorship criteria. A substantial amount of authorship credit given to supervisors and other workers is perceived by the postdocs to violate the professional society's ethical statement.

Introduction

Research scientists attempt to discover, describe, and understand phenomena of nature. The information that results is published in books and journals. These books and journals are continuously appended with new information that slowly replaces or enhances what was there before. It is one of the most successful endeavors of humanity.

In the publication process, scientists are rewarded by being listed as authors on the publications. Authorship credit is an important motivator for scientists. Friedman writes that it is "the principal means of demonstrating intellectual achievement for the purpose of academic advancement or recognition". [1]Courtiss writes that without significant authorship, grant money is hard to get, citations and prizes are few. Authorship is also desired for reasons of ego, referrals, politics, education

credits, and to have a technique or other entity named after oneself. 2 Authorship is also important to the funders of the scientific endeavor. Without such, it would become much more difficult to decide which scientists should be given resources to perform future research.

This paper is one of the first inquiries into how authorship is distributed in everyday research collaborations. It will focus on the perhaps most important class of all research collaborations: junior scientists in non-permanent positions (postdoctoral associates or "postdocs") supervised by senior scientists. A short summary of some of the present results was previously published. 3

It might be helpful to describe the circumstances under which a postdoc performs and reports her research. Let us say she investigates a particular property of a particular substance in the laboratory, and discovers something that is original about that substance. Typically, the postdoc did not perform this research independently. Minimally she needed funding for her salary, a laboratory in which to work and a library in which to learn about previous findings. The first two likely came from a government grant awarded to her supervisor by a government agency. The postdoc may also have collaborated more or less closely with other scientists including her supervisor. The project scope itself is defined by the government agency, the supervisor, and the postdoc.

After the research project is finished, the postdoc usually writes a paper. This paper is reviewed by the supervisor before it is submitted for consideration for publication in a journal. Several people are designated authors. One of them is the postdoc, another is usually the supervisor, and, likely, a few (even many) more scientists are credited as well. The funding agency does not receive authorship, but it does receive an acknowledgement at the end of the paper.

Several questions can be asked about the designation of authorship: Is there an agreed upon standard for this process? Is this standard complied with? How much communication about the authorship assignment takes place?

The scientific work on the designation of authorship is limited to four statistical studies4. Ross Vasta5 investigated authorship among junior and senior scientists who were members of the American Psychological Association. He found that 28% of respondents answered yes to the question "have you personally ever been involved in a situation where you believe your authorship was not commensurate

with your input?". He also found that although ethical guidelines existed at the time, they were not specific and not used by the scientists. Honorary authorship (authorship given to colleagues who did not contribute substantially to the research) was considered reasonable by 21% of respondents, and Vasta found this to be uncorrelated with professional age. Further, he found an interesting division of the respondents: some had been hurt by authorship issues and displayed hostility and bitterness, while others were not convinced that the topic deserved attention.

Swazey, Anderson and Lewis[6] studied self-reported exposure to a variety of types of misconduct within the preceding five years among university professors and graduate students in four academic fields. The authors found that the rates of plagiarism and inappropriate authorship were reported to be similar by both faculty and students, that is, student reports of faculty violations were similar to faculty reports of faculty violations and vice versa. They further found that inappropriate authorship was slightly more frequent than plagiarism with one interesting twist: while plagiarism was about three times more likely to be committed by students than by faculty, inappropriate authorship was about three times more likely to be committed by faculty than by students.

Kalichman and Friedman[7] carried out a study further refined by Eastwood, Derish, Leash and Ordway.[8] The latter authors surveyed the overall perception of postdocs regarding inappropriate authorship of others and self, their training in ethics, and their opinions with regard to appropriate criteria for authorship. They surveyed one thousand postdocs at the University of California, San Francisco, an institution primarily devoted to biomedical research. Among the postdocs, 66% held PhDs; those with MDs and PharmDs were included as well. The authors found that fewer than half of the respondents were familiar with any university, school, laboratory or departmental guidelines for research and publication. (Such guidelines may or may not exist.) When asked to check off whether a particular contribution warrants authorship, nearly half believed that being head of the lab warrants authorship, and slightly fewer believed that obtaining funding warrants authorship. Both views are in opposition to the "Uniform Requirement for Manuscripts Submitted to Biomedical Journals".[9]

Formal training in ethics was rare--only a small minority (18%) had a course specifically dedicated to ethics in research. The training correlated with an individual's *belief* that it influenced conduct of scientific research and publishing, and that it heightened his sensitivity to misconduct. However, these authors found

that training in ethics is actually uncorrelated with willingness to commit unethical or questionable research practices in the future, and *is positively correlated with a tendency to award honorary authorship.* The intention to award honorary authorship also increases dramatically for those who have first-hand experience with inappropriate authorship (either by having been asked to list an undeserving author, named as an author together with an undeserving author, or unfairly denied authorship). The authors concluded that "despite the respondents' own standards in this matter, their perception of the actual practice of authorship assignment in the research environment has fostered a willingness to compromise their principles." They also pointed out that their study provided "no insight into the actual prevalence of ... misconduct." The present contribution will address the latter in the field of physics by counting the number of papers with inappropriate authorship, where "inappropriate" is defined by postdocs' interpretation of authorship violating the existing ethical statement of the American Physical Society (APS).

Since authorship is of such great importance to careers in science, one can argue that four statistical investigations is not very many. INSPEC, an online database covering physics and engineering since 1/1/90 shows not one article about the ethics of authorship under the keyword "authorship" out of a total of 1.2 million articles. MEDLINE, covering the health sciences, includes about one hundred opinion articles by journal editors and journal letter writers corresponding to 0.006 % of all articles. There is also a relative absence of discussions of authorship in community-wide efforts with regard to science ethics. The recent report from the Commission on Scientific Integrity, perhaps the largest attempt by the government to deal with ethics in science, did not touch upon designation of authorship. It is also noteworthy that a common standard of scientific misconduct promoted by the National Academy of Sciences--fabrication, falsification, and plagiarism--does not include the bulk of possible misconduct relevant to the designation of authorship.

The current investigation examines postdoc awareness of the APS ethical statement on authorship, communication with the supervisor about authorship criteria, and appropriateness of authorship assignments on submitted papers.

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Method

The questionnaire (see Appendix A) examined the process leading up to authorship assignment as perceived by physics postdocs. It consisted of respondent background information, information about the immediate research group (including, for example, the postdocs' perception of the importance of recommendation letters from the research supervisor, and of published papers) and whether the postdoc had seen the APS ethical statement regarding authorship. Using this ethical statement as a reference, the postdocs were asked about the appropriateness of the authorship assignment on the last five papers the postdoc authored in her or his present position. They were also asked how much authorship decisions were discussed with the supervisor.

Two groups of postdoctoral associates were sampled: 99 randomly picked from a mailing list of all postdocs at a very large national laboratory, and 92 randomly picked from an APS mailing list of all university postdocs. For the first sample non-respondents were asked a second and third time to return the questionnaire. For the second sample permission to follow up was not given. The respective return rates were 59% and 47%. Included among the returns were incomplete questionnaires, for example, questions eliciting authorship details were answered the least (by 65-70% of the returned surveys giving an effective return rate of 34-37%). To compare, the return rate for Vasta's investigation was 66%,[10] for the one by Swazey, Anderson, and Lewis the rates were 72% and 59%, for faculty and graduate students, respectively;[11] and for the one by Eastwood, Derish, Leash and Ordway, it was 33%.[12] In the present study, all results below are averaged over both groups sampled. Finally, in the interest of confidentiality, respondents' genders have been changed.

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Results

The APS ethics guidelines give "minimal standards of ethical behavior" that are important for the creation of an environment of mutual trust in which physics is "best advanced" (APS Guidelines for Professional Conduct as published on the APS Web page

). The sentence relating to requirements for authorship reads:

> "Authorship should be limited to those who have made a significant contribution to the concept, design, execution and interpretation of the research study."

The results will be based on the postdocs' interpretation of this ethics statement. Supervisors interpretations may be similar to the postdocs since Swazey, Anderson and Lewis[13] found that both faculty and graduate students reported a similar rate of faculty authorship misappropriation.

The survey results indicate that 26% of respondents have seen the ethical statement above, the majority have not. Moreover, there is sometimes little agreement among respondents as to what the APS ethical statement means as revealed by the answer to the question:

> "Do you consider, according to the ethical statement above, that obtaining grants and other funding for a project qualifies as a substantial contribution that warrants authorship?"

Forty-nine percent of the respondents answer affirmatively, while the rest are of the opposite opinion.

Respondents reported publishing an average of two papers per year. Guided by the APS ethical guidelines, in 14 % of papers with the supervisor as an author, respondents indicated that the supervisor should not have been listed as an author. The supervisor was an author on 92% of all papers the survey respondents authored. Similarly, in 33% of papers with authors in addition to the supervisor or the postdoc, one or more authors, other than the postdoc or the supervisor, should not have been listed as authors. Forty-six percent of all postdocs answering the question reported that at least one paper on which he or she was an author had at least one inappropriate author; twenty-two percent of postdocs answering the question reported that at least one paper had the supervisor as an inappropriate author. Respondents reported that in one percent of all papers, they were themselves inappropriate authors.

In 75% of postdoc-supervisor relationships, authorship criteria had never been discussed: in 61% of relationships the criteria for the postdoc's authorship were not

"clearly agreed upon" and in 70% of the relationships the criteria for designating others as authors were not "clearly agreed upon." Discussions were somewhat correlated with agreement on postdoc authorship criteria (12% of the variance) and with agreement on criteria for others' authorship (17% of the variance). There is no correlation between postdocs who reported supervisors discussing authorship criteria and postdocs who reported inappropriate attribution of authorship by their supervisors.

Reasons reported for the inappropriate attribution of authorship are listed in Appendix B. The responses were divided into four categories: relationship building (11 entries); minor contributions (11 entries); previous or expected contributions (7 entries); and crediting staff that are close in a social sense, for example, part of the same research group (6 entries). Two entries remained unclassified.

The importance of the supervisor-postdoc relationship was investigated by asking about the factors a postdoc perceives as influencing career advancement. A question read as follows:

> "Rate, on a scale of 1-5 (where 5 is essential and 1 is unimportant), the importance of the following items to your career (for example, in obtaining a permanent position):"

Average Ratings of Factors Influencing Postdoc Careers

Influence	**Rating**
learning from supervisor	3.4
prestige and influence of your supervisor	3.5
supervisor recommendation letters	4.1
your publications	4.2

Numbers after the question show the results. We see that, from the combined average of factors related to the postdoc's objective achievements (learning from supervisor and publications) versus factors related to more subjective measures (prestige and influence of your supervisor and supervisor recommendation letters) that the former are perceived to be no more important than the latter.

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Discussion

Main Conclusions

From this study two main conclusions stand out:

First, *the distribution of authorship is a relatively undefined undertaking*. It is typically not something that postdocs and supervisors have discussed or agreed upon. The single ethical statement available to the community, the APS Guidelines for Professional Conduct, has not been seen by a majority of postdoc authors. Furthermore, these Guidelines allow broad interpretation--for example, the statement on authorship does not clearly indicate whether obtaining funding for a research project qualifies a person for attribution as author since half of survey respondents believe that it does while the other half do not.

Second, using the existing APS Guidelines for Professional Conduct as a standard, *postdocs perceive there to be a substantial amount of inappropriate authorship*. The supervisor, a joint author in 92% of all papers, is inappropriately given authorship in 14% of those papers. In 33% of the papers with additional authors other than the supervisor, one or more authors were perceived as inappropriately listed. In contrast, the postdoc was an inappropriate author on only one percent of all papers.

Lack of Criteria for Authorship Assignment

The physics community is not alone in its lack of a consistently applied, well-defined public procedure for assignment of authorship. A similar situation in psychology was found by Vasta[14] and in biomedical sciences by Eastwood, Derish, Leash, and Ordway.[15] There are considerable forces acting against addressing the issue of assignment of authorship among postdocs as well as among senior scientits. Two anecdotal examples illustrate the point: a statement was made to me by a postdoc who had an elected position with the APS. He told me that the present study was "offensive," a "hot issue" and that he feared "isolating himself" should he bring it up in an APS committee meeting. Second, a committee that was to create the authorship guidelines for the APS some years ago worked in an "atmosphere of hostility" according to one committee member. The guidelines brought difficult

issues to the table including due process, defamation of character, deprivation of rights, whether an individual accused would have a right to face his or her accuser(s), and other legal ramifications. The proposed guidelines were difficult to pass and had to be "watered down" until they became the guidelines quoted above.

Although legal issues influence the scientific community with regard to procedures for assignment of authorship, they are not the only relevant factors.* There are at least three other factors that may be involved. First is the desire to avoid a process that could involve conflict:

> Interest in attributing varying degrees of credit to individual members of groups is a principal source of strain for collaborators. It forces their attention to delicate matters of credit that they prefer to keep undefined (p.401).16

A second factor is that postdocs generally believe their supervisors' recommendation letters are very important for future job prospects. Accordingly, fear of obtaining bad recommendations may prevent the postdocs from raising the topic of authorship with their supervisors. The role of fear of penalization and retaliation in preventing reports of faculty ethical misconduct by graduate students was previously reported.17

A third factor that may explain the lack of a well understood and agreed upon contract for authorship is that the power to legislate the rules of authorship is in the hands of more senior scientists (a finding of powerlessness among postdocs to address ethical issues has been reported).18 At this stage in their career, senior scientists may not perceive the issue as important--for example no supervisor exists who can easily appropriate authorship from them--or, they may see authorship as an entitlement of their senior status.19

Two well established senior physicists with high elected APS positions made statements to me that were consistent with this third possibility. One told me that allocation of authorship was not a problem: he guessed that only a minority of perhaps ten percent of supervisors would misappropriate authorship. He stated that a study of authorship issues was "nobody's highest priority with the exception of postdocs" who he said "tend sometimes to be an underclass" and therefore would not have the political clout needed to bring up the issue. The second told me that once you obtain a high level position it becomes easy to just go with the flow.

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Conclusion

As we have seen, assignment of authorship is a relatively undefined undertaking in the physics community. Since authorship is such an important part of the scientific endeavor, one must ask the question--are there useful ways to standardize the procedure of authorship assignment? There seems to be at least two options. One is to follow the patent authorship model and have an attorney, or another disinterested party, inquire into the research work and, according to existing legal standards for patent authorship, write down the list of authors.A second choice would be to more accurately assign authorship by adding an authorship section at the end of each paper explaining what each author contributed[20] (a non-committal endorsement of this latter option is described in the "Uniform Requirement for Manuscripts Submitted to Biomedical Journals":[21] "Editors may ask authors to describe what each contributed; this information may be published."). Both approaches would counteract major reasons that underlie honorary authorship found in this paper: relationship-building, social closeness, previous and expected work; in the first model because the authorship list is written down by a disinterested third party and in the second model because of the public disclosure of what the person actually accomplished. The latter procedure may also respond to concerns about minor contributions resulting in authorship credit since the extent of all contributions would be stated. A sample "manuscript authorship form" appears in Appendix C.

However, it is likely that the scientific community will not adopt any new procedures. Therefore authorship assignment needs to be studied further given its

fundamental importance for the scientific endeavor. Several topics are worthy of further research.

For example, while this paper has made some progress in elucidating the current procedure for assigning authorship, more details are needed. Who writes or types the list of authors the first time? Who reviews the list? Is the list changed in the review process? If so, by whom, when, how and why?

A second topic of interest is the perceptions of supervisors. Vasta's observation that the tendency of awarding honorary authorship is not related to professional age, and the finding of Swazey, Anderson and Lewis[22] that both faculty and graduate students report a similar rate of faculty authorship misappropriation both suggest that supervisors would not tell a different story. However, a longitudinal study of authorship assignment across the graduate student-faculty transition would shed further light on this question.

A third topic for further investigation is the value of authorship, that is, what is authorship worth in terms of money, career and prestige? Assuming it is the postdoc who types the list of authors, how much can a postdoc gain or lose by giving authorship to others more or less generously? Is the partial loss of intellectual ownership more than compensated by the positive promotion of the postdoc by the additional staff listed as authors? What should a mentor give as career advice?

In addition, the relationship between authorship credit and intellectual property needs to be clarified among all members of the scientific community. Should authorship credit be treated like other intellectual property such as patents and copyrights? Or, as journal editors might rather have it, is authorship a way to establish responsibility for the research content, a "certification" of the results? (For example, as the "Uniform Requirement for Manuscripts Submitted to Biomedical Journals"[23] states: "Each author should have participated sufficiently in the work to take public responsibility for the content".) If so, what is the purpose of the referee process?

A fifth topic for further investigation is the statistical distribution of opinions as to the importance of clarifying authorship practices. Many postdocs believed that authorship credit distribution was not "a problem," but many other would agree with what one of the postdocs said when given an authorship questionnaire at a

conference: "Usually authorship is a sham, right?" (a pilot study was conducted with questionnaires handed out in person). Similarly, Vasta[24] had some respondents ask him why he cared, and others thanked him for his study. These two positions seem common with little in between, suggesting a statistically non-normal distribution of responses. If this is indeed born out in a statistical study it would support stage models for ethical judgement.

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I would like to extend my gratitude for the time given to me by the survey respondents; for critical readings of the manuscript by Michelle Fine and Stephanie Bird, for patent information from Sharon Fujita, for a suggestion of one referee to classify the reasons listed in Appendix B, for a discussion with Rafi Kleiman which led to the "manuscript authorship form" in Appendix C, and for the contribution of others who shall remain anonymous. I would also express my profound gratitude to my doctoral thesis advisor John D.Joannopoulos for his tireless efforts on my behalf during my physics career. Any concerns I may have about authorship assignment are not a result of any experience in his group

References

ed. note: *These are the references in the order they are given in the print version*.

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Footnotes

ed. note:*The numbers in each footnote refer to the References list above.*

- 1.1-Friedman
- 2.2-Courtiss
- 3.3-Tarnow (1996)
- 4.4-7 Vasta, Swazey et al., Friedman, and Eastwood et al.
- 5.4-Vasta
- 6.5-Swazey et al.(1993)
- 7.6-Friedman
- 8.7-Eastwood et al.
- 9.8-Uniform Requirement
- 10.4-Vasta
- 11.5-Swazey et al.(1993)
- 12.7-Eastwood et al.
- 13.5-Swazey et al.(1993)
- 14.4-Vasta

- 15.7-Eastwood et al.
- 16.9-Zuckerman
- 17.10-Swazey et al.(1994)
- 18.7-Eastwood et al.
- 19.11-La Follette
- 20.12-Tarnow (1991)
- 21.9-Uniform Requirement
- 22.5-Swazey et al.(1993)
- 23.8-Uniform Requirement
- 24.4-Vasta
- *Indeed, the legal issues were resolved in the related case of patent authorship. Authorship on patents is a much more well defined and consistently carried out task than authorship on research papers. Typically a patent attorney meets with all parties, inquires as to how the invention was conceived, calls other parties to investigate the content of discussions, brain storming sessions, etc., and thereafter the attorney writes down the authorship list. The attorney functions as an objective third party who ensures that the legal criteria for authorship are met.

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Notes

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Rights

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