

Responsible authorship of papers in PNAS

The National Academy of Sciences has long been a leader in promoting responsible authorship of scientific papers. For example, the 1995 National Research Council report "On Being a Scientist: Responsible Conduct in Research" (1) outlined guidelines for allocation of credit for discovery. In recent years, the allocation of credit among authors has grown more complex. In 1975, the average number of authors for a PNAS paper was three. Now the average is seven, and some papers have more than 15 authors or no named authors at all, just a consortium representing a group of researchers. When the contribution of each author is unclear, the authors' sense of responsibility for the work can diminish. The PNAS Editorial Board has decided to make explicit the practices the journal has followed to ensure authorship transparency and to introduce new practices that further the mission of the Academy.

We start by including in our Information for Authors a statement of principles about responsible authorship. The statement is based on the one used by the American Physical Society:

All collaborators share some degree of responsibility for any paper they coauthor. Some coauthors have responsibility for the entire paper as an accurate, verifiable report of the research. These include coauthors who are accountable for the integrity of the data reported in the paper, carry out the analysis, write the manuscript, present major findings at conferences, or provide scientific leadership to junior colleagues. Coauthors who make specific, limited, contributions to a paper are responsible for their contributions, but they may have only limited responsibility for other results. While not all

coauthors may be familiar with all aspects of the research presented in their paper, all collaborators should have in place an appropriate process for reviewing the accuracy of the reported results.

The traditional rule has been that all authors accept responsibility for the whole paper. Each author could enjoy credit for publication but would suffer when results were shown to be false or fabricated. We suggest that science has become too specialized, too collaborative, and too multidisciplinary for that rule to be applied uniformly. For example, one cannot realistically expect the project statistician to know whether polymerase chain reactions were done with the proper controls. We believe that the principles stated above combine the best of the traditional view with the realities of modern science.

We also recognize that papers may result from specialized contributions from individual authors. Accordingly, we now strongly encourage authors to indicate their specific contributions to published work. This information will be posted online as a footnote to the paper, but to save journal space, it will not appear in print. Examples of designations an author could note include the following:

- Designed research;
- Performed research;
- Contributed new reagents or analytic tools;
- Analyzed data; or
- Wrote the paper.

An author may list more than one contribution, and more than one author may have contributed to the same aspect of the work.

Our goal is both to inform readers and to eliminate gift authorship. We hope that someone who made a minimal

contribution to a paper would, upon reflection and review of our new policy, conclude that coauthorship is inappropriate. Gathering funds for the project, paying salaries, providing a conducive environment, being the spokesperson, or providing published reagents or procedures (2) are not activities that warrant authorship without a significant contribution to the scientific content of the paper. Proper acknowledgment is the requirement in these cases. When a consortium or group is listed in the author byline, there must be a footnote listing the names and affiliations of the group members that contributed substantially to the research. We strongly encourage consortium members to indicate their specific contributions to the work in the online footnote, as we do for nongroup authors.

We have codified a change in our interpretation of "corresponding author." This term means literally the person who handles correspondence regarding a paper, but by implication and practice, it also identifies a guarantor of the published work. We now state explicitly that the corresponding author must be a guarantor of a significant part or all of the work. A coauthor can also be a guarantor as indicated in the opening statement of principles.

We hope that the statement of authorship principles, the listing of author contributions, the annotation of consortium members, and the codification of the role of the corresponding author as the work's guarantor all add clarity to the definition and practice of authorship in scientific publishing.

We recognize that there are different points of view on this topic, particularly between disciplines. We welcome your comments and criticisms.

Nicholas R. Cozzarelli, *Editor-in-Chief*

1. Committee on Science, Engineering, and Public Policy (1995) *On Being a Scientist: Responsible*

Conduct in Research (Natl. Acad. Press, Washington, DC), 2nd Ed., <http://books.nap.edu/html/obas>.

2. Cozzarelli, N. R. (2004) *Proc. Natl. Acad. Sci. USA* **101**, 3721–3722.