Current Comments

More on the Ethics of Scientific Publication: Abuses of Authorship Attribution and Citation Amnesia Undermine the Reward System of Science

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In May of this year, the Council of Biology Editors (CBE) held its annual meeting in Louisville, Kentucky. The meeting included a panel discussion on the ethics of scientific publication. I was delighted to be one of three panelists because this is a topic which I have addressed in *Current Contents*® (*CC*®) many times. It's encouraging to know that my concerns are shared by many in the scientific community.

Also serving on the panel was Arthur Mlodozeniec, executive director of research at INTERx Research, Merck and Company, Lawrence, Kansas. He discussed ethical issues of particular concern to drug companies. For example, should pharmaceutical scientists publish results of clinical trials so early that they jeopardize proprietary rights in patent applications? The other panelist was William Raub, associate director, National Institutes of Health (NIH), Bethesda, Maryland. He discussed the problems of premature release of information from studies funded by NIH, biased selection of results for publication, and outright falsification of data. The panel was chaired by George Adelman, editor of MIT's *Neuroscience Research Program Bulletin*. A full summary of the panel discussion will appear in the fall issue of *CBE Views*.

My own presentation focused on two problems that I have specifically addressed before: the ethics of scientific authorship and bibliographic "plagiarism" through the failure to cite appropriate sources. In these two areas, convention is often ignored with the best of intentions. For example, who would criticize an eminent researcher of established reputation for allowing a junior collaborator to be listed as first author on a paper? Similarly, bibliographic plagiarism is sometimes committed in innocence, the result of "citation amnesia."

But the sad fact is that many institutional directors and department heads routinely list themselves as authors on papers originating from their laboratories, even though they have not done any of the actual research. And I know that many *CC* readers have been subjected to the painful experience of having their work blatantly exploited by authors without explicit citation.[1] These and other practices undermine the reward system of science.

My presentation before the CBE is reprinted here in the hope that it will impress upon readers the seriousness of these issues. Several solutions to various ethical problems are presented. I invite *CC* readers to comment upon them, or to suggest solutions of their own.

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1. **Garfield E.** To cite or not to cite: a note of annoyance. *Essays of an information scientist.* Philadelphia: ISI Press, 1980. Vol. 3. p. 215-8. (Reprinted from: *Current Contents* (35):5-8, 29 August 1977.)

The Ethics of Scientific Publication: Authorship Attribution and Citation Amnesia*

Eugene Garfield

There are two topics I'd like to focus on today—the ethics of authorship in multiauthored papers and the problem of plagiarizing work by failing to cite proper sources. These problems may seem less pressing than the few cases of scientific fraud that have recently received wide publicity. But they are far more widespread, and certainly more irksome to the scientists affected. They present a major challenge to any ethical biomedical publisher or editor.

As many of you know, several of my *Current Comments*® essays have dealt with the ethics of scientific publication.[1-8] In addition, many of the most-cited author and article studies we've published at ISI® have provoked controversial questions about multiple authorship and citation practices. For example, a number of our readers have expressed skepticism about our data on most-cited authors. They find it hard to believe that so many authors are so prolific. Well, a good deal of this skepticism stems from the varied and inconsistent methods used in awarding authorship in team research. Also, most scientists do not seem to be aware of Lotka's law.[9] From this they would know that for any population of authors, a small but significant group will always be prolific. So if we single out 1,000 of the 1,000,000 or more authors who have published during the past two decades, it is not surprising to find several hundred who regularly publish ten to 30 papers per year.

The trend toward team research has been increasing for many years. In 1963, Derek J. de Solla Price, Yale University, discussed the dramatic increase in multiple authorship in his work, *Little Science, Big Science*. Even then, he noted that the number of papers with three authors was increasing faster than those with two. And the number of papers with four authors was increasing even more quickly than those with three.[10]

This increase in team research and multiauthored papers has caused a number of problems for researchers, as well as editors and bibliographers. Frequently, authorship is awarded in an arbitrary manner, with political factors playing a more important role than actual contributions.

Several factors have contributed to this dilemma. For example, Patricia Woolf, Princeton University, recently observed that current funding patterns for scientific research have reinforced situations where an accomplished scientist presides over the research activities of a large number of postdoctoral fellows and graduate students. In these cases, the senior scientist may delegate most of the actual research and writing to his postdocs, graduate students, or junior faculty members, but receive first authorship on papers.[11]

This is a fairly common practice. Although it may put us in a somewhat uncomfortable position, I believe journal editors have a right and even a duty to question the presence of a senior scientist's name, and certainly an administrator's name, on a paper. If an administrator or a senior scientist doesn't participate in a project, he or she shouldn't be awarded authorship.

But what about the support people, such as lab technicians, who provide backup help on a project? Do their contributions warrant authorship? Do you assign credit to a colleague who may have been called in for professional advice? What about librarians or others who collect data? And how should illustrators, data analysts, typists, and clerical assistants be listed?

These people, like administrators, deserve *recognition*, but not necessarily *authorship*. Instead, they should be mentioned in footnotes or in an acknowledgment section. Individuals who perform such tasks as typing the report, computer programming for data analysis, gathering data, and other clerical activities can thus be credited in a fitting way.[12,13]

Indeed, a future scientific paper may need a list of credits not unlike those for Hollywood films. I was amazed and pleased the other night to see that even musicians are now being credited in films. I'm always curious to know who the soloists are. Some of the best saxophone music today is found in the musical themes of films.

Many studies done on authorship attribution reveal that the scientific researchers themselves are in favor of guidelines for awarding authorship. For example, one study found many scientists believe that prior to beginning any research project, all participants should be appraised of how they will be

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awarded credit for their contributions. This simple courtesy could help avert many problems.[12,13] Footnotes somewhere in the paper, explaining each author's contribution, could prevent any ambiguity.

But deciding who is awarded authorship is only one of many problems encountered with multiauthored papers. Once it's decided who the authors will be, they must determine the order in which their names will be arranged. We all know that primary authorship is highly valued. Yet, the ways in which names are ordered on multiauthored papers are so varied that you can no longer tell who made the primary contribution to a paper.

For example, during our recent study of the 1,000 most-cited authors of journal articles from 1965 to 1978, we found that most eminent scientists received nearly twice as many citations as secondary authors than as primary ones. They also published more cited papers as secondary authors than as primary ones.[8] What do these findings mean? Undoubtedly, eminent scientists have been systematically ceding primary authorship to their junior collaborators in most instances. This practice, termed *noblesse oblige* by Harriet Zuckerman, Columbia University, is common in many fields of scientific publication.[14] She has found that established scientists, especially Nobel prizewinners, frequently cede primary authorship to junior collaborators whose careers are less secure.

For this and other reasons, ISI's studies of most-cited authors no longer rely solely on first-author data. We now treat all authors of a paper as though they were listed first.[7] We are dealing here with some very complex statistical problems. Our studies of eminent scientists are often confused with other controversial uses of citation data—such as decisions on tenure. But this is not the place to discuss those problems.

There have been many proposals on how to award citation credit on multiauthored papers. Price would assign credit *proportionally*. Thus, if a paper were written by two authors, each would get half credit. Three authors each would get a third, and so on.[15]

T.C. Hsu, Texas Medical Center, Houston, suggests a "golf tournament method." That is, the first author would get full credit, the second would get half, etc. Hsu also believes credit should be limited to the first four authors.[16] However, this would be a hardship for high-energy physicists. Their papers often include 30 or 40 authors!

Fred Rapp, Hershey Medical Center, Pennsylvania State University, believes the golf tournament method would not work. He claims that in his own field of virology, the convention for ordering names is as follows: students and postdoctorates first, senior scientists last, and everyone else—technicians, support staff, drug and tissue suppliers—in between.[17]

Rapp aptly noted: "You can pick up any journal in the clinical sciences, at least in virology, look at the names of the most-cited authors, and you'll find that most will be listed *last* on the papers. If the key person isn't first, he or she is going to be last, but not in between."[17] Clearly, *noblesse oblige* is the rule, not the exception, for determining how names will be ordered on multiauthored papers in many scientific disciplines.

But scientists aren't the only ones responsible for confusing name ordering practices. Some journals discourage logical name ordering by placing authors' names in alphabetical order—no matter how the authors would have arranged them.[18] One study provided evidence that this policy can significantly influence the content of a journal. The study found that researchers whose surnames began with the letters P-Z avoided publication in the journal studied to a statistically significant degree.[19] So by alphabetizing names, you may well be discouraging certain authors from publishing in your journal.

Incidentally, even if the scientists and journal editors could reach universal agreement on the order of authors' names, there is evidence that the best-known author will be remembered—no matter what. This phenomenon, which Robert Merton names the "Matthew Effect,"[20] is especially common when a Nobel laureate is one of the multiple authors. Indirectly, this may serve the purpose of the junior author because others will remember and cite the paper done by someone in "Jones's group."

Merton coined the term "Matthew Effect" from a verse found in the Gospel according to St. Matthew. The verse goes: "For unto everyone that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath."[20] In other words, people will often remember, and associate a paper with, whoever's name is best known.

As editors, you do have the authority to establish guidelines for authorship. Of course, we know that no matter how fair and comprehensive guidelines are, they will not completely halt abuses in authorship attribution. But they might deter some scientists and administrators from allowing their names to

be used on papers to which they did not contribute. Simple guidelines might also give graduate students, postdocs, and junior collaborators who made significant contributions an opportunity to receive the credit they deserve. As New Jersey surgeon, Herbert Dardik, points out: "Authorship is akin to success and achievement, and cannot and should not deteriorate into a bargaining tool or commodity."[21]

Using authorship as a mere commodity robs people of the recognition they deserve. Similarly, failure to cite one's sources—which I consider a form of plagiarism—also robs the individual author of the credit he or she deserves for having made an original contribution to science.

The importance of citing sources in scientific publications should not be taken lightly. After all, citations are the reward system of scientific publication. To cite someone is to acknowledge that person's impact on subsequent work. Citations are the currency by which we repay the intellectual debt we owe our predecessors. Furthermore, failing to cite sources deprives other researchers of the information contained in those sources, and may lead to duplication of effort. A dramatic illustration of this type of citation deprivation is the common practice in Eastern Europe of deleting references to the works of scientists no longer considered politically acceptable.

Only by publishing his or her work can a scientist establish ownership of, or priority for, that work. Once published, the researcher's claim to ownership is strengthened when the work is cited. In other words, a scientist must first give away his property, and then hope that his colleagues will be honest in acknowledging their use of it. Such repayment for ideas is obligatory for scientists.[22]

Unfortunately, this repayment system in scientific publishing is like the loan system in business. Scientists, like debtors, may default on their loans for reasons beyond their control. For example, a researcher may refer to an idea or concept he's seen or heard about somewhere without crediting the original source. This type of unintentional, unconscious borrowing is annoying, but it is common in the scientific profession. But banks, like Arnold Relman, have good memories. So there may be hidden penalties for failure to disclose information properly.

I call this unconscious type of plagiarism "citation amnesia."[2] It is understandable and, to a degree, forgivable. A far more serious practice is the intentional appropriation of someone else's ideas into one's own work without acknowledging the contribution. This is outright bibliographic plagiarism. An author who is guilty of this practice deserves punishment. Like the businessperson who intentionally refuses to repay a debt, such scientists are guilty of out-and-out stealing.

If a "citation court of appeals" were ever established, the more serious charge of "grand larceny" plagiarism would be brought against people who intentionally copy entire texts. Unquestionably, this type of large-scale theft is easier to detect, and thus easier to prove, since the original texts provide indisputable evidence.[2]

But "petty larceny" plagiarism—citation amnesia—is the more common, and more subtle, variety. It involves the use of ideas without explicitly citing the source.[2] If there were such a citation court of appeals, such cases might seem as common as traffic "citations." Ironically, the author who fails to cite a pertinent source may cause his or her own work to be missed in a search of the *Science Citation Index®*. That's a well-deserved and self-imposed penalty.

A scientist may fail to cite the proper source for many reasons. He may mistake someone else's idea for an original of his own. In fact, scientists are often forgetful about their own ideas! For example, Otto Loewi, a Nobel physiologist, excitedly proved the chemical transmission of nervous impulses without realizing he'd written on the subject 18 years before.[23]

Another type of petty larceny plagiarism occurs when scientists mistakenly attribute an idea to the person who first made them aware of it. This person could have been a teacher or colleague who meant to present the idea only as a reformulation of another author's idea. This syndrome is called "palimpsestic," from the term for a manuscript that has been erased and written over. This syndrome occurs because successive repetition of ideas tends to erase all but the most recent version of the idea.[24] The result is still plagiarism.

The "palimpsestic syndrome" is quite similar to what Merton terms the "obliteration phenomenon." This takes place when a scientist's work becomes so generic to the field, so integrated into its body of knowledge, that people no longer need to cite it explicitly.[24] Take Einstein's theory of relativity. Every paper on atomic physics needn't cite his 1905 paper on this theory. And every mathematics paper doesn't have to cite Archimedes.[6]

On the other hand, too little attention to citations could be dangerous. The search for truth requires that assertions be checked, and that results be replicated. Citations provide important background on papers. And failure to acknowledge one's sources distorts our understanding of who was responsible for particular advances and innovations. By overlooking or refusing to cite relevant material, authors are depriving other researchers of the information and knowledge contained in those sources. This leads to duplication of research, and cheats people out of the recognition they deserve.[2]

For any scientific paper, there are certain earlier works that *must* be cited. These are papers that any honest scholar would be ashamed to omit from his bibliography—and that any careful referee would insist on.[6] After all, the refereeing process is supposed to discourage the unfair appropriation of ideas in the scientific press. By the way, the possibilities for citation amnesia in contract research reports are legion.[25] Clearly, refereeing of reports, too, is badly needed. Among their other critical functions, including verification of authorship claims, referees and editors are supposed to insure that relevant sources are cited in a paper submitted for publication. In spite of this moral imperative, it is remarkable, if not at times discouraging, how often errors of omission occur.[2]

One solution to the problem of bibliographic plagiarism is to require authors to do comprehensive literature searches. Journal editors and referees, as well as authors, must raise their citation standards to insure that *all* pertinent sources are referenced. Only by doing so can they guarantee their readers thorough access to useful information. I'm not encouraging unnecessarily inflated bibliographies, or the inclusion of spurious references. Instead, I'm advocating the preparation of bibliographies that are as informative and succinct as the articles to which they are attached.[2]

Plagiarism, in its many forms, will never be completely eliminated. But the more obvious problems can be avoided. Editors and referees can make contributing scientists aware of the need for complete literature searches and bibliographies. By doing so, members of the publishing community will be encouraging authors to respect history and, perhaps, to take special pleasure in rediscovering and acknowledging some predecessor's ideas.[2]

Everyone needs to be rewarded for his or her particular contributions. In the arena of scientific publishing, peer recognition in the form of citation is a major factor in the reward system. Likewise, primary authorship on a paper should be the reward for making the primary contribution to the study reported. Until it signifies this, many scientists will not be appropriately repaid for their work. And their altruism may distort established mechanisms for peer evaluation.

I will now make a concrete proposal. I wonder how many of you will have the courage to implement it. In the US patent system, an inventor must sign an affidavit that to the best of his knowledge the claimed invention is original and his or her own. You are entitled to a patent even if someone else is willing to pay you for your invention. That is why we have a procedure for assigning property rights in patents. Every author should also be asked to affirm that he or she is indeed an author as defined in the instructions to the authors. This means that you, as editor, must define your criteria for authorship.

I believe that the Council of Biology Editors, in consultation with professional societies, can devise an international standard which will protect the rights of all concerned. These guidelines will protect many young scientists in the near future who will be subjected to many pressures because of the important relationship between patent rights and publications considered to be in the public domain.

In closing, I would like to discuss a subject I am often asked about—the practice of self-citation. Auto-citation is not a simple subject. In this lecture, I have cited ten of my own works. The reason for that, as in all *Current Contents*® (*CC*®) essays, is that I want to make it easy for you to locate the original sources of my ideas. If I were writing for one of your journals I might be able to consolidate some of these references by simply referring to one of my books.

However, like other prolific authors, I have written many papers in collaboration with others at ISI and elsewhere. Shall I fail to cite these papers in an effort to reduce self-citations? How can an author like Carl Djerassi, with over 1,000 papers to his credit, avoid self-citation? As I will state in a future *CC* essay, I am absolutely certain he has contributed significantly to each of these papers. But as he became world famous he, too, followed the practice of *noblesse oblige*.

Djerassi also illustrates an interesting point about most prolific authors. Eventually they write either review papers or summary papers that they themselves or others choose to cite.

It is because of this practice that our early first-author studies identified so many eminent scientists. Unfortunately, those studies did an injustice not only to some scientists who practiced *noblesse oblige*, but especially to certain authors who were victimized by the alphabet.

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