Farewell authors, hello contributors

More disciplines must embrace a system of academic credit that rewards a greater range of roles more specifically, says **Alex Holcombe**.

We graduate students flocked to our department's 'sherry hour' — it meant free drinks. As I fished around in the beer bucket, a friendly professor struck up a conversation. He needed a programmer, and my skills fit the bill. He offered to pay. I could have used the money, but knew that dollars wouldn't get me a professorship. For that, what I needed was authorship.

But the professor told me that "just programming" did not merit authorship. According to the journals in our field, becoming an author required participation in the conception or design of the experiment, the data analysis and interpretation, and the writing. These roles were already spoken for. So, the next day, I was back in my adviser's lab, conducting experiments and writing them up — doing what I had to do to get my name on papers. Twenty years on, to my chagrin, I resemble that professor from sherry hour. I'm too busy to do everything myself, so I'm looking for someone who can program.

The shortage of researchers with specialized skills, such as programming, should ease if more journal publishers adopt a better way to document who does what in research: a function provided by the machine-readable classification system CRediT (the Contributor Roles Taxonomy; https://www.casrai.org/credit.html). Launched in 2014, CRediT allows contributors to report the specific tasks (such as data collection or statistics) they performed in a paper's production. We need to make this routine across most of the sciences.

Hundreds of journals are listed as following the recommendations of the International Committee of Medical Journal Editors, which state that, to qualify for authorship, a researcher must have been involved in "drafting the work or revising it critically for important intellectual content". This means that specialists such as programmers or statisticians must rely on lead authors to take the initiative to include them in the writing or revising of the paper. They sometimes get left off. Consequently, concentrating on programming, or any other skill, can be bad for one's career.

By discouraging specialization, current authorship conventions weaken the scientific enterprise. As the philosopher Immanuel Kant pointed out more than 200 years ago, "All crafts, trades and arts have profited from the division of labour … where everyone is a jack-of-all-trades, the crafts remain at an utterly primitive level." Duly recognizing individual roles is also simply the right thing to do. Science is a team sport, and we need to credit those who are bringing us its advances.

Ten years ago, *Nature* started requiring that authors describe their contributions (see *Nature* **458**, 1078; 2009). But the wording used to describe different sorts of contribution was not standardized, and free text does not lend itself to the sort of compact metrics that hiring committees, funders and other bean-counting bodies demand.

CRediT was created to allow quantification. Currently, it recognizes 14 types of contribution, including conceptualization, methodology, software, project administration and data curation. More than two dozen journal publishers — including Cell Press, Public Library of Science and Oxford University Press — are already using CRediT for at least some titles.

I had nothing to do with CRediT's development, but I like the fact that it encourages appropriate recognition of data analysts, statisticians and other specialists. It also mitigates over-acknowledgement of those who are sometimes derided as 'honorary' authors, often senior team leaders who have done little of the work. Under the CRediT system, their actual contributions can be described as they often really are, thanks to its 'funding acquisition' and 'supervision' designations.

CRediT also addresses an issue holding back large-scale collaboration in my field. Five years ago, as concerns about reproducibility in psychology grew, I helpd to establish a type of journal article called Registered Replication Reports (RRRs; D. J. Simons *et al. Perspect. Psychol. Sci.* **9**, 552–555; 2014), in which scientists submit plans to carry out a replication of important studies, which journal editors help coordinate. These RRRs typically involve dozens of scientists, and some come on board after the experimental protocol and data-analysis plans have been fully established. We need these people, but they are not conventional authors. CRediT's 'investigation' contribution type, which includes data collection, resolves this issue.

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Human behaviour is strongly influenced by incentives, and in academia incentives tend to revolve around the evaluation of the papers we author. A leading campaign to shift incentives, the Declaration on Research Assessment, is supported by more than 1,400 organizations and some 14,000 individuals, and would move us from tallying publications in 'high-impact' journals to using a broader set of measurements for the quality and influence of a journal publication. The adoption of CRediT enables richer, more differentiated measurement of a researcher's achievements. And journals can move towards CRediT in small steps, by relaxing authorship requirements and by making the CRediT taxonomy available as an option.

Will making less-acknowledged roles more visible really change things? It will. Research institutes recruiting for positions such as programmers, statisticians and project managers will have better information for hiring. Applicants for grants will find it easier to show funders that they have the right skills. The allocation of scientific resources will shift to more effective combinations of researchers.

A lot of good can come of making it easier to show who did what. ∎

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