

# THE PRAXIS OF ACKNOWLEDGEMENT: FROM BIBLIOMETRICS TO INFLUMETRICS

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**Abstract:** The practice of acknowledgement in scholarly communication is widespread and growing. Acknowledgements define a variety of cognitive and social relationships between researchers within and across disciplines, and could thus be used to map networks of influence. We explore the relationship between authorship, acknowledgement and citation—the «Reward Triangle»—in the context of the academic audit process. We also consider the case for using acknowledgement data conjointly with established bibliometric indicators, such as citations, in performance assessment.

**Keywords:** Acknowledgements; citation analysis; research evaluation; scholarly communications; bibliometrics; influmetrics.

**Resumen:** El uso del agradecimiento está muy extendido en la comunicación académica y tiende a aumentar. El agradecimiento sirve para definir una serie de relaciones sociales y de conocimiento entre investigadores de una disciplina, así como vinculación con otras áreas del saber y, por eso, puede utilizarse para hacer un diseño de redes de influencia. En este artículo se explora la relación entre autores, agradecimientos y citas—el «triángulo del reconocimiento»—en el contexto de la evaluación académica. Los autores también consideran la posible utilización de datos procedentes del agradecimiento conjuntamente con otros indicadores bibliométricos, tales como las citas, en las evaluaciones.

**Palabras clave:** Agradecimientos; bibliometría; publicaciones científicas; producción científica; análisis de citas.

## Collaboration

Multi-authorship is a fact of life in scholarly communication. In «Big Science», the phenomenon has reached absurd proportions with sometimes hundreds of named co-authors appearing on the title page of a journal article. The collaboration trend is not restricted to co-authorship: the growth in sub-author collaboration is even more striking. In sociology, for instance, the number of assistants per article has been growing faster than the number of co-authors (1). Our own studies confirm the scale of sub-author collaboration: in the social sciences and humanities, the percentage of articles containing one or more acknowledgement ranges from a low of 22% in philosophy to a high of 86% in both psychology and sociology (2, 3, 4).

Acknowledgements provide a revealing window onto trends in collaboration beyond co-authorship. In the literature of genetics, as in most scientific fields, almost every research article carries an acknowledgement of one kind or another (5). Some

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are brief; the majority, such as those in the journal *Cell*, for example, are lengthy and multiplex expressions of gratitude (6, p. 286) recording anything from gifts of plasmids to access to proprietary data sets. The scale of this trade demonstrates powerfully the degree of instrumental inter-dependence among competing scientists (7) and the extent to which public recognition for such gifts has become institutionalized in the form of an acknowledgement statement.

The proliferation of acknowledgements is causing headaches for editors of scientific journals: «Traditionally, authors use acknowledgements to identify those who made special intellectual or technical contributions to a study that are not sufficient to qualify them for authorship. In reports of multicenter clinical trials, however, acknowledgements are often made to everyone who had anything to do with the study, including those who were merely carrying out their jobs, such as technicians» (8). These comments imply two things: firstly, some individuals make contributions, which though not deserving of co-author listing, warrant explicit acknowledgement somewhere in the text. A tacit knowledge on the author's part of what justifies one modality rather than the other is assumed. Secondly, the practice is being progressively degraded, as trivial contributions are being acknowledged. Kassirer and Angell's comments call to mind earlier debate within the bibliometrics literature as to what constitutes a serious as opposed to a perfunctory or redundant citation (9).

### **The Reward Triangle**

If Kassirer and Angell are correct in assuming that many acknowledgements reflect «special intellectual or technical contributions» why are these records of influence largely ignored by the scientific and scholarly communities? In assessing scholarly performance, two principal measures are used: productivity and impact. The former is traditionally equated with publication counts; the latter with citation counts. The limitations of both measures are widely recognized (10, 11), but they continue to be used. To set the reward register ringing, all a scholar has to do is feature as an author or co-author and/or have his work cited by another. Whether that scholar is the least significant author on a multi-author article, or whether his work has been negatively cited, does not really matter. Within the prevailing reward system of science, a measure of kudos will be conferred, however insignificant the actual contribution. And yet, if the same individual is fulsomely acknowledged for his contributions by an author, the reward register remains silent. The most trivial citation counts for more than the most sincere acknowledgement. Such a practice is logically inconsistent (12). If authorship and citedness are to be counted, so should acknowledgements. By admitting acknowledgements, the Reward Triangle is closed.

The similarities between citations and acknowledgements have been noted by Edge (13) who reconceptualized acknowledgements as «super-citations». Paradoxically, «super-citations» have yet to be used in network analyses of scholarly communication or in academic evaluation exercises alongside «regular citations». Why this anomaly? It is not enough to argue that because some acknowledgements may be trivial, or because, unlike citations, they lack commodity status, that they

should be excluded from consideration. The limitations and inconsistencies of citation analysis have not prevented that approach from achieving a broad measure of acceptance among scholars and researchers, and there is no convincing reason why a different set of standards should be applied to acknowledgement. Indeed, if fear of trivialization is the principal concern, then there are a number of practical quality assurance measures which can be implemented.

### Quality control

The International Committee of Medical Journal Editors (14) has agreed a set of procedures to be followed by authors. The «Uniform Requirements for Manuscripts Submitted to Biomedical Journals» includes a section devoted to acknowledgements, which recognizes that there may be «contributions that need acknowledging but do not justify authorship». More specifically, it states that authors «are responsible for obtaining written permission from persons acknowledged by name because readers may infer their endorsement of the data and conclusions». The document also recommends that «technical help should be acknowledged in a paragraph separate from those acknowledging other contributions». In 1991, *The New England Journal of Medicine* (15) announced that it would «leave to the authors the choice of those acknowledged, but limit the space devoted to acknowledgements... If acknowledgements fill more than a column of *Journal* space... we shall deposit them with the National Auxiliary Publications Service. At the authors' request we shall consider publishing fuller acknowledgements... in reprints of the paper».

Neither set of recommendations suggests that journal editors consider acknowledgements as textual trivia. Quite the reverse: the evident concern is to put in place guidelines which will ensure that authors appropriately, parsimoniously and correctly acknowledge the contributions of their peers: «it is not in our readers' interests to permit unlimited lists of authors and acknowledgements, and it undermines the meaning of authorship and the *value of an acknowledgement*» (italics added). If the «invigilators» (16, p. 67) of the primary communication process agree that acknowledgements have value, then there is a plausible case for incorporating these data into the academic audit process.

### Acknowledgement and citation

The evidence from some of the quantitative studies cited earlier demonstrates not only the extent to which, but also the consistency with which scholars acknowledge their peers. In fact, format and literary style vary only minimally across the journal literatures of different fields (17). But our understanding of the social significance of acknowledgement is incomplete, and future research needs to address the following issues in greater detail: i) scholars' expectations about what acknowledgements can and do tell us; ii) the etiquette associated with the giving and receiving of acknowledgements; iii) ethical issues relating to failure to acknowledge; iv) the degree of equivalence between a particular form of acknowledgement

and the class of behavior which is being acknowledged; v) issues of equity in terms of how rewards are distributed, e.g. co-authorship versus acknowledgement; vi) the encodability or indexicality of acknowledgements, and the potential for an online acknowledgement index; and vii) the feasibility and desirability of factoring acknowledgements into the evaluation of academic performance.

Acknowledgement is a voluntary act. Like citation, it is governed by an implicit code of professional conduct (18). Many authors choose to acknowledge in formal manner the contributions they have received from colleagues and others. Since acknowledgement is a voluntary practice, and since the practice is endemic, why should we not accept that it has real social, cognitive and instrumental significance? The fact that an individual's actual reason for granting an acknowledgement must necessarily remain the stuff of speculation does not mean that the process should be discounted, any more than citation analysis should be disparaged because individual citer motivations cannot be laid bare (19).

Citation and acknowledgement are both well-established facets of the scholar's rhetorical repertoire. Both practices exhibit a high degree of cultural consensus. Both describe webs of interaction and influence: both declare a relationship. In the analysis of scientific discourse, both deserve serious scrutiny.

### **Acknowledgements online**

There are other similarities between acknowledgements and citations. Frequency distributions of both reveal a considerable degree of concentration: a small number of scholars are highly cited and an even smaller number are highly acknowledged (20). With the development of ISI's (Institute for Scientific Information) machine readable Citation Indexes in the 1960s, citation analysis became a popular tool for measuring research productivity and impact at the individual, group, institutional and national levels. However, no comparable tool exists for acknowledgements.

Given the functional and symbolic similarities between citations and acknowledgements, there is a logically appealing case for developing a sister product—an online acknowledgement index. In the light of current developments in digital scanning technology, there is no major technical barrier to capturing and processing the full text of acknowledgements. In an automated environment, the increase in production costs should be marginal. The unknown element in the equation is the market: would an acknowledgement index be greeted with a barrage of skepticism by members of the scientific and academic establishment just as ISI's Citation Indexes were in the 1960s and 1970s? (21).

We have previously outlined three approaches to acknowledgement indexing (22). In the compliance model, journal editors, in their role as invigilators, require that submitting authors conform to a set of uniform and detailed acknowledgements standards, just as they do when attaching bibliographic references to their text. As we have already seen in the case of *The New England Journal of Medicine*, there are intimations of such a trend. The attraction of this approach is that the database producer (ISI, or whoever) would work from a tightly pre-structured meta-textual element which would be machine processed no differently from, say,



the list of references at the end of the paper or the title sequence and abstract at the top. The downside is that this kind of approach increases the burden on authors and editors.

An alternative is the free-trade model in which the database producer treats the acknowledgement statement as a searchable textual element (e.g. like an author's address/institutional affiliation) which has a number of pre-ordained categories (e.g. technical assistance; peer interactive communication; financial support). Users of the system would be able to search on specific categories of acknowledgement. Authors would be free to use or not the suggested categories. Those who chose to opt out would have to accept that their acknowledgements would not be processed by the database producer.

In the no-frills version, we propose that the entire acknowledgement statement be treated as a separate, searchable field. Free text searches could be run using the an individual's name (AU = FABA in a cited author search would become ACK = FABA where Faba is the individual acknowledged). Searches could also be expressed in terms of the funding agency which is acknowledged (e.g. National Science Foundation), or, for example, the nature of the assistance received (e.g. technical help).

## Summary

The development of an online acknowledgement index is technically feasible. It would seem a logical extension of ISI's current portfolio of citation-based products; one likely to generate a high level of product synergy. With rapid advances in digital imaging technology, the associated development and operating costs would be relatively low. The short to medium-term commercial viability of such a product would, however, hinge upon the producer's ability to stimulate awareness and build market demand.

The ability to process acknowledgement data online would add an extra dimension to bibliometrically-grounded research assessment exercises. By admitting acknowledgements to the bibliometrician's tool-kit, we are in a position to close the Reward Triangle.

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## References

1. PATEL, N. Collaboration in the growth of American sociology. *Social Science Information*, 12, 1973, 77-92.
2. CRONIN, B. Let the credits roll: a preliminary examination of the role played by mentors and trusted assessors in disciplinary formation. *Journal of Documentation*, 47(3), 1991, 227-239.
3. CRONIN, B., MCKENZIE, G., and STIFFLER, M. Patterns of acknowledgement. *Journal of Documentation*, 48(2), 1992, 107-122, 1991.

4. CRONIN, B., MCKENZIE, G., and RUBIO, L. The norms of acknowledgement in four humanities and social sciences disciplines. *Journal of Documentation*, 49(1), 1993, 29-43.
5. MCCAIN, K. W. Communication, competition and secrecy: the publication and dissemination of research-related information in genetics. *Science, Technology & Human Values*, 16, 1991, 491-516.
6. CRONIN, B., and WEAVER-WOZNIAK, S. An online acknowledgement index: rationale and feasibility. In RAITT, D. I. (ed.): *Online Information 92: Proceedings of the 16th International Online Information Meeting*, London, 8-10 December 1992, Learned Information: Oxford, 1992, 281-290.
7. CRONIN, B. *et al.*, 1993, *op. cit.*
8. KASSIRER, J. P., and ANGELL, M. On authorship and acknowledgements. *New England Journal of Medicine*, 352(21), 1991, 1510-1512.
9. MORAVCSIK, M. J., and MURUGESAN, P. Some results on the function and quality of citations. *Social Studies of Science*, 5, 1975, 86-92.
10. ANDERSON, M. *Imposters in the temple*, New York: Simon & Schuster, 1992, p. 104.
11. MACROBERTS, M. H., and MACROBERTS, B. R. Problems of citation analysis: a critical review. *Journal of American Society for Information Science*, 40, 1989, 342-349.
12. MACKINTOSH, K. H. *Acknowledgement patterns in sociology*, University of Oregon, Unpublished Ph. D. dissertation, 1972.
13. EDGE, D. Quantitative measures of communication in science. *History of Science*, 19, 1979, 102-134.
14. International Committee of Medical Journal Editors. Uniform requirements for manuscripts submitted to biomedical journals. *Annals of Internal Medicine*, 108, 1988, 258-265.
15. KASSIER, J. P., and ANGELL, M., 1991, *op. cit.*
16. CRONIN, B. *The citation process: the role and significance of citations in scientific communication*, London: Taylor Graham, 1982.
17. CRONIN, B. *et al.*, 1993.
18. KAPLAN, N. The norms of citation behavior: prolegomena to the footnote. *American Documentation*, 16(83), 1965, 179-184.
19. WHITE, H. D. Author co-citation analysis: overview and defense. In BORGMAN, C. L. (ed.): *Scholarly communication and bibliometrics*, Newbury Park, CA: Sage, 1990, 84-106.
20. DAVIS, C. D., and CRONIN, B. Acknowledgements and intellectual indebtedness: a bibliometric conjecture. *Submitted for publication*.
21. See for example: GOUDSMIT, S. A. Letter to the editor. *Science*, 183(4120), 1974, 28.
22. CRONIN, B., and WEAVER-WOZNIAK, S., 1992, *op. cit.*