

Coauthorship in Radiology Journals

Felix S. Chew¹

Diagnostic radiology journals are publishing an increasing number of articles with many authors (Fig. 1). The number of authors per article is also increasing, and this increase in authors has been far more rapid than the increase in articles [1] (Fig. 2). As radiology journals do not limit the number of authors per article, the rapid increase in authors reflects the individual and aggregate behavior of their contributors. Also, since first authorship is limited by the number of articles, it is coauthorship that has increased most rapidly. (The "first author" of a paper is defined here as the author listed first, regardless of the total number of authors; a "coauthor" is any subsequently listed author.) Coauthorship complicates the proper crediting of work to researchers, creates problems in the indexing and retrieval of papers, and may affect the actual performance of research. Collaborative research and concomitant multiple authorship have some legitimacy and advantage both in allowing the rapid aggregation of data from separate sources and in bringing together researchers from different disciplines; some studies might not be feasible otherwise. However, such strategies appear to refocus research activities rather than increase them [1]. Instances of fraudulent coauthorship in the recent medical literature, including radiology, have been described [2, 3].

Pervasiveness of Coauthorship

The frequency of coauthorship in radiology journals was examined by searching MEDLARS (National Library of Medicine, Bethesda, MD) for the publications of an arbitrary sample of diagnostic radiology researchers. The sample, consisting

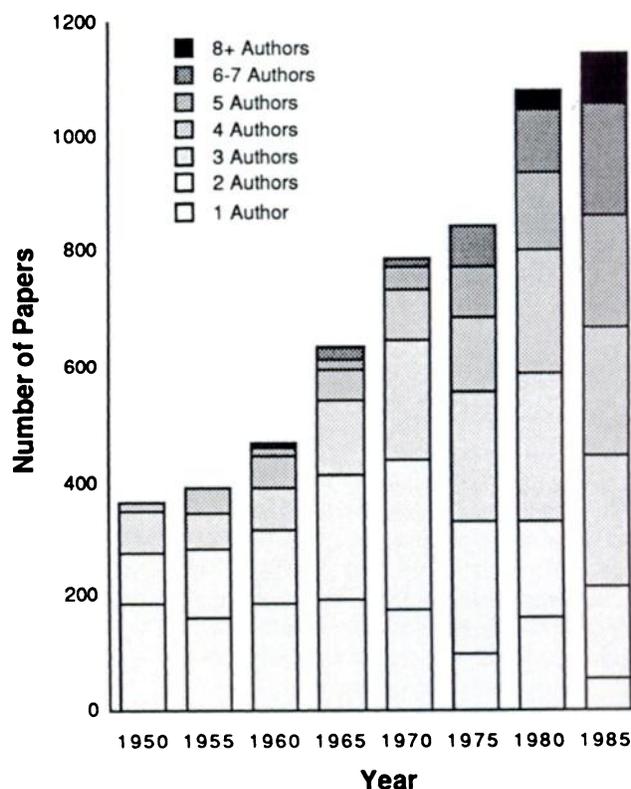


Fig. 1.—Stacked column graph shows the increasing numbers and proportions of multi-authored articles published in *AJR* and *Radiology* (combined data adapted from [1]).

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¹ Department of Radiology, State University of New York Health Science Center at Syracuse, 750 E. Adams St., Syracuse, NY 13210.

of 136 authors who published in the July 1982 issue of the *AJR*, was intended to be representative of the clinical diagnostic radiology research community. The MEDLARS search located the articles of all individuals in the sample that were published between 1980 and 1985 in diagnostic radiology journals.

The number of coauthorships accumulated by many was impressive, ranging from none to 82 in the 6-year period studied (median = 6, mean = 11.9) (Table 1). The total number of articles published ranged from 1 to 87 (median = 10, mean = 16.4). Such rapid and sustained rates of publication virtually ensure that the time spent on each publication by the most prolific coauthors is small. Preparation and revision of major manuscripts for publication in the sciences require an average of about 82 hr of time by the authors, excluding the actual research [4].

The researchers with the most coauthorships have articles with more coauthors. The 5% of researchers with the most coauthorships had an average of 6.2 authors per paper in 1985; 70% of their papers had five or more authors. These 5% also had a higher proportion of articles with more authors as well as more authors per article than the average for all articles published the same year in the *AJR* and *Radiology* [1]. In contrast to this, the 10% of the researchers with medial numbers of coauthorships had an average of 3.8 authors per article; only 29% of their articles had five or more authors.

Coauthorship is a simple means of inflating a bibliography without necessarily increasing productivity. This does not imply that coauthorship is necessarily inappropriate or without value; on the contrary, it is now the usual situation in scientific publication. For example, in 1985, 95% of the papers published by *Radiology* and the *AJR* had coauthors [1]. Nonetheless, to prevent abuses of the system, researchers should consider the level of participation that merits coauthorship. One view is that all authors, including coauthors, should have had sufficient involvement with the work and the article reporting it to be able to defend its method, results, and conclusions without reservation [5, 6]. To accept coauthorship under other circumstances seems at best foolish and at worst esurient and dishonest.

Although multiple authorship appears well entrenched in the radiologic literature, only a few highly prolific authors account for most of the coauthorships: 15% of researchers account for 53% of coauthorships. By their example, these few may set *de facto* standards and goals for the specialty. Prolificacy in publication is a common pathway to promotion and prominence in the profession.

Pressure to Publish

It is self-evident that there must be considerable incentive to publish and to publish frequently. Since most articles emanate from academic medical centers [1], the pressures to publish must originate there. It seems likely that quantitative expectations for research productivity in promotion and grant proceedings are to blame, at least in part, for the publish-or-perish syndrome [2-8]. A specific numeric criterion may appear explicitly on documents of appointment. For example, in

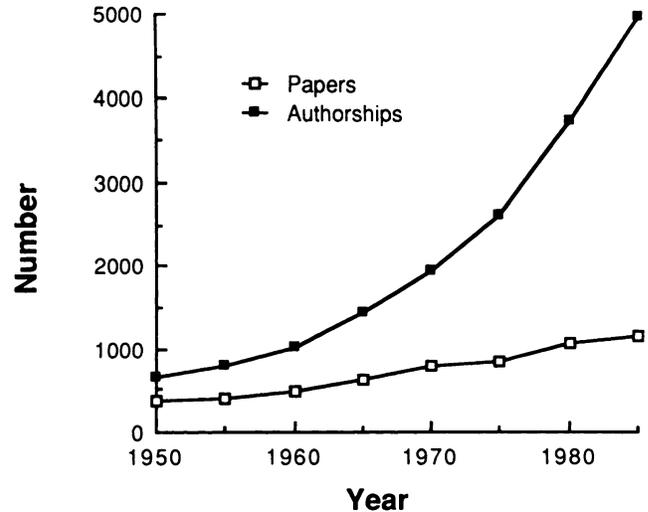


Fig. 2.—Line graph shows exponential increase in authorships with linear increase in published articles in *AJR* and *Radiology* (combined data adapted from [1]).

one university department, the goal for each faculty member was “to be involved in three publications annually in refereed journals,” two of which could be coauthored. Scientists, particularly medical scientists with public funding, have a positive obligation to publish their work. Some incentive is healthy, but even the most reasonable expectations may spawn excess.

The medical literature takes little notice of multiple authorship. Full lists of authors are isolated to title pages, and such lists are truncated in the tables of contents and bibliographies of journals and by indexing services, sometimes to a single author. The identities of coauthors are lost to all but those with the actual journal pages. If coauthorship becomes more difficult and less acceptable as a means of building a bibliography, a more insidious abuse becomes attractive: wasteful publication.

Wasteful Publication

Wasteful publication may take two forms [5]. “Divided publication” is the publication of a single piece of research in installments of “least publishable units” [7]. “Repetitive publication” multiplies the publications possible from essentially the same content and is accomplished by submission to multiple journals or by adding small successive bits of data and then republishing. In both abuses, results and conclusions are strewn across the literature separated by journal and time. This strategy is self-defeating in a situation in which everyone wants to publish, but only a few want to read [9]. In addition to the obvious problem a reader has in collecting all of these together, the resources of scientific publication are wasted [5]. Assuming that the research was worthwhile to begin with, only the last of any such string of articles (the one with *all* the information) would be necessary to a reader. Since only 9% of the papers published in radiology journals

TABLE 1: Distribution of the Number of Coauthorships Accumulated by 136 Diagnostic Radiology Researchers, 1980-1985

No. of Coauthorships	No. of Researchers	Cumulative %	
		Of Researchers	Of Coauthorships
0	4	2.9	0.0
1	32	26.5	2.0
2	14	36.8	3.7
3	3	39.0	4.2
4	7	44.1	6.0
5	7	49.3	8.1
6	6	53.7	10.3
7	1	54.4	10.8
8	9	61.0	15.2
9	2	62.5	16.3
10	2	64.0	17.5
11	1	64.7	18.2
12	4	67.6	21.2
13	4	70.6	24.4
14	2	72.1	26.1
15	2	73.5	27.9
16	3	75.7	30.9
17	5	79.4	36.1
20	2	80.9	38.6
21	1	81.6	39.9
22	1	82.4	41.2
23	1	83.1	42.6
24	1	83.8	44.1
26	2	85.3	47.3
27	1	86.0	49.0
28	2	87.5	52.4
29	1	88.2	54.2
30	3	90.4	59.8
32	1	91.2	61.7
33	1	91.9	63.8
37	2	93.4	68.3
40	1	94.1	70.8
44	1	94.9	73.5
48	1	95.6	76.4
51	1	96.3	79.6
58	1	97.1	83.1
60	1	97.8	86.8
63	1	98.5	90.7
69	1	99.3	95.0
82	1	100.0	100.0

Note.—A total of 1625 coauthorships were accumulated by 136 researchers.

account for 49% of all citations to radiology literature [10], there is a considerable level of noise for the amount of signal.

The net advantage of accumulating large numbers of coauthorships is unclear. By distinguishing coauthorships from first authorships for individuals in the sample of researchers studied, the percentage of all authorships that were coauthorships was found to range from 0 to 100% (median = 83%, mean = 76%) (Table 2). Fifty researchers (36.8%) had only coauthorships, and four (3%) had only first authorships (Fig. 3). The average ratio of coauthorships to first authorships was 2.7. Bibliographies bloated with coauthored items are cumbersome and may discourage detailed analysis of the articles, losing those of quality and significance amidst the distracters. In a very real and practical sense, coauthorships can be both irrelevant and detrimental.

TABLE 2: Distribution of the Proportion of Coauthorships Relative to All Authorships for 136 Diagnostic Radiology Researchers, 1980-1985

% of Coauthorships	No. of Researchers	Cumulative % of Researchers
100	50	36.8
≥90	13	46.3
≥80	14	56.6
≥70	13	66.2
≥60	13	75.7
≥50	10	83.1
≥40	6	87.5
≥30	9	94.1
≥20	3	96.3
≥10	1	97.1
≥0	4	100.0

Note.—Data for 136 researchers have been aggregated into intervals of 10%.

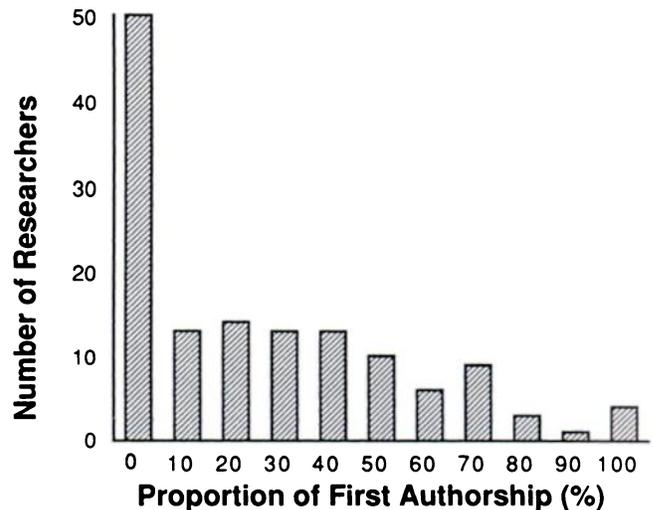


Fig. 3.—Histogram for 136 researchers of the percentage of first-authored articles relative to total papers published in diagnostic radiology journals over 6 years (1980-1985).

Remedies

Scientists are remembered for their best, most important works. A sensible approach to evaluating a researcher's work might rely on his defense of a few self-selected, first-authored papers [6, 8]. In view of the length of time required to initiate, complete, and publish research (as well as the time frame for promotions in most academic settings), a limit of three to five articles may be appropriate. According to Angell [8], this might (1) improve the quality of medical research by allowing more ambitious but time-consuming studies, (2) improve the accuracy and precision of the promotion and grant-funding processes by allowing fuller evaluation of the quality of a researcher's work, and (3) eliminate some of the "fluff" from the scientific literature [8]. Discounting bibliographies inflated with coauthorships is already universally practiced by appointment

and promotion committees (Berk RN, personal communication), but explicit notice of such action is often lacking.

Although journals may impose limitations on coauthorship, editors and reviewers may become more alert to attempts at divided or repetitive publication, and departments and academic institutions may create review mechanisms and establish more appropriate expectations, no system that preserves the academic freedom necessary to good scientific work can always stop a determined, unethical author [11]. The ultimate imperative for ethical behavior rests with the individual. To preserve academic freedom, the research community must be self-policing. The issue is not moot, for the future direction of radiology as a discipline depends on sound research and scholarship.

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