

## The fall of uncitedness

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### Background and research problem

It is a widely held belief, [HAMILTON 1990; 1991] that most scientific articles are never cited. Though several authors [PENDLEBURY 1991, ABT 1991, GARFIELD 1998] challenged this belief by showing that papers uncited after 5 years represented only 25% of the literature in the sciences, this *taken for granted* common lore comes back periodically in the literature [MEHO, 2008; MACDONALD and KAM, 2007; COLLINS, 2004, p.364]. Though several empirical study have been made on uncitedness rates [SCHWARTZ 1997, STERN 1990, VAN DALEN and HENKENS 2004] and its differences among natural and social sciences fields, no study has yet measured the changes in scientific articles' uncitedness rates over a long period of time and across fields. As suggested by PENDLEBURY [1991]:

“A trend toward more or less "uncitedness," however, might be meaningful. For the 1980s, we see no such trend in the scientific literature: the numbers are essential flat ...” p. 1410.

This paper analyses the changes in articles' uncitedness rates over a 26 year period (1981-2006) for all fields of the natural sciences and engineering (NSE), medicine (MED), social sciences (SS) and humanities (HUM).

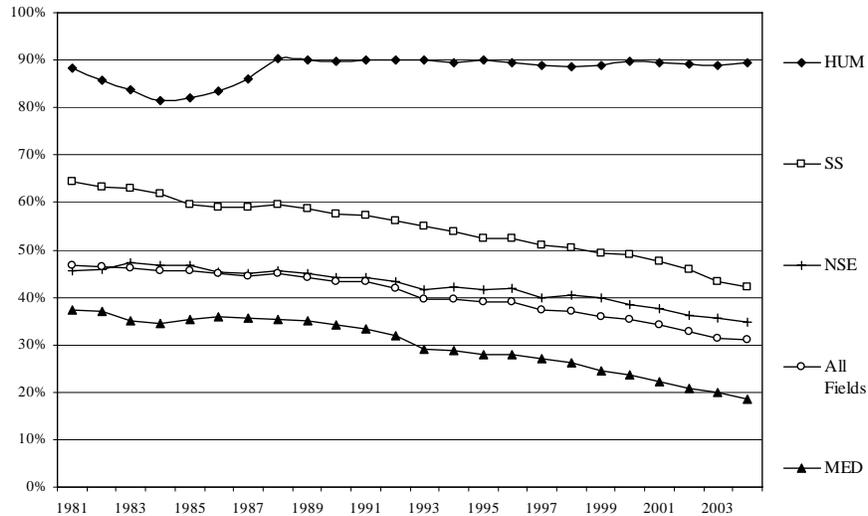
## Methods

Data for this paper are drawn from Thomson Scientific's Science Citation Index Expanded (SCIE), Social Sciences Citation Index (SSCI) and Arts and Humanities Citation Index (AHCI) for the period 1981-2006. Journal classification is based on that used by the National Science Foundation, complemented with some in-house classification for the humanities. The matching of citations was made using Thomson's reference identifier provided with the data, as well as additional matching using the author, publication year, volume number and page numbers. Only citations received by articles, notes and review articles are included in the study. Self-citations were also excluded. Citations made to 9 million (M) papers in NSE, 7.7 M in MED, 1.7 M in SS and 0.8 M in HUM are retrieved in a pool of half a billion references recorded in the database. Though this macro-level matching create false positives and negatives alike (<1%), these are not large enough to affect the validity of our results. Uncitedness shares are presented for two citation windows: 2 years after publication year and 5 years.

## Results

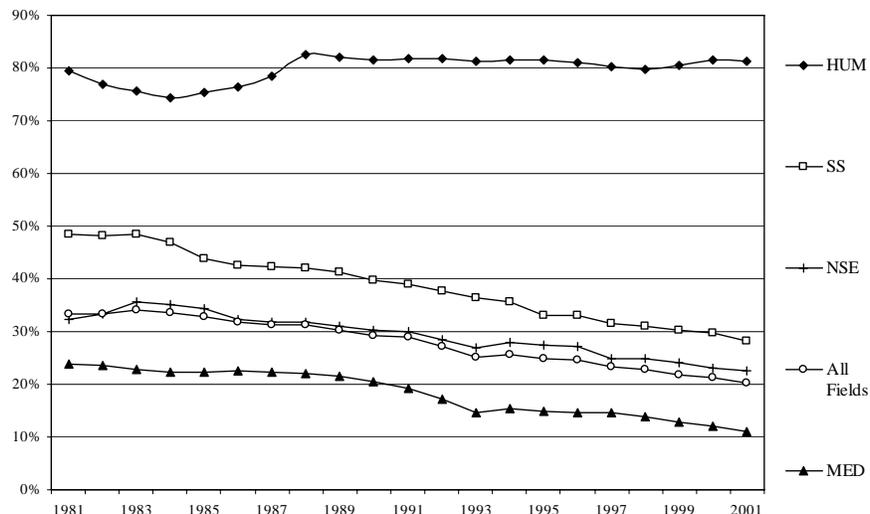
Figure 1 uses a two-year citation window while Figure 2 uses a five-year window. These data clearly show that uncitedness declines for all disciplines but remain about the same in HUM. It must be noted that citation data for HUM are not reliable before 1988. These data confirm that in all other fields, science is increasingly drawing on the stock of published papers and consequently the level of uncitedness is constantly shrinking. Though not shown, data for a 10 year window also show the same trends.

**Figure 1** Share of articles uncited 2 years after publication, 1981-2004



Source: Web of Science. Data compiled by OST.

**Figure 2** Share of articles uncited 5 years after publication, 1981-2001



Source: Web of Science. Data compiled by OST.

### Conclusion

This paper provides evidence that the widely held belief that the majority of scientific papers are never cited is not empirically grounded. Contrasting with this belief, the data presented here suggest that the science system is increasingly being efficient as less and less literature is published without ever being used. One can indeed observe that in all domains but HUM, the share of scientific papers that are uncited has been decreasing steadily since the beginning of the eighties. Four phenomena could explain this trend. First, the emergence of online bibliographic databases and of electronic means of diffusion and access provided more opportunities for researchers to find and access scientific articles. Second, as suggested by SEGLEN [1992], uncitedness rates might be caused by limited space allowed to references by journal editors. Hence, the steady increase in the number of references per paper [LARIVIÈRE, ARCHAMBAULT, GINGRAS, 2008] might decrease uncitedness rates. Third, the levelling off of the growth of the world's scientific production [LARIVIÈRE, ARCHAMBAULT, GINGRAS, 2008] increases the probability that articles are increasingly being cited. A fourth phenomenon that could explain this decrease is an improved accuracy of cited references in Thomson's bibliographic database, but we think that this technical aspect would explain only part of the decline in uncitedness. For the particular case of humanities, the relatively high level of uncitedness and its stability over time are probably related to the fact that these disciplines tend to cite books more than articles (LARIVIÈRE *et al.*, 2006)

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