

# Citations of books

## Evaluation of books as research outputs in history of medicine

Grant Lewison

*Lists of books about the history of medicine were compiled from book reviews and from the references in papers in the subject taken from the Social Sciences Citation Index. The authors' addresses were sought from papers in this database and thereby some of the books could be attributed to individual countries, such as the UK and the USA, which were to be compared. Counts of citations and of reviews to individual books both showed that the UK was a very strong performer in this subject, and that its standing relatively had increased over the last few decades. This judgement reinforced the results of interviews carried out overseas with senior historians of medicine and gave them extra credibility.*

Grant Lewison, at the time of writing, was at the Policy Unit, Wellcome Trust, 210 Euston Road, London NW1 2BE, UK. He is now at the Bibliometrics Research Group, City University, Northampton Square, London EC1V 0HB, UK; E-mail: g.lewison@soi.city.ac.uk.

The author is indebted to the many historians of medicine who took part in the interviews and gave advice on evaluation criteria. Nadia Azzouzi of the Policy Unit undertook the analysis of changes of address in *Current Work*. Thanks are due also to the helpful comments of two anonymous referees.

THIS INVESTIGATION WAS CONDUCTED in order to answer a question that arose from the recent evaluation by the Policy Unit of the Wellcome Trust's programme in the history of medicine (Allen *et al*, 2000). This evaluation sought to provide, *inter alia*, a view 'on the state of the history of medicine in the UK and ... how this has developed ... from approximately 1960 onwards'. In the early years of the programme, the intention of the Trust's trustees (now governors) had been to create a cadre of history of medicine researchers who could benefit from the library and other collections built up by Sir Henry Wellcome. The evaluation sought to discover whether the subject was now a respected academic discipline in the UK and how the community of scholars was viewed from an international perspective.

Research evaluators are frequently asked to establish the standing of individuals (Kademan *et al*, 1999; Lewison *et al*, 1995), departments or institutes (Vinkler, 1998; Thomas and Watkins, 1998; Ugolini *et al*, 1997), universities (Lewison, 1998; Moed *et al*, 1998; López-Martínez and Rocha-Lackiz, 1998), or even whole countries or regions (Katz and Plevin, 1998; Rao and Suma, 1999; Krauskopf and Vera, 1997; Luwel, 2000; Jacobs and Ingwersen, 2000; Davis *et al*, 1999) in a subject. (The references are to some typical recent work, selected to show the range of studies currently being undertaken and the teams conducting them, but are inevitably only a small selection.) When bibliometric methods are used, they are almost invariably based on outputs of articles in the serial literature. However, the quadrennial Research Assessment Exercise (RAE) conducted by the Higher Education Funding Councils in Britain allows the submission by researchers of other

outputs (HEFC, 1996), as appropriate to their discipline, and these have included conference proceedings, patents and monographs (books). The RAE recognises that journal papers, so long used as the basis for bibliometric studies, are not necessarily the main or even a major output in some disciplines. History is an example of a subject in which the book has the primary place as a scholarly output, and many historians have made their reputations through authorship of notable books, so evaluations of history and other social sciences have to take many different outputs into account (Must, 1999; Burnhill and Tubby-Hille, 1994).

It seemed, therefore, that it would be necessary to try to evaluate the books produced by UK historians of medicine, not necessarily supported by the Trust, in order for us to form a view on the standing of the subject. We were aware that the most obvious comparator was the USA because of the volume of output from that country and because both countries use English. However, there appeared initially to be many difficulties:

- There is no comprehensive listing of books in a database (other than history of medicine library catalogues). Moreover, we needed to distinguish history of medicine books from ones on other subjects.
- Normal bibliographic data on books do not include the author's address. Indeed, even inspection of the actual volume sometimes will not reveal this, although it is commonly given on the dust jacket.
- Books vary greatly in their contents, and there are no agreed criteria by which one book can be compared to another. Many scholars judge book quality mainly on the basis of their own reading (see below).

The evaluation was assisted by advice from a Steering Group, and it was a remark by one of the members that suggested that a way might be found to tackle the problem of evaluating large groups of books in a comparative way. This was the recommendation that we should consider the number of book reviews received by a book as a possible indicator of impact, or at least of interest to other historians. Book reviews are included as items in the *Social Sciences Citation Index* (SSCI) © The Institute for Scientific Information, and a quick examination revealed that they were plentiful — more numerous, in fact, than research articles in the field. They have previously been used for evaluation purposes (Jordy *et al*, 1999), but on the basis of their content rather than their number. It was, however, necessary to devise a means of selectively retrieving reviews of books in the history of medicine from the ones on other subjects.

The development of a selective 'filter' in the history of medicine was quite simple and it worked well when applied to the SSCI (see below). It could,

of course, also be used to select research articles and to identify the references that they cited. These would be likely to be relevant to the history of medicine, too, and some of them might be non-journal items and would therefore provide an additional listing of books. It turned out that more than half of the references were to non-journal items (quite unlike the situation in most areas of science where journal papers form the large majority of references). It was possible to unify these references and it then appeared that some works had received respectable numbers of citations — up to more than 50. So it then became possible to consider whether citation analysis could, after all, be applied to books as well as to papers in journals.

There remained the second problem, namely how to identify books with a country or an institution. This was solved, at least in part, by making the assumption that most active historians of medicine would have written at least one research article in a journal, or one book review, in the last dozen years. Since the addresses of authors of these items are recorded in the SSCI if they are present in the original, this would provide an address book and allow the addresses of book authors to be determined. In practice, there were many books by authors who had not written such articles or book reviews, but it could be argued that these were occasional works rather than mainstream academic outputs and, as such, not relevant to the main question of the evaluation. Support for this view came from the interviews with 37 senior historians of medicine in Canada and the USA which were undertaken as part of the evaluation: 33 claimed that journal articles were a major form of output and an equal number said the same for book reviews. Moreover, an inspection of the titles of a sample<sup>1</sup> of the post-1988 cited books without addresses revealed that only about a quarter were on history of medicine subjects and by individuals.

It should be noted that the SSCI contains a distinct language bias towards English, which is much more important in the social sciences than in the physical sciences. The result is that relatively few foreign-language journals relevant to the history of medicine are covered, and so many non-Anglophone authors of history of medicine books would not have been identified with an address. Moreover, their books would be much less likely to be reviewed or cited. So the study to be described may well have been satisfactory for the purpose for which it was conducted — which was to compare UK with US outputs — but it could not be generalised to compare UK work with that from countries in continental Europe.

## Method

The first step was to define a 'filter' for the history of medicine. For some time now the Wellcome Trust's Policy Unit has been defining filters for the

selective retrieval from bibliographic databases of papers in various biomedical subfields (Lewison, 1996; Lewison, 1999). These filters nearly always consist of two parts, one a list of specialist journals and one a list of title keywords, often in combination, and papers are taken if they satisfy either condition. Address keywords are not normally used because departmental names do not correlate well with the research actually being undertaken in them (Bourke and Butler, 1998).

In this study, the filter consisted of three parts:

- seven specialist journals (*Bull Hist Med, Hist Psychiat, J Hist Med Allied Sci, J Hist Sexual, Med Hist, Nurs Hist Rev, Soc Hist Med*)
- title keywords<sup>2</sup> indicating a medical subject, such as clinic\*, disease\*, hospital\*, matern\*, mortality, nurse\*, smallpox, schizophreni\*
- title keywords indicating an historical approach, such as 18<sup>th</sup> century, historical, medieval, 17\*-18\*, 18\*-19\*

Papers were taken if they were in one of the specialist journals or had title keywords from both medical and historical sets. When applied to the SSCI, inspection of the titles of the papers thus retrieved showed that the filter was working well; however, in another parallel exercise when the filter was applied to the *Science Citation Index* (not reported here) the filter collected many papers concerned with the taking of the (clinical) history of individual patients which were clearly not relevant.

The filter was applied to the *Social Sciences Citation Index* in the CD-ROM version for the 11½ years from 1988 to the end of June 1999<sup>3</sup> and it retrieved 2,274 articles, notes and reviews; it also retrieved 3,243 book reviews, incidentally showing the relative importance of this type of document in the history of medicine. Both types of document were

Table 1. List of countries and world regions represented among authors with addresses of history of medicine articles, notes, reviews and book reviews in the SSCI, 1988–99, and numbers of address changes recorded in *Current Work* (CW), 1994 and 1999

Country	SSCI	% of US	CW	% of US	SSCI/CW
USA	1,247		589		
UK	528	42.0	241	41.0	1.04
Canada	144	11.0	46	7.8	1.47
AU/NZ	73	5.9	40	6.8	0.87
Europe (excl. UK)	292	23.0	626	106	0.22
Latin America	5	0.4	36	6.1	0.07
Africa	9	0.7	11	1.9	0.37
Asia	34	2.7	82	14.0	0.19
Other	1		50		
Total	2,334		1,721		

used to form an address book for authors. This was much easier than it would have been in the physical sciences as the large majority of publications had only a single address, and most of these only one author. As a result, some 2,334 different authors could be linked to an address. Table 1 shows the distribution by country or by world region.

As a check on the relative numbers of addresses from different countries, an examination was made of the listings of changes of address in a quarterly report published by the Wellcome Trust's library: *Current Work in the History of Medicine*. Unfortunately it was not possible to collect the information in an electronic format, and the numbers of address changes may not necessarily reflect the sizes of the historian of medicine populations in the different countries, but at least these listings do afford some kind of independent check on whether the SSCI correctly represents the balance between UK and US active historians of medicine. Numbers of such address changes taken from two quarterly volumes, April to June 1994 and April to July 1999, are also listed in Table 1.

The last column shows the extent to which the SSCI over- or under-represents the historians of medicine, relative to *Current Work*. For present purposes it shows that the UK is rather well represented. The over-representation of Canada and under-representation of Australia and New Zealand are probably attributable to the small numbers involved, but the serious under-representation of continental Europeans, Latin Americans and Asians is clear. (For Africa, the difference is marginally significant; most of the historians of medicine from that continent in the SSCI are from South Africa.)

For the articles, notes and reviews, details of all the references were downloaded from the SSCI for analysis. They numbered 100,262<sup>4</sup> and from an inspection it was clear that a large number of these references were to books and other non-journal documents as there were no volume numbers given. For present purposes, the references with a volume number were removed, as were the numerous references to the *Lancet* and *BMJ* (formerly the *British Medical Journal*), many of which did not carry a volume number. This left 50,648 references, just over half the total.

It was now necessary to group together the references to the same item. A typical reference was of the form:

SCULL-A-1989-SOCIAL-ORDER-MENTAL-P245

so they were unified by means of a 'key' consisting of the author's surname and the first three letters of the title, that is, the part appearing after the year of publication, in this example SCULL-SOC. This allowed different abbreviations of the title and references to different editions of the same work (or citations with incorrect dates) to be collected

together and the numbers of citations to individual documents to be determined. Most, of course, had only one citation but the numbers for individually authored books ranged up to 59 (for STARR-P-1982-SOCIAL-TRANSFORMATION). The date of publication was extracted from the reference (the earliest in the present era being 1435, but there were many to dates BC, for example, to books of the Old Testament) and the address and country of the author were determined where possible. However, only a minority of even recent books could be assigned an address: the percentage rose from 6.5% for books published 1970–79 and 15.9% for ones dated 1980–89 to 26.4% of ones from the last decade. The reasons for this have been discussed above in the introduction; the real shortfall will be much less than the apparent one because:

- only 25% of the titles cited without addresses were relevant to the history of medicine; and
- only about 10% of the authors without addresses wrote more than one cited work during the period 1988–99 and thus could be considered as professional historians of medicine.

For the 3,243 book reviews, the analysis was simpler as normally the ‘title’ of the book review consisted of the title of the book being reviewed and the name of the author, thus:

*The Great Scourge: The Tasmanian Infantile Paralysis Epidemic 1937–1938*, by A. Killalea

(This title was picked up because of the presence of the word ‘epidemic’ and the conjunction ‘19\*-19\*’, indicative of a historical period.) It was possible for the most part to unify reviews of the same book mechanically but the list, ordered by book author, was inspected to ensure that slightly different wordings of the book title, or its quotation in different languages, were grouped together. The result was that the number of individual books reviewed in this way was 1,847, and the number of reviews varied up to a maximum of 18 (for *A History of Psychiatry: From the Era of the Asylum to the Age of Prozac* by E Shorter of Toronto, Canada); some 671 of these books’ authors had identifiable addresses (36%). These two approaches to the listing of history of medicine books both worked reasonably well, but

---

**Interviews were conducted with senior historians of medicine in six countries (other than the UK) and the questions included one on the way that respondents would judge the quality of a book**

---

Table 2. Ranking of criteria for evaluation of history of medicine books by senior historians of medicine in Canada, France, Germany and the USA, mean vote (max = 7.0)

Criterion	Vote
Reading them	6.2
Reviews	5.0
Citations	3.3
Publisher	2.6
Recommendation	1.9
Repute of author	1.8
Number of reviews	1.7
Availability	0.8
Sales	0.5

how was quality to be determined? As part of the evaluation, interviews were conducted with senior historians of medicine in six countries (other than the UK) and the questions included one on the way that respondents would judge the quality of a book. They were invited to rank nine possible criteria. In Table 2, the analysis is based on 49 responses from respondents in Canada (8), France (9), Germany (3) and the USA (29), and seven votes have been given to the criterion ranked first, six to that marked second, and so on down.

Although there is no substitute for reading books oneself to determine how good they are, historians depend a lot on reviews by others (hence the large numbers of such reviews that appear in the serial literature and probably many more that appear in newspapers). It was interesting to see that citations ranked third as a measure of esteem. In this study, there was not time to explore the relative esteem in which different book publishers were held, although some of the interviewees drew a distinction between university presses and commercial publishing houses. The actual number of reviews was not ranked very highly as a criterion in Europe but it was considered more important in the USA and Canada, and so it seemed worthwhile using it in the present study as an indicator of impact additional to citation counts. Availability of a book in many shops and for a long period, coupled with sales as an indicator of commercial success, were considered by the mainly academic respondents as almost irrelevant to its esteem.

### Results: citations

As mentioned above, documents cited by historians of medicine in their research papers go back in time for many centuries, even for several millennia. The listing of titles by year of publication gives a measure of the growth of the source literature and for the first 60 years of the twentieth century the graph of cited works is shown in Figure 1. Here the yearly outputs have been smoothed by the plotting

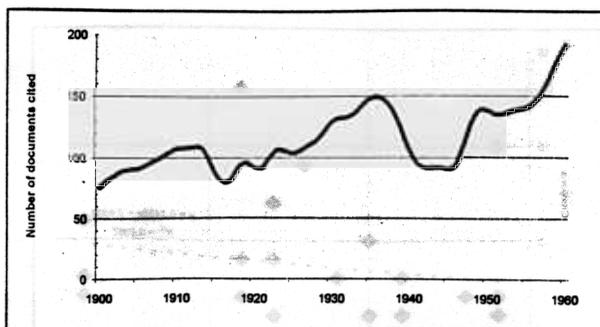


Figure 1. Numbers of documents (non-journal items) from different periods cited in history of medicine papers in the SSCI, 1988-99 (five-year running means)

of five-year running means. The reductions in output of history of medicine sources during the periods of the two world wars (especially the second) are evident; there is also a more modest reduction in the early 1950s. Since the 1960s, production has increased rapidly: smoothed output that was cited reached 369 titles in 1971, 761 titles in 1981 and peaked at 1,199 in 1988. Subsequently, the reduction in number of years available for citation reduced the apparent number of cited items.

However, the major interest of the study was to determine the relative interest of cited items from the UK and the USA, and the proportion of each that were 'well cited' in different periods of time. This information would show if the standing of UK history of medicine was high or low and whether it was growing or declining. The benchmark used for comparative purposes was outputs of biomedical research papers, for which typically the UK produces 10% of the world total and the USA, 40% (Dawson *et al.*, 1998). The data on publication numbers are summarised in Figure 2, and those on the proportion cited different numbers of times are in Table 3.

Figure 2 shows that UK authors have published a fairly constant proportion of the books cited, averaging just under 32% of the total with addresses. However, the USA share has declined from 56% of cited books with addresses in the 1970s to 44% in the 1990s, its share being taken up by books from other countries. Consequently the UK/US ratio of book production has increased from 56% in the 1970s to

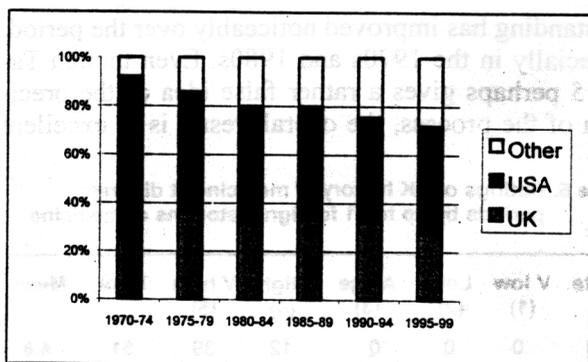


Figure 2. Change in proportion of documents with attributable addresses cited in history of medicine papers in the SSCI, 1988-99, from the UK, USA and other countries

Table 3. Percentages of cited books that are cited at different levels in SSCI history of medicine papers from two periods from the UK, the USA and other countries

Period	Citations	UK	USA	Other
1970-87	1 or 2	68.7	68.4	84.1
1970-87	3+	31.3	31.6	15.9
1970-87	6+	14.8	12.4	6.2
1970-87	12+	4.3	5.0	2.8
1988 & later	1 or 2	80.1	87.9	83.2
1988 & later	3+	19.9	12.1	16.8
1988 & later	6+	8.8	4.6	3.6
1988 & later	12+	2.1	0.9	0.0

70% in the 1980s and 1990s. This is much higher than the 25% ratio of biomedical papers and the ratio of history of medicine papers recorded in the SSCI in the period 1988-99, which was 35%.

In Table 3, the percentages of each country's output that was cited at all that received 3, 6 or 12 or more citations are shown. In the first period, 1970-87, the UK and US books had about equal citation distributions, suggesting approximate equality in impact. However, in the latter period, books published since 1988, the UK performance appears superior to that of the USA, with higher percentages of books being cited 3, 6 or 12 times or more. The differences are statistically significant for 3+ and 6+ citations: on a  $\chi^2$  test the probabilities of this occurring by chance are  $p \sim 0.3\%$  and  $p \sim 2\%$  respectively, but not for 12+ citations. This result is particularly noteworthy because there is a natural tendency for authors of papers preferentially to cite their fellow countrymen (Narin and Whitlow, 1990), and during this period US paper authors outnumbered UK ones by nearly three to one.

### Results: numbers of reviews

The database of books reviewed in the SSCI only goes back effectively to 1988 as most reviews appear shortly after a book is published (or even

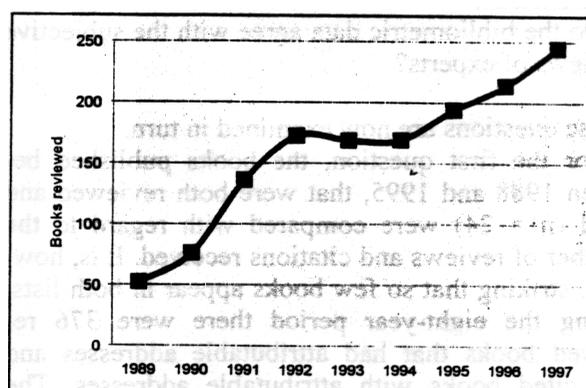


Figure 3. Numbers of history of medicine books reviewed in SSCI journals (three-year running means)

Table 4. Percentages of history of medicine books reviewed different numbers of times in SSCI journals from the UK, the USA and other countries, 1988-99

Reviews	UK	US	Other
1 or 2	66.7	59.3	66.0
3+	33.3	40.7	34.0
6+	11.1	17.7	11.5
12+	2.3	2.3	1.9

shortly before). There has been a big rise during the last decade in the numbers of history of medicine books reviewed, as shown in Figure 3: this is unlikely to represent the actual increase in publication but rather a greater tendency for relevant SSCI journals to carry book reviews as a scholarly output. Over the period, books whose authors had traceable addresses in the UK numbered 216, with 300 in the USA (one was a joint US-UK publication), and 156 from third countries. The ratio of UK to US production was therefore 72%, closely in line with the figure quoted above for the ratio of cited items.

Table 4 shows the percentages of each group of books that were reviewed 3+ times, 6+ times, or 12+ times in SSCI journals during the period. All the books except one had only a single country address; the exception was a UK-US book with eight reviews. This table suggests that US books are somewhat more frequently reviewed than UK and other country ones at intermediate levels. Comparison using a  $\chi^2$  test shows that the difference at 3+ citations is not significant ( $p \sim 10\%$ ) but that it is just significant ( $p \sim 4\%$ ) at 6+ citations.

### Discussion

The analysis described seems to provide data to answer one of the questions set for the evaluation, namely what was the standing of UK history of medicine now and how it had changed over the last 40 years. But two further questions arise:

- Are the data from citations and reviews mutually consistent?
- Do the bibliometric data agree with the subjective views of experts?

These questions are now examined in turn.

For the first question, the books published between 1988 and 1995, that were both reviewed and cited ( $n = 24$ ) were compared with regard to the number of reviews and citations received. It is, however, striking that so few books appear in both lists: during the eight-year period there were 376 reviewed books that had attributable addresses and 917 cited books with attributable addresses. The graph is shown in Figure 4, from which it is apparent that there is almost no correlation between the two

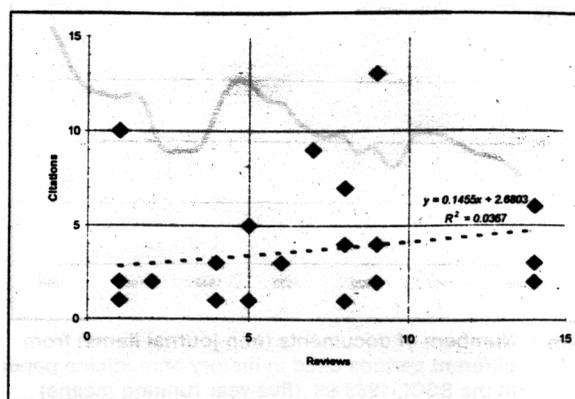


Figure 4. Correlation between numbers of reviews to 1988-95 history of medicine books and citations to them in the SSCI

measures of esteem for individual books: some of those most often reviewed are barely cited, and those most cited are not reviewed many times. The interpretation of this finding is difficult: it could mean that the two indicators are effectively independent because they are measuring quite different properties of the books, and therefore if they agree in their estimate of the standing of history of medicine in the UK one can have more confidence in the result. On the other hand, the indicators appear to relate primarily to different sets of documents, with only 24 in common (5%) out of 1,269 books with attributable addresses published from 1988 to 1995. Of course, the large majority of these books would have received only a single review or a single citation in SSCI journals and they may have received reviews in other media (e.g., newspapers and magazines) or citations in books.

For the second question, evidence was obtained from the 51 interviews in Canada, France, Germany and the USA. Respondents were asked to rank UK history of medicine on a five-point scale from 'very high' (scored 5) through 'average' (scored 3) to 'very low' (scored 1); they were asked to do this for four periods in time: now (1999), 1990, 1980 and 1970. The results were as shown in Table 5.

Although not very many of the interviewees could recall the situation 30 years ago, it is clear that their opinion of the current standing of the history of medicine in the UK now is mostly very high and that its standing has improved noticeably over the period, especially in the 1970s and 1980s. Even though Table 5 perhaps gives a rather false idea of the precision of the process, the overall result is in excellent

Table 5. Ratings of UK history of medicine at different periods by up to 51 foreign historians of medicine

Date	V low (1)	Low (2)	Av'ge (3)	High (4)	V high (5)	Total	Mean
1999	0	0	0	12	39	51	4.8
1990	0	0	1	16	29	46	4.6
1980	0	0	7	15	11	33	4.1
1970	0	2	2	5	1	10	3.5

qualitative agreement with that obtained from the citation data given above.

It seems reasonable to conclude that the bibliometric evidence is robust and that it has served a useful purpose within the overall context of the current evaluation. However, it has to be admitted that this is something of a special case because the comparison has been made between two Anglophone countries so that the linguistic bias of the SSCI did not cause problems. It is certainly possible that the application of bibliometric techniques to books might also have worked on a smaller scale — to the evaluation of the outputs of individual universities — provided that the sample sizes were large enough, but this was not attempted in this evaluation.

## Notes

1. The sample comprised 936 out of 7,332 works, written by 6,396 different authors of whom 5,729, or nearly 90%, wrote only one work.
2. The asterisk denotes any character(s) or none.
3. The study was carried out in August 1999, when the CD-ROM for the period to June 1999 had just arrived.
4. For technical reasons it was not possible to download references from 53 of the 2,274 papers.

## References

- E Allen, C Cooper, G Fawcett, G Lewison and C Matterson C (2000), *Evaluation of the Wellcome Trust History of Medicine Programme* (The Wellcome Trust, London).
- P Bourke and L Butler (1998), 'Institutions and the map of science: matching university departments and fields of research', *Research Policy*, 26, pages 711–718.
- P M Burnhill and M E Tubby-Hille (1994), 'On measuring the relation between social science research activity and research publication', *Research Evaluation*, 4, pages 130–152.
- M Davis, C S Wilson and W W Hood (1999), 'Ophthalmology and optics: an informetric study of Australia's contribution to fields in the vision science domain, 1991–95', *Scientometrics*, 46, pages 399–416.
- G Dawson, B Lucocq, R Cottrell and G Lewison (1998), *Mapping the Landscape: National Biomedical Research Outputs 1988–95* (The Wellcome Trust: London.), Policy Report 9.
- Higher Education Funding Councils (1996), *Research Assessment Exercise: The Outcome* (HEFCE, Bristol), ref RAE96 1/96.
- D Jacobs and P Ingwersen (2000), 'A bibliometric study of the publication patterns in the sciences of South African scholars 1981–96', *Scientometrics*, 47, pages 75–93.
- M L Jordy, E L McGrath and J B Rutledge (1999), 'Book reviews as a tool for assessing publisher reputation', *College and Research Libraries*, 60(2), pages 132–42.
- B S Kademani, V L Kalyane and S Jange (1999), 'Scientometric portrait of Nobel laureate Dorothy Crowfoot Hodgkin', *Scientometrics*, 45(2), pages 233–250.
- J S Katz and J Plevin (1998), 'Environmental science in the UK: a bibliometric study', *Research Evaluation*, 7(1), pages 39–52.
- M Krauskopf and M I Vera (1997), 'Assessment of scientific profiles and capabilities of PhD programs in Chile: a scientometric approach', *Scientometrics*, 40, pages 569–577.
- G Lewison (1996), 'The definition of biomedical research subfields with title keywords and application to the analysis of research outputs', *Research Evaluation*, 6, pages 25–36.
- G Lewison (1998), 'New bibliometric techniques for the evaluation of medical schools', *Scientometrics*, 41, pages 5–16.
- G Lewison (1999), 'The definition and calibration of biomedical subfields', *Scientometrics*, 46, pages 529–537.
- G Lewison, J Anderson and J Jack (1995), 'Assessing track records', *Nature*, 377, page 671.
- R E López-Martínez and A Rocha-Lackiz (1998), 'University R&D performance evaluation: the case of the National University of Mexico', *Research Evaluation*, 7(3), pages 167–177.
- M Luwel (2000), 'A bibliometric profile of Flemish research in natural, life and technical sciences', *Scientometrics*, 47, pages 281–302.
- H F Moed, M Luwel, J A Houben, E Spruyt and H van den Berghe (1998), 'The effects of changes in the funding structure of the Flemish universities on their research capacity, productivity and impact during the 1980s and early 1990s', *Scientometrics*, 43, pages 231–255.
- Ü Must(1999), 'Estonian historical science in the 1990s', *Research Evaluation*, 8(2), pages 77–81.
- F Narin F and E S Whitlow (1990), *Measurement of scientific cooperation and coauthorship in CEC-related areas of science* (Commission of the European Communities), report EUR12900 EN/1. See page 82 and Figures 6.5, 6.6.
- I K R Rao and P Suma (1999), 'A quantitative study of Indian engineering literature', *Scientometrics*, 46, pages 605–619.
- P R Thomas and D S Watkins (1998), 'Institutional research rankings via bibliometric analysis and direct peer review: a comparative case study with policy implications', *Scientometrics*, 41, pages 335–355.
- D Ugolini, S Parodi and L Santi (1997), 'Analysis of publication quality in a cancer research institute', *Scientometrics*, 38, pages 265–274.
- P Vinkler (1998), 'General performance indexes calculated for research institutes of the Hungarian Academy of Sciences based on scientometric indicators', *Scientometrics*, 41, pages 185–200.