

EDITORIAL

■ Upcoming Anniversary: 15 Years of ISSI

Indeed time is speeding up. Events follow close upon each other. While the last issue heralded the start of the third volume of the ISSI newsletter, the society is now approaching its following benchmarking event. It is fifteen years ago that the board of the 4th International Conference on Scientometrics and Informetrics decided to found the International Society for Scientometrics and Informetrics (ISSI) to contribute to the advancement of the theory, methods and explanations with regard to Scientometrics, Informetrics and related fields. The Society intends to achieve these goals, among others, by encouraging communication and exchange of professional information and by enhancing the public perception of the discipline. The ISSI Newsletter took up the cause of this mission by regularly publishing news items, announcements, event reports, short communications and other contributions of common interest.

In order to celebrate the foundation of the Society, which took place in Berlin in September 1993, we intend to publish the September number of the newsletter as a special issue. Herewith **we would like to invite** both Society members and scientists active or interested in the field of Scientometrics and Informetrics **to contribute to this issue by submitting material relevant to the Society and her history including pictures, reports or research notes** of up to 2 pages. In order to keep the size of the issue within reasonable limits, all submissions will be moderated and reviewed. Contributions should be sent to my email address (see p. 20). Deadline for submission is Sunday, 17 August 2008.

Wolfgang Glänzel
Editor-in-Chief

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ISSI

CONFERENCE CALLS

10th International Conference on Science and Technology Indicators

Excellence and Emergence – A new Challenge for the Combination of Quantitative and Qualitative Approaches

Announcement

The Austrian Research Centers GmbH – ARC and the University of Vienna are jointly organising the 10th International S&T Indicators Conference from 17 to 20 September 2008 at the University of Vienna, Vienna, Austria. There will be a welcoming reception on the evening of Wednesday 17 September.

Science and Technology (S&T) indicators have a long tradition as instruments for the quantitative measurement of S&T performance and development. New challenges appear in the S&T producing system: growing competition, efficiency and the call for excellence. On the other hand new dimensions in research are created through expanding electronic resources, research progress around the knowledge-based society and increasing importance of new concepts like network analysis or mapping of science.

The S&T Indicators 2008 conference in Vienna will be organised around the **following main themes:**

- Theme 1* Quantitative and qualitative approaches: a special focus in evaluation of the academic performance;
- Theme 2* S&T indicators for the identification of emerging fields;
- Theme 3* Disciplinary relevance of bibliometric indicators: Science and Technology, Social Sciences and Humanities;
- Theme 4* Interactions between Open Access initiatives and scientometrics;
- Theme 5* Visualisation and Science Mapping: tools, methods and applications;
- Theme 6* Accuracy and reliability of data sources for scientometric studies;
- Theme 7* Management and measurement of bibliometric data within scientific organisations.

■ **The conference will be of interest to:**

- Policy makers and politicians concerned with the design and implementation of national and international S&T policy;
- R&D managers in funding agencies, in universities and research institutes, and in the business sector;
- Information scientists and statisticians, especially those interested in S&T data;
- Researchers in the field of S&T studies;
- Science publishers and editors, writers and journalists and database vendors;
- Librarians

The language of the conference will be English.

■ **Organisation**

Programme Chair: Antony van Raan
Programme Co-Chair: Juan Gorraiz
Conference Chair: Edgar Schiebel
Local Committee: Marianne Hörlesberger, Michael Barber, Bernhard Dachs, Martin Fieder, Michael Greil, Barbara Heller-Schuh, Andrea Kasztler, Alexander Kaufmann, Karl-Heinz Leitner, Wolfgang Mayer, Manfred Paier, Ralph Reimann, Dorothea Sturn, Bernard Wallner, Lucas Zinner.

■ **Conference website:** <http://www.sti2008.at/>

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13th Nordic Workshop on Bibliometrics and Research Policy

11-12 September 2008; TaSTI, University of Tampere, Finland

Call for Presentations

The Unit for Science, Technology and Innovation Studies (TaSTI) organizes the 13th Nordic Workshop on Bibliometrics and Research Policy, 11-12 September 2008, University of Tampere, Finland. Bibliometric researchers in the Nordic countries have arranged annual Nordic workshops on bibliometrics since 1996:

1996 in Helsinki	1999 in Copenhagen	2002 in Oslo	2005 in Stockholm
1997 in Stockholm	2000 in Oulu	2003 in Aalborg	2006 in Oslo
1998 in Oslo	2001 in Stockholm	2004 in Turku	2007 in Copenhagen

The general idea of the workshop is to present recent bibliometric research in the Nordic countries and to create better linkages between bibliometric research groups and their PhD students. The workshop language is English and the workshop is open to participants from any nation.

The participants who wish to present a research paper or a research idea are called for an abstract of their presentation no later than **August 4th, 2008**. The workshop is also **open to participants without a presentation**. Final date for registrations is **August 11th, 2008**. There are **no fees** for participating in the workshop. Travel and accommodation have to be arranged and sponsored by the participants themselves.

More information on the workshop is available on the website: <http://www.uta.fi/conference/nwb2008/>

Workshop organizers: *Hanna-Mari Pasanen, Laura Himanen, Erkki Kaukonen and Otto Auranen*
Unit for Science, Technology and Innovation Studies (TaSTI), University of Tampere, Finland

The Past, Present, and Future of the Impact Factor

Announcement

The **Polish Academy of Sciences** organises an international Symposium on "The Past, Present, and Future of the Impact Factor and Other Tools of Scientometrics". The conference is focused on the use of these tools in comparing the scientific quality of researchers, journals, institutions, and countries. The symposium, which will be held in **Warsaw (Poland) on 26 September**, is organised under the patronage of the President of the Polish Academy of Sciences. Up-to-date information and further details are available on the website of the Polish Academy of Sciences at: <http://www.pan.pl/english/>.

FROM OUR MEMBERS

On Friday, September 21 2007 Chinese member Liming Liang obtained a - long overdue - doctoral degree from Antwerp University (Belgium) for a thesis entitled: Rhythm Indicators for Measuring the Evolution of Science: Construction and Applications. Thesis advisor was Ronald Rousseau, while ISSI members Leo Egghe, Wolfgang Glänzel and Peter Ingwersen were members of the doctoral jury.

This thesis subsequently obtained the 2007 Emerald/EFMD Outstanding Doctoral Research Award in the category Information Science.

More information about this award can be found at the EFMD website: <http://www.efmd.org/html/home.asp>

ISSI Newsletter is published by ISSI (<http://www.issi-society.info/>). Contributors to the newsletter should contact the editorial board by e-mail. Wolfgang Glänzel: wolfgang.glanzel@econ.kuleuven.be | Ronald Rousseau: ronald.rousseau@khbo.be | Dietmar Wolfram: dwolfram@uwm.edu | Sujit Bhattacharya: sujit_academic@yahoo.com | Balázs Schlemmer: balazs.schlemmer@econ.kuleuven.be | Accepted contributions are moderated by the board. **Guidelines** for contributors can be found at <http://www.issi-society.info/editorial.html> Opinions expressed by contributors to the Newsletter do not necessarily reflect the official position of ISSI. Although all published material is expected to conform to ethical standards, **no responsibility** is assumed by ISSI and the Editorial Board for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the material therein.

RESEARCH FOCUS: NORTH AMERICA

■ Overview

I've been reading with interest the articles published in the ISSI newsletters over the past several years. The reports on international scholarly events and research by authors from around the world highlight the global contributions made to quantitative studies of recorded discourse. As a North American member of this community, it struck me

thors' national address affiliations, with the countries grouped into six continents (Africa, Asia, Europe, North America, Oceania, South America). I then used the "Analyze Results" feature of WoS to generate tallies of different dataset characteristics. Of particular interest were the numbers of annual contributions made over the 21 years of available data (1987-2007). A summary of the annual con-



IS INFORMETRICS RESEARCH ON THE DECLINE IN NORTH AMERICA?

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that there have been few reports of organized activities in North America of late. Aside from a scattering of metrics-themed sessions or individual presentations at the annual meetings of the American Society for Information Science and Technology, Canadian Association for Information Science/L'Association canadienne des sciences de l'information, and North American-based meetings of the Society for Social Studies of Science, I couldn't recall a single conference with a strong metrics focus held in North America over the past decade other than the 1999 ISSI meeting in Colima, Mexico. I began to wonder whether interest in this vital research area has been waning in North America, despite its global growth. If so, any changes should be evident in the absolute and relative research productivity of North American authors.

■ A Brief Exploration of Informetrics Literature

The growth of informetrics literature itself has been studied over the past several years (Hood & Wilson, 2001; Stock & Weber, 2006). What does not appear to have been investigated is whether this growth has been geographically uniform. As an initial exploration, I conducted a topic-based search on ISI's Web of Science (WoS) across all citation indexes using the union of truncated metrics-related terms (bibliometrics, citation analysis, cybermetrics, informetrics, scientometrics, webometrics). Searches were further limited by the union of au-

tributions by continent appears in Figure 1. The tallies reveal that there has been growth for almost all continents, but with some geographic areas exhibiting much more dramatic growth in the absolute number of WoS-indexed publications.

Given the large differences in the sizes of the research communities on different continents, is there any evidence to support changes in relative contributions? Total article contributions for each year were tallied and relative percentages were calculated (Figure 2).

It is clear North American contributions have not kept up with this growth, whereas other continents have either maintained or increased their rate of contribution. The one additional exception is Africa,



Figure 1 Annual Contributions to Informetrics/Scientometrics Literature by Continent

for which absolute numbers have remained stable, but relative contributions have declined.

At the continent-level of aggregation, it is not clear whether this decline is observed for all contributing countries in North America. The United States contributes the majority of indexed publications, with other North American countries like Canada and Mexico each contributing a smaller number. A finer-grained analysis of the data revealed

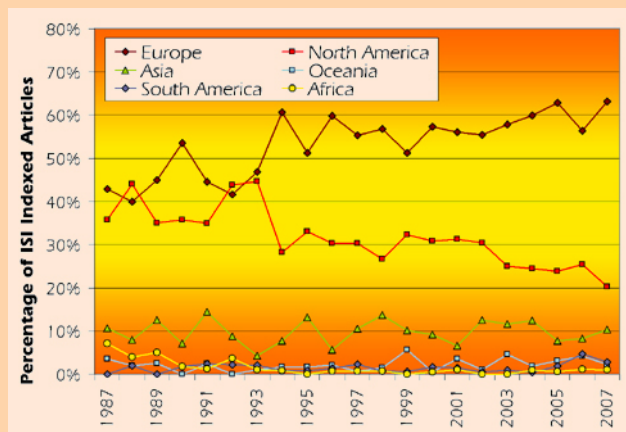


Figure 2 Annual Relative Contributions to Informetrics/Scientometrics Literature by Continent

that non-U.S. North American countries contribute anywhere from 8% to 32% of the indexed North American publications in any given year. The comparatively small numbers, however, result in widely varying percentages for any given year. When the annual values are averaged across several years, they reveal an increase in the relative contributions by these countries to the North American totals. The average percentage of non-U.S. North American contributions from 1987 to 1993 was 12.7%, followed by 14.0% from 1994 to 2000, and 19.5% from 2001 to 2007.

■ Evidence or Artifact?

What factors can account for the observed relative decline in North American contributions? Is it possibly an artifact of the search process used for this exercise? One contributing factor could be changes in the inclusiveness of international journals indexed by ISI in which North Americans do not publish. However, Shelton, Folan and Gorelsky (2007) have found that this is not the case, at least for Science Citation Index. Similarly, North American authors could be contributing more to non-ISI indexed publications, such as online open access sources, which are not counted. It is difficult to confirm this possibility at present since these data are not as easily captured. Also, given the existing reward system, it is unlikely researchers would bypass indexed journals for much of their research. Another factor may be that North

American researchers are shifting away from terms like "informetrics" or "scientometrics" to describe their research in these areas. Their works would not be included using the search terms employed in this analysis. A longitudinal study of term usage would be needed to confirm this likelihood.

It has been suggested that the global influence of scientific research in the United States, specifically, has been declining. David King's 2004 article in *Nature* on the scientific impact of nations notes a decline in American science publications and citations, particularly in relation to member nations of the European Union (King, 2004). Similarly, Robert Shelton points to the paradox of the United States' declining share of scientific publications despite its ongoing large investment in research and development in science and technology (Shelton, 2008). The recent article by Glänzel, Debackere and Meyer (2008), as well as Ronald Rousseau's piece in the previous issue of the ISSI Newsletter (Rousseau, 2008), also attest to the growth of science and technology research internationally, not only in the European Union, but in other parts of the world, particularly China. With this larger picture in mind, it is conceivable that the relative decline in informetrics-related research output in North America serves as another example of this trend. Only time and further investigation will tell.

■ Acknowledgement:

Thanks go to Ronald Rousseau and Isola Ajiferuke for their comments on drafts of this piece.

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PODUNK EFFECT

The KNUDOP Search Group*

Like most information scientists we are well aware of the Matthew Effect, introduced by Merton (1968). This expression refers to the habit of giving credit to already famous people and minimizing or withholding recognition for scientists who have not (yet) made their mark.

Yet, until recently, few of us (except Liming Liang) had heard of the Podunk Effect. This changed, however, when student Wei Liu from Henan Normal University asked Ronald Rousseau: "Who was the first scientist to use the term Podunk Effect?". This question initiated a search in which several colleagues participated.

The word *Podunk* refers in American English to a small, unimportant and isolated town. Already in 1963 Meyer (1963) wrote in the *Library Journal* "How do you do it at Podunk?". The term *Podunk university* is derived from this and refers to a small-town, unimportant university. Evolutionary philosopher Donald T. Campbell is quoted to have recognized that Podunk University also houses genuine scholars (Heyes, 1997). The term "Podunk Effect" seems to be in use in China as a kind of corollary to the Matthew Effect. It is used to describe the fact that scientists from a university or institute of low reputation 'inherit' (using computer science terminology) this low prestige.

Who first used this term? We found that already in 1993 information scientists Sun Jianjun and Chen Xinbao from Nanjing University used this expression in a Chinese article (Sun & Chen, 1993) and so did Liang Liming and Wu Yishan (1993). Sun and Chen refer to the Chinese translation of a book written by Jerry Gaston, in which the expression *Podunk Effect* has been used. This translation was made by Gu Xin and published in 1988. Yet, Liang and Wu refer to the original: *The reward system in British and American science*.

This led us to a search in Flanders (in vain) and in the United States (successful) in order to find a copy of Jerry Gaston's book. There, on p. 121, Gas-

ton discusses the reward system in science and notes that the system is not perfect. Deviations from perfection require an explanation leading to the Matthew Effect and a new effect for those with lower than expected recognition. He writes;

The explanation for those with low recognition tends to focus on a process that has not been labeled, and I shall do so here. It is the Podunk Effect.

So, indeed, Jerry Gaston is the one who introduced the term Podunk Effect. Yet, he did not stop there. On p. 131 he notes that it should be investigated if, and how often, the opposite of the Matthew Effect and of the Podunk Effect occur. He baptizes these effects the Knudop Effect and Wehttam Effect (even suggesting the pronunciation: wet-tem).

The Knudop Effect is the process whereby scientists at low-prestige institutions receive more recognition than they apparently deserve. If there is a process opposite from the Podunk Effect, then one must think of the scientists at high-prestige institutions who fail to receive recognition... Let us call it the Wehttam Effect...

This completely solved the original question and ended our search. Maybe this note will revive the use of these terms, also, in Western scientific literature.

We would like to end this contribution about 'Effects' by mentioning the Matilda Effect, a term proposed by Rossiter (1993), pointing to the systematic undervaluation or reduced recognition of women's academic contributions. So in addition to discrimination based on institutional affiliation (Podunk Effect and Wehttam Effect), reduced recognition may arise from other factors such as gender.

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SEVEN MYTHS IN BIBLIOMETRICS ABOUT FACTS AND FICTION IN QUANTITATIVE SCIENCE STUDIES*



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Abstract: Seven myths with cognitive and methodological background are analysed for validity. Although, there is always a grain of truth in bibliometrics myths too, the generality of their statements is disproved on the bases of methodological studies and by referring to typical counterexamples. It is shown how and where the logical fallacy lies in the inference from the reality behind the myths leading to the erroneous generalisation of the actual statements.

1. Introduction

The sharp rise bibliometrics took since the 1970s and, above all, the various changes in the fields of application bibliometrics has undergone during this time, have fostered a number of myths which seem to pertinaciously persist. When scientometrics still was a tool in the service of scientific information or, at most, of national research reports, the scientific community was less sensitised to rumours and myths around useful or even harmful aspects of quantitative science studies. However, researchers became more susceptible to the consequences of bibliometric practice after quantitative methods have made their entrance into the every-day evaluation of research teams and individuals and into formulas for the allocation of funding. Scientists even feel sometimes victims to the evaluations which are usually performed by bibliometric semi-professionals. Thus, beyond the usual excuses, readily found in the case of unsatisfactory evaluation, communication problems lead to attempts to challenge, undermine or even to dismantle the methodologies underlying the evaluation procedure. Fostering, disseminating and extending existing myths is probably one of the possible repercussions on policy use and misuse of bibliometric data. And just as in the case of other myths, there is a grain of truth in bibliometrics myths as well. In the present study seven of the most popular myths are selected and analysed for supporting facts. It is shown that, beside the above-mentioned grains of truth, the simplified statements conveyed by these myths rather belong to the realm of fiction.

2. The myths

Most of the bibliometric myths have a cognitive, methodological or technical aspect. The following selection of seven myths is restricted to those with cognitive and methodological background. The plethora of myths or rather rumours regarding technical and application-related questions

* Preprint version of a paper to be published in the *Collnet Journal of Scientometrics and Information Management*, 2 (1), June 2008.

are mostly a consequence of evaluation practices, have therefore a rather local character, and do not necessarily put forth 'universal' statements. The topics and statements of the seven myths are as follows.

2.1 Myth #1 - The myth of delayed recognition

According to this myth there are many papers that have initially not been cited or been poorly cited, but have become highly cited later on. Citation windows of 3 to 5 years or shorter are therefore definitely too short.

An often-heard argument against the practice of using citation indicators in research evaluation is that important research results and, among those, also breakthroughs in science are often not cited in the beginning, and only become recognised in a time that is beyond the standard citation windows used in most bibliometric studies. This phenomenon is called delayed recognition (e.g., Garfield, 1980).

Another argument refers to subject-relation citation delay. Scientists state that standard bibliometrics may not be used to assess their publication output, or may at least not be applied to their research field because of field-specific slow ageing and citation delay.

This myth evolved from these two different issues. Nowadays these two components superpose. The first one, the myth of delayed recognition itself, can be easily dismantled by long-term citation analysis. This applies, of course, to the citation delay of individual papers. In order to identify such papers and to shed some light on their role in scientific communication, we analysed the citation histories of the 450,000 research and review articles indexed in the 1980 edition of the Science Citation Index (SCI). Delayed recognition papers were defined as those which, during a period of five years, were initially rarely cited but then became highly cited only beyond this period. In particular, highly cited was defined as at least 50 citations or 10 times the journal's 20-year cumulative impact factor till 2000. The chance that a paper, uncited or very poorly cited for three to five years after publication, will ever be cited is quite low, even in slowly aging fields such as mathematics. Among initially poorly cited papers, only 60 could be considered highly cited during the subsequent 15 years. Thus, a statistically marginal share of 1.3 per

10,000 papers published in 1980 met the criterion of delayed recognition (cf. Glänzel et al., 2003, Glänzel and Garfield, 2004). Among these papers we have found important contributions, which could even be considered breakthroughs, but these cases are indeed the exception to the rule. Very few individual cases do not stand as pars pro toto.

The phenomenon of delayed recognition is largely independent of the particular subject field (cf. Glänzel et al., 2003). We find delayed-recognition papers in practically all fields. The second issue, however, which is statistically more relevant and as such also more complex, is intimately connected with the phenomenon of ageing of scientific information. Field-specific differences in the ageing of scientific literature can be measured by means of the change of citation impact in time (see Glänzel and Schoepflin, 1995, 1999). The ageing of social science, applied sciences and mathematics is distinctly slower than that of experimental sciences and the life sciences (cf. Figure 1).

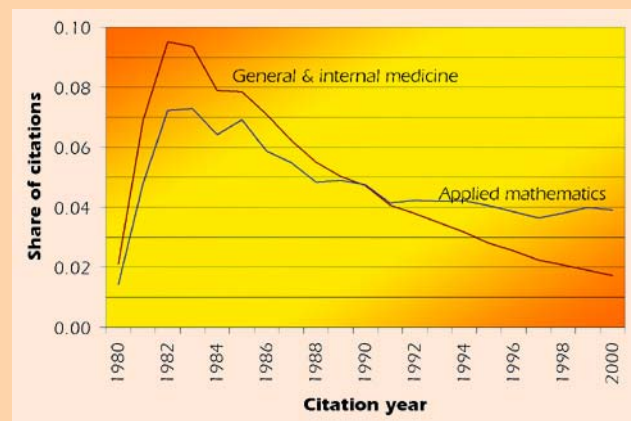


Figure 1 Different subject-specific ageing of scientific literature

Beyond doubt, a preferably long citation window increases the reliability of assessments. However, one should keep in mind that the application, for instance, of a ten-year citation window already refers to research done at least twelve years ago since various time related considerations come into play. One indeed has to add the time necessary to conduct the research, the time to organise and to condense the results obtained into written documents, the time for the reviewing process, a certain publication delay dependent on the journal and field where the paper is published (e.g., Roland and Kirpatrick, 1975, Luwel and Moed, 1998) as well as

the time for indexing the most recent citing literature in the citation index, and finally the time for processing all the necessary bibliographic information. At a lower aggregations level, such as the level of research groups, this might become critical since normally the constitution of a research team has considerably changed over a period of 10 years or more.

From the statistical viewpoint, the citation impact received in an initial period determines the later citation history (see Glänzel and Schubert, 1995, Glänzel, 1997). The reliability of prediction increases, of course, with the length of the underlying observation period and decreases with the length of the interval to be predicted. The results of these studies suggest the use of a three-year citation window as a good compromise between the fast reception of life science and technology literature and that of the slowly ageing theoretical and mathematical subjects. As shown in Figure 2, a three-year citation window suffices at both the national and the institutional level if properly standardised and normalised citation indicators are used. And finally, in a sound bibliometric evaluation, the same rules of the game are applied to all units of assessment.

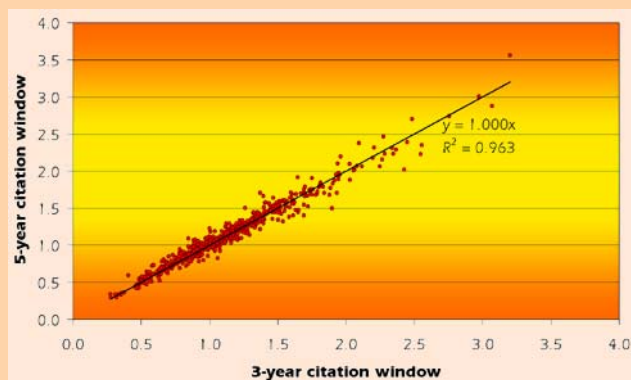


Figure 2 Plot of subfield-normalised mean citation rate based on 5-year citation window vs. 3-year window for selected European higher education and research institutions

We can conclude that the particular choice of a standard citation window cannot be made responsible for possibly negative results of an otherwise correct bibliometric evaluation study.

2.2 Myth #2 - Citing yourself is blowing your own trumpet

The myth: Author-self citations are used to manipulate impact and to artificially increase the own position in the community. Self-citations are very harmful and must be removed from the statistics.

Since citations are used to measure important aspects of the research performance, there is an ongoing debate on how author self-citations should be judged (see MacRoberts and MacRoberts, 1989) and dealt with. This debate has resulted in a certain polarisation and created its own myths as well. The science policy view of this particular citation type is gradually spreading among the researchers themselves (Anon, 2003). Repercussions caused by policy use on the scientists' communication behaviour have certainly boosted the development and several negative effects have already become measurable (e.g., Glänzel and Debackere, 2003, Butler, 2004). According to this view, author self-citations are to be condemned as possible means of artificially inflating citation rates and thus of strengthening the author's own position in the community. In addition, author self-citations are considered highly problematic and suspected in determining the quality of scientific journals as well (Anon, 2004).

A somewhat different view is advocated by information science, where a reasonable share of author self-citations is considered a natural part of scientific communication (cf. Narin and Olivastro, 1986). Thus self-citations are quite inevitable in larger research projects and prevent authors from repeatedly copying larger parts of earlier publications. Accordingly the almost absolute lack of self-citations over a longer period is just as pathological as an always-overwhelming share. Pichappan and Sarasvady (2002) list nine reasons for author self-references, which are by nature somewhat different from giving citations in general (cf. Garfield, 1964).

Although the arguments of information scientists are plausible, the tenacity of the persistence of the self-citation myth is astonishing. The deviating interpretation of one and the same phenomenon in different contexts opens the door to the emergence of rumours and myths. The inclusion of bibliometrics in funding formulas is probably one of the most sensitive issues; scientists might be under the impression that authors could directly influence allocation of funding by "adjusting" their citation behaviour.

At least at the meso and macro level, bibliometric studies have not found alarming trends in self-citation patterns so far (e.g., Aksnes

2003, Glänzel et al. 2004, Glänzel and Thijs, 2004, Thijs and Glänzel, 2006). Of course, individual citation behaviour might extremely deviate from the statistical patterns. Our studies, however, showed that there is no reason for condemning self-citations in general or for removing them from citation statistics. Self-citations rapidly lose their weight as time elapses since they age much faster than foreign citations. This effect substantiates that authors normally cite their own work if necessary, but own results lose relevance as scientists address themselves to new tasks and challenges. On the other hand, supplementary indicators based on self-citations are useful to understand the scientists' communication behaviour, and might help to clarify if the measured citation impact really reflects the reception of the research results by the scientific community. The (sometimes hysterical) ado about author self-citation, however, lacks empirical foundation.

2.3 Myth #3 - Collaboration is always a guarantee for success

The myth: Multi-authorship and above all international collaboration increases productivity, visibility and impact. It also facilitates publication in high-impact journals.

Scientific collaboration, above all international co-operation has unquestionably a positive effect on visibility and citation impact. Many studies have dealt with this phenomenon and confirmed that on an average research collaboration pays off. If this is an acknowledged fact then the question arises of why we speak about a myth. This has several reasons. Firstly, collaborative work and even more acknowledged co-authorship nowadays gained a meaning as the very recipe for success, as a necessary and almost sufficient condition for receiving funding, getting visibility and strengthening the position in the scientific community. As a result of simplification, collaboration as such is often considered a quality criterion. The choice of appropriate co-operation partners or co-authors already plays a determining part in the application and reviewing process of research projects. Strategic co-authorship and sub-authorship is actually used in the hope of starting with advantages and of easier achieving success. Cronin (2003) reports on fraud and honorific authorship having become an issue in several science fields. Even acknowledgements

are used in a strategic manner, particularly, for "signifying subsidiary support rather than substantial and technical collaboration" (Cronin et al., 2003). Honorific authorship and hyper-authorship, i.e., the extraordinarily large number of authors of single papers in several subfields of biomedical research and in high energy physics (Cronin, 2001) are contrasted by suppressed sub- and co-authorship (Laudel, 2002). She has shown on the basis of a sample of interviewed scientists that a major part of (intramural) collaboration is not acknowledged either through a proper acknowledgement or through co-authorship. A large share of persons involved in the preparation of a scientific paper does thus not appear either as co- or sub-author of the publication. Indeed, the above cases of suppressed, fraud, honorific, hyper-authorship or even "mandatory" authorship, e.g., of supervisors questions the possibility of fixing the degree of the individual co-authors' contribution to the paper (Cronin, 2001), and may raise the question: Co-authorship – who's contribution is it anyway?

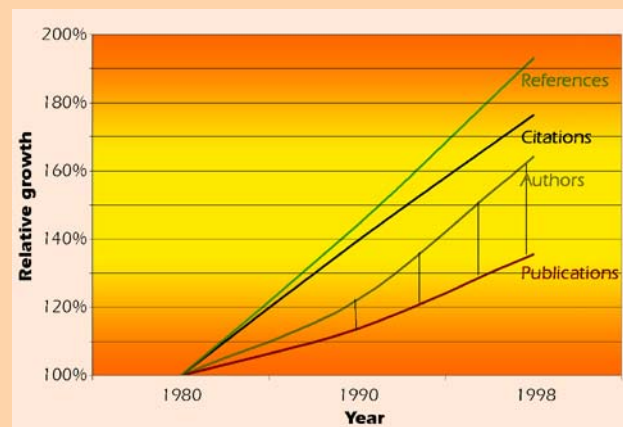


Figure 3 Relative growth of publications, authors, references and citations in all fields combined based on the Science Citation Index

On the other hand, honorific authorship and hyper-authorship can be considered two symptoms of an inflationary process (Glänzel and Schubert, 2004) leading us to the second source of the collaboration myth. Persson et al. (2004) have shown that the number of (co-)authors is increasing faster than the number of publications indexed in the Science Citation Index (SCI) database of Thomson Scientific. This trend allows only one single conclusion, namely, that the collaboration network is becoming denser and co-authorship is gradually intensifying (see Figure 3).

In recent papers on neuroscience (Braun et

al., 2001), biomedical research, chemistry and mathematics (Glänzel, 2002) it was shown that "team work" exhibits higher productivity than single authorship indeed, but beyond a field-characteristic level, productivity distinctly decreases with growing co-operativity. Extensive collaboration does therefore not result in further increase of productivity. Although citation impact and visibility of collaborative research is on an average higher than that of non-collaborative research (Persson et al., 2004), counterexamples of so-called 'cool links' substantiate that even international collaboration does not necessarily result in higher visibility or impact (Glänzel and Schubert, 2001, Glänzel, 2001). However, once we speak about inflationary tendencies and research collaboration has become an imperative, the question arises of strategic thinking could indeed further increase the desired effects, such as career advancement or facilitating access to funding, if everybody applies the same success formula. Research co-operation is certainly a necessary and positive phenomenon in the era of 'big science' but the notion of collaboration as a recipe for guaranteed success remains a myth.

2.4 Myth #4 - Citations are measures of 'scientific quality'...
... "and, in fact, the journal impact factor has become the common currency of scientific quality" (Neuberger and Counsell, 2002).

The notions of citation cover a large range of possible interpretations (e.g., 'reward system of science': Merton, 1973, 'concept symbols for citing authors': Small, 1978, 'information utilisation': Smith, 1981, Cronin, 1981, Glänzel and Schoepflin, 1995, 1999, 'rhetoric-first model': Cozzens, 1989). Although none of these interpretations are directly connected with quality issues, it was sociology of science and actually Robert K. Merton's idea of citation as part of the reward system of science that paved the way for taking citation impact and scientific quality as quasi identical. Citations are more and more considered the currency of science (Garfield, 1982). Although Holmes and Oppenheim (2001) have shown that citation rates significantly correlate with measures of quality, citations are primarily a formalised account of the information use and can thus be taken as an indicator of reception at this level (Glänzel and Schoepflin, 1995). In particular, the fact that a paper

is less frequently cited or even still uncited several years after publication provides information about its reception but does not reveal anything about its quality or the standing of its author(s). Uncited papers by Nobel Prize winners may just serve as an example. However, "if a paper receives 5 or 10 citations a year throughout several years after its publication, it is very likely that its content will become integrated into the body of knowledge of the respective subject field; if, on the other hand, no reference is made at all to the paper during 5 to 10 years after publication, it is likely that the results involved do not contribute essentially to the contemporary scientific paradigm system of the subject field in question" (Braun et al., 1985). These latter two views completely reflect what citations really express.

With the wide distribution, which bibliometrics experienced during the last decade, the situation turned even worse. The availability of the large citation indexes and notably of the journal impact factors has opened up bibliometrics to anyone. Impact factors are used as surrogate for factual citation impact (Seglen, 1989) and have in fact become the "common currency of scientific quality" (Neuberger and Counsell, 2002). Even where the impact factors are not used as immediate evaluation tools, these journal citation measures often serve as decision criterion and reference standard in the choice of journals for paper submission. Reaching the targeted readership has become a secondary aspect in individual publication strategies.

In spite of their statistically evidenced correlation with quality related aspects, citations in general, and impact factors in particular are and remain primarily indicators of reception of scientific information. The possibility of measuring the scientific quality of individual publications through citations alone is a myth.

2.5 Myth #5 - Reviews are inflating impact

The myth: Reviews are always highly cited, and do therefore inflate citation impact. Even uninspired authors can readily attract many citations by writing reviews. These documents should be removed from bibliographies when used for evaluation.

This myth is somewhat related to the previous one. Its origin is twofold: The impact factors of review journals usually exceed those of other scientific jour-

If a statistical sample follows a normal distribution, then the observations should be symmetrically distributed around the sample mean and the standard deviation can be used to determine a tolerance threshold for individual observations. However, this is obviously not the case in bibliometrics. Most bibliometric distributions are far from being symmetric and discrete. Publication-activity and citation-impact distributions are often extremely skewed, the majority of the observations are below the sample mean and the rest of the sample elements are located in the long tail of the distributions. In such cases the mean value and the standard deviation seem to be completely useless. Therefore the application of classical tools of moment-based statistics seems not to be appropriate in research evaluation either. This is a misbelief. According to the central limit theorem, the distribution of the means of random samples is approximately normal for a large sample size, provided the underlying distribution of the population is in the domain of attraction of the Gaussian distribution. In other words, sample means approach a normal distribution regardless of the distribution of the population if the number of observations is large enough and the first statistical moments are finite. Consequently, means and shares of different samples drawn from the same populations can be compared with each other and the significance of the deviation can be determined. Means and shares are used as unbiased estimators of the expected value and the corresponding probabilities, respectively. Furthermore, in the case of skewed discrete distributions the mean value is superior to median. The underlying methods of application of mathematical statistics have been described, among others, by Schubert and Glänzel (1983), Glänzel and Moed (2002) and reliability-related statistics have been regularly and successfully applied to bibliometrics since. These statistical properties have severe effects on ranking issues as well. Different ranks can prove as ties because the underlying indicator values might not differ significantly (cf. Glänzel and Debackere, 2007).

The myth of the inapplicability of Gaussian statistics in a bibliometric context actually arose from a misunderstanding, namely from the assumed comparison of individual observations with a standard. However, that is not what statistics does.

3. Conclusions

Myths arise from reality. They reflect dreams and visions, are used as excuse for unsatisfactory results, or serve as recipe for hoped-for success. Using collaboration or impact factors in a merely strategic manner might result in frustration since the hoped-for success fails to materialise. Other myths are fostered by mistrust as can be observed in the case of self-citations and review articles. And finally there are myths that have their roots in uninformed use of data, in misunderstandings or ignorance. The history of these myths reaches back in a time when bibliometrics did not yet exist, but due to policy use and misuse of publication and citation statistics, bibliometrics might act as catalyst in the process of fostering, disseminating and extending these myths.

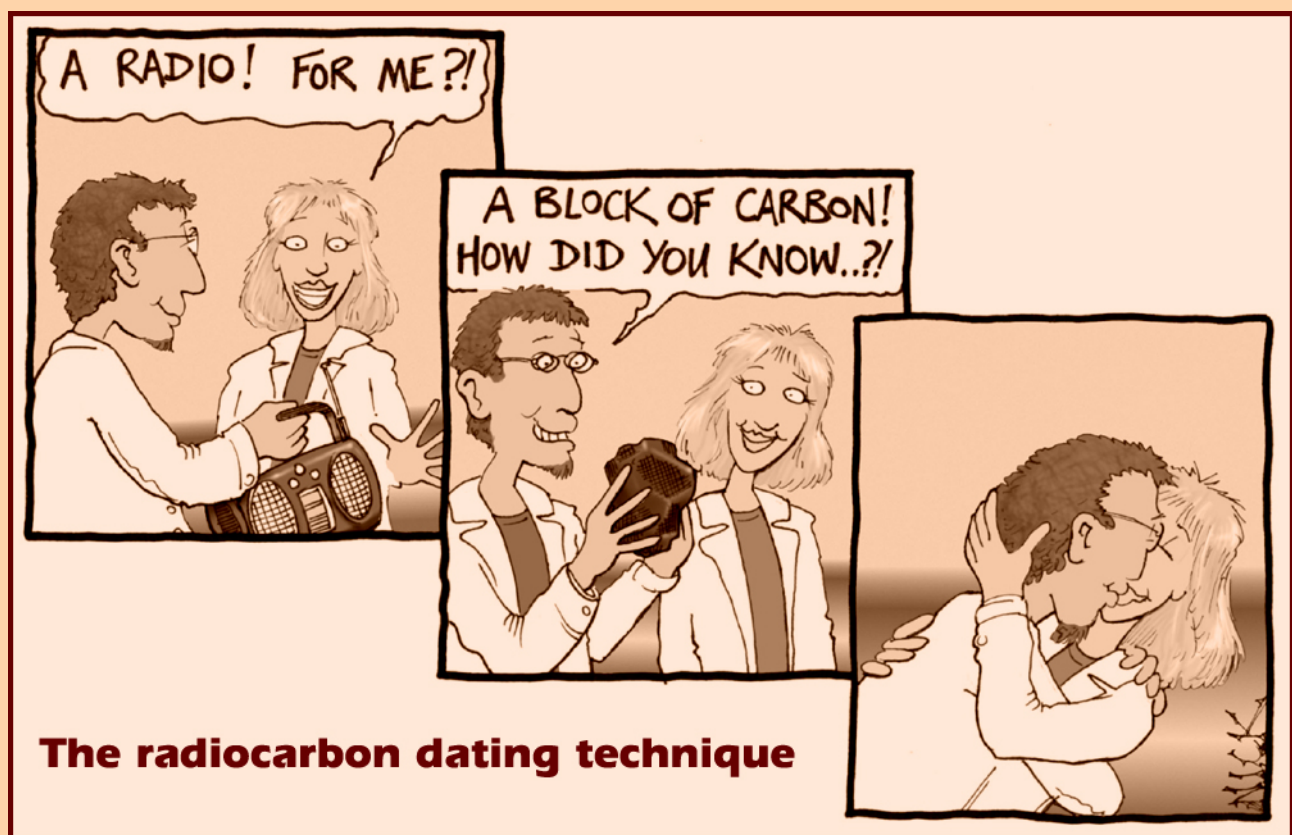
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