VERÖFFENTLICHUNGEN (1. JANUAR 2003 – 31. DEZEMBER 2003)

Scientometrics of FKF Papers 2003

W. Marx

Output

Publications are generally seen as the measurable output from the activities of scientists and research institutes. However, the pure number of publications is insufficient as a measure of scientific productivity and impact. The size of publications and the dissemination of journals vary considerably and the publications unit is not clearly defined. Nevertheless, the yearly FKF publication list (here the papers from the publication year 2003) may be analyzed further by scientometric methods. The publications within the natural sciences disciplines are predominantly published as journal articles. Therefore, these areas of research are covered well by bibliographic databases like the *Science Citation Index* (SCI), offered by Thomson ISI as *Web of Science* (WoS). Furthermore, this database allows to search for the addresses of all authors and not only of the first authors (the selection here is done using the address field only). The following data were determined using the SCI under the host *STN International (Fachinformationszentrum Karlsruhe)*.

At the date of searching (02.02.2004) the SCI covered 432 FKF papers from publication year 2003. Maybe a few papers from the end of the year 2003 are not yet included. The FKF papers were published by 1194 different authors, that is about 3 authors per paper. The distribution of papers on these authors is very skew: one author (M. Jansen) published 39 papers, 16 authors published 10 or more papers each and 846 authors published only one paper each. Many of these are guests from other institutes publishing mainly under their home addresses. This is in accordance with Lotka's law, which describes the frequency of publication by authors in a given field by an inverse square law. It states that the number of authors publishing n papers is about $1/n^2$ of those publishing one paper. Only 11 FKF papers (about 2%) were published in German as original language. See for comparison the FKF papers from 1980, when almost 10% were published in German. The mean number of references per paper is 27 (reference count). This is about the mean world reference count of papers published in chemistry and physics.

The 432 FKF papers from 2003 were published in 116 different journals covered by the SCI. The distribution of papers on these journals again is rather skew: almost 50% of the papers were published in only 10 core journals and more than 25% were published in only 3 main journals (Tab. A). The physical oriented publications are far more concentrated in a few high impact journals than the chemistry publications. The distribution of papers on the SCI document types shows that about 98% are journal articles (414 articles, 8 review articles, 10 editorials). If other bibliographic databases like *Chemical Abstracts* (CAS) or *Physics Abstracts* (INSPEC) are conducted beside the SCI, about 35 preprints in the *Los Alamos Preprint Archive* and some 10 conference proceedings could be selected in addition. Accordingly, the FKF papers are covered well by the SCI journals and can easily be found by everybody outside, who has access to the SCI or the WoS, respectively. Unlike many other Max Planck Institutes, only a minor fraction of all FKF papers (like some non-journal conference proceedings) are not covered by the SCI.

Table A: Distribution of the FKF papers on the journal titles (only journals with more than 3 FKF papers in 2003).

No.	#	%	Journal Title
1	63	14.58	Physical Review B
2	30	6.94	Physical Review Letters
3	19	4.40	Applied Physics Letters
4	18	4.17	Zeitschrift für anorganische und allgemeine Chemie
5	16	3.70	physica status solidi (b): Basic Research
6	13	3.01	Physica C: Superconductivity and its Applications
7	12	2.78	Physica E: Low-Dimensional Systems & Nanostructures
8	10	2.31	Synthetic Metals
9	9	2.08	Inorganic Chemistry
10	9	2.08	Zeitschrift für Kristallographie: New Crystal Structures
11	8	1.85	Europhysics Letters
12	8	1.85	JETP Letters
13	8	1.85	Journal of Physics: Condensed Matter
14	8	1.85	Solid State Communications
15	7	1.62	Physica B: Condensed Matter
16	6	1.39	Angewandte Chemie: International Edition
17	6	1.39	Journal of Crystal Growth
18	6	1.39	Physical Chemistry Chemical Physics
19	6	1.39	Solid State Ionics
20	6	1.39	Solid State Sciences
21	5	1.16	Journal of Magnetism and Magnetic Materials
22	4	0.93	Acta Crystallographica E: Structure Reports Online
23	4	0.93	Journal of Solid State Chemistry
24	4	0.93	Journal of Superconductivity
25	4	0.93	Journal of the American Chemical Society

Impact

A citation analysis of the FKF papers from publication year 2003 only was conducted as usual. The most frequently cited FKF paper from that publication year (L. Vitali *et al.*: Surface Science V523, PL47, 2003) was cited 8 times until now (5 times when self citations are excluded). As can be expected, about 80% of the FKF papers from publication year 2003 were not cited within that same year. Scientific papers usually need some years to accumulate a notable number of citations. The citations immediately after publication are firstly a measure of the immediacy of the communities resonance and less an indicator for the final impact. Thus, the citations of a single paper (or the papers of an individual scientist, or a research institute) should not be discussed as a measure of importance or utility before some years after their publication.

The ISI *Journal Impact Factors* (JIFs) are increasingly used to evaluate research. They are far more easily available than citation data of single papers. Expressed in words JIFs indicate the mean number of citations per year of a typical paper from a specific journal about two years after publication. The distribution of citations to articles is highly skewed: A large fraction of citations going to a small fraction of publications. In contrast to the normal bell-shaped distribution, the mean value and the most frequent value differ considerably. Accordingly, there is no significant correlation between the impact of a specific article published in a specific journal and the JIF of that journal. The skewness of the citation distribution of different journals is proportional to their JIFs. Thus, in particular high JIFs are originated by exceptionally few high impact papers. The majority of papers of all journals (including high impact journals) are cited only a few times, if at all. The JIFs are therefore not representative for the mass of papers from the according journals. That is why JIFs should not be taken to evaluate single papers or even scientists and research groups.

Immediacy and Half-Lifes

The yearly updated JIFs from the ISI *Journal Citation Reports* (JCR) are completed by some additional information: The *immediacy index*, the *citing half-life* and the *cited half-life* of each journal. These data may also be determined for the publications of a specific publication year from a research institute instead of a journal. Here the institute adapted definitions and the values determined for the FKF papers concerning the year 2003:

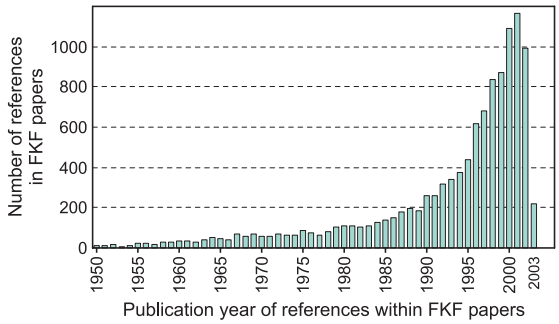

Figure A: Distribution of the references on their publication years within the FKF papers from publication year 2003 only.

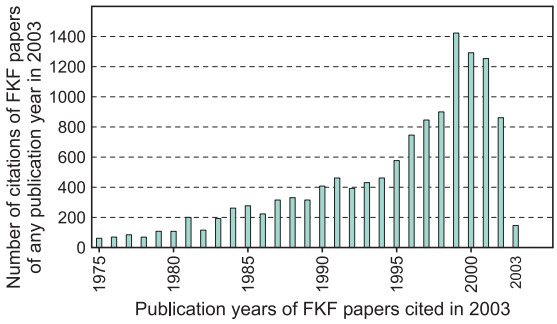

Figure B: Distribution of FKF papers from any publication year (but cited in the year 2003 only) on their publication years.

The immediacy index – The average number of times that FKF papers published in a specific year are cited over the course of that same year. The immediacy index can be seen as a kind of short-time impact of FKF papers within the year of their publication and reflects the directness of resonance within the scientific community. The 432 FKF papers published in 2003 were cited 155 times in the same year, which results in 0.36 as immediacy index. See for comparison: The immediacy index of *Phys Rev B* is 0.61, that of *Phys Rev Lett* is 1.57 and that of *Solid State Communications* is 0.27 (ISI JCR-2002).

The citing half-life – The number of years, going back from the current year, that account for 50% of the total references given by the citing FKF papers in the current year. The citing half-life reflects the actual reference literature selection by FKF authors in view of the publication age and shows, how long the papers of the scientific community (from any publication year) are currently remembered by FKF authors.

Figure A shows the reference age distribution of the about 11 000 references within the FKF papers from publication year 2003. The maximum is around the publication years 2000–2001, e.g., the two to three years old references are dominating. A small percentage of references (about 1%) was published before 1950 (outside the time frame of Fig. A, ranging back to 1806 as the oldest reference cited in an FKF paper from 2003 (A. Simon *et al.* cited R. Proust). The distribution of references is laterally reversed to the time-dependent impact (citation history) of most publications in the natural sciences. The estimated citing half-life of the FKF papers published in 2003 is 6.7 years. See for comparison: the citing half-life of *Phys Rev B* is 7.2 years for publication year 2002 (ISI JCR-2002).

The cited half-life – The number of years, going back from the current year, that account for 50% of the total citations received by the cited FKF papers in the current year. The cited half-life reflects the actual selection of FKF papers by the authors of the citing papers and shows, how long FKF papers (from any publication year) are currently remembered by the scientific community.

Instead of analyzing the references cited by FKF papers, we may look at the FKF papers themselves, cited by other papers. FKF papers from any publication year (not only from publication year 2003) were cited almost 13 000 times by other papers published in 2003 only. Figure B shows the publication year distribution of FKF papers cited in 2003. The FKF papers cited are dominated by those published around 2000. The procedure used here was *citation matching*: Each of the FKF papers (about 13 000 papers up to now) was checked for the number of citations received by citing papers published in 2003 only. The estimated cited half-life of FKF papers in 2003 is 6.7 years. See for comparison: the cited half-life of *Phys Rev B* is 7.0 years for publication year 2002. Within the SCI subject category *Condensed Matter Physics* the cited half-lifes are ranging from 1.4 to > 10 for that publication year (ISI JCR-2002).

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