



## Veröffentlichungen (1. Januar 2002 - 31. Dezember 2002)

### Scientometrics of FKF publications 2002

W. Marx

#### Output

Publications are seen as the (measurable) output from the activity of scientists and research institutes, respectively. The number of publications of different scientists and institutes cannot be determined and compared easily, because the publications unit (what is a publication?) is not clearly defined. Nevertheless, the yearly FKF publication list (here the papers from publication year 2002) may be analyzed further by scientometric methods. In the natural sciences the majority of papers is published as journal articles or conference proceedings. Therefore, these areas of research are covered well by bibliographic databases like *Science Citation Index* (SCI), offered by 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 was done using the address field only). The following data were determined using SCI under the host *STN International*.

At the date of searching (14.01.2003) the SCI covered 468 FKF papers from publication year 2002. At that time a few papers from the end of the year 2002 are not yet included. The FKF papers were published by 1224 different authors, that is about 2.5 authors per paper. The distribution of papers on these authors is very skew: One author (M. Jansen) published 39 papers, 20 authors published 10 or more papers each and 867 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 Lotkas 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 publications from 1980, when almost 10% were published in German. The mean number of references per paper is 27.3 (reference count). This is about the mean world reference count in chemistry and physics.

Table A: Distribution of FKF papers on journal titles (only journals with more than 3 FKF papers in 2002).

No.	#	%	Journal Titel
1	82	17.52	Physical Review B
2	41	8.76	Physica E
3	25	5.34	Physical Review Letters
4	17	3.63	Journal of Applied Physics
5	16	3.42	Zeitschrift für Anorganische und Allgemeine Chemie
6	15	3.21	Applied Physics Letters
7	15	3.21	Physica B
8	11	2.35	Journal of Physics: Condensed Matter
9	10	2.14	Zeitschrift für Kristallographie: New Crystal Structures
10	9	1.92	Angewandte Chemie International Edition
11	8	1.71	Journal of Solid State Chemistry
12	8	1.71	Solid State Communications
13	7	1.50	Journal of the American Chemical Society
14	6	1.28	Journal of Chemical Physics
15	6	1.28	Materials Science and Engineering B

No.	#	%	Journal Titel
16	6	1.28	Nature
17	6	1.28	Solid State Sciences
18	6	1.28	Surface Science
19	5	1.07	Chemistry – A European Journal
20	5	1.07	Journal of Magnetism and Materials
21	5	1.07	Low Temperature Physics
22	5	1.07	Physica C
23	5	1.07	Science
24	4	0.85	Acta Crystallographica B
25	4	0.85	Inorganic Chemistry
26	4	0.85	International Journal of Modern Physics B
27	4	0.85	Journal of Alloys and Compounds
28	4	0.85	Nano Letters
29	4	0.85	Physical Chemistry Chemical Physics
30	4	0.85	Solid State Ionics
31	4	0.85	Thin Solid Films

The 468 FKF papers from 2002 were published in 114 different journals covered by 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 nearly 33% were published in only 3 main journals (see Tab. A). The physical oriented publications are far more concentrated in a few high impact journals (see Phys Rev B) than the chemistry publications are. The distribution of papers on SCI document types shows that only about 3% are others than journal articles (see Tab. B). If other bibliographic databases like *Chemical Abstracts* (CAS) or *Physics Abstracts* (INSPEC) are conducted beside SCI, about 30 preprints in the Los Alamos Preprint Archive and some 10 conference proceedings can be selected in addition. However, compared to many other Max Planck Institutes that is only a minor fraction of all papers. According to this the FKF papers are covered well by SCI and can be easily selected by everybody outside, who has access to SCI or WoS, respectively.

Table B: Distribution of FKF papers on SCI document types.

No.	# Papers	% Papers	SCI Document Type
1	468	100.00	Total
2	452	96.58	Journal Article
3	7	1.50	General Review
4	6	1.28	Editorial
5	2	0.43	Letter
6	1	0.21	Errata

### Impact

A citation analysis of the FKF papers from publication year 2002 was conducted as usual (see Tab. C). The most frequently cited FKF paper from that publication year was cited 16 times up to now (12 times when self citations are excluded). As expected, about two third of the FKF papers from publication year 2002 were not cited within that year. Scientific papers usually need some years to accumulate their citations. The citations immediately after publication are more or less a measure of the immediacy of the communities resonance than an indicator for future impact. Thus, the impact 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 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 its publication. The highly skewed distribution of citations on the papers of a journal makes mean citation values questionable. The JIFs are largely originated by only a small fraction of highly cited papers. The skewness of the citation distribution of different journals is proportional to their JIFs. Thus, in particular high JIFs are originated by exceptional few high impact papers.

Table C: Top 20 most frequently cited FKF papers from publication year 2002. Column 1: Running number; Column 2: Number of citations at the date of search; As of column 3: Abbreviation of the cited publications.

MPI for Solid State Research

Number of publications: 468

Time frame of publications: 2002 only

Number of citations: 235 (including self citations)

Time frame of citations: 2002 only

Date of search: 2003-01-14

1	16	GOLUBOV A A	2002	V14	P1353	J PHYS-CONDENS MAT
2	9	BRINKMAN A	2002	V651	P517	PHYS REV B
3	9	SMET J H	2002	V415	P281	NATURE
4	7	HIRSCHER M	2002	V330	P654	J ALLOY COMPD
5	6	DINNEBIER R E	2002	V296	P109	SCIENCE
6	6	MAZIN I I	2002	V651	P510	PHYS REV B
7	5	GAMBARDELLA P	2002	V416	P301	NATURE
8	5	KROSSING I	2002	V8	P700	CHEM-EUR J
9	4	CAPAN C	2002	V880	P6601	PHYS REV LETT
10	4	HE H	2002	V295	P1045	SCIENCE
11	4	JOOSS C	2002	V65	P651	REP PROG PHYS
12	4	NIEDERMAYER C	2002	V650	P4512	PHYS REV B
13	4	VEGAS A	2002	V58	P38	ACTA CRYSTALLOGR B
14	3	Barth J V	2002	V124	P7991	J AM CHEM SOC
15	3	CAMACHO J	2002	V14	P739	J PHYS-CONDENS MAT
16	3	CUI J B	2002	V2	P117	NANO LETTERS
17	3	FAN Y W	2002	V14	P130	ADV MATER
18	3	GRIGORIEV P D	2002	V650	P403	PHYS REV B
19	3	HEIDEMEYER H	2002	V80	P1544	APPL PHYS LETT
20	3	KISELEV S I	2002	V650	P4517	PHYS REV B
...						

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-Lives

The yearly updated *Journal Impact Factors* (JIFs) from the *ISI Journal Citation Reports* (JCR) are completed by some additional information: the *immediacy index*, the *citing* and

*cited half-life*. These data may also be determined for the publications of a specific publication year from a research institute instead of a journal. The institute adapted definitions are:

***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 468 FKF papers published in 2002 were cited 235 times in that same year, which results in 0.5 as *immediacy index*. See for comparison: The *immediacy index* of *Phys Rev B* is 0.59 and of *Solid State Communications* is 0.33.

**citing half-life** The number of publication 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 literature selection for the references within their papers in view of publication age by FKF authors.

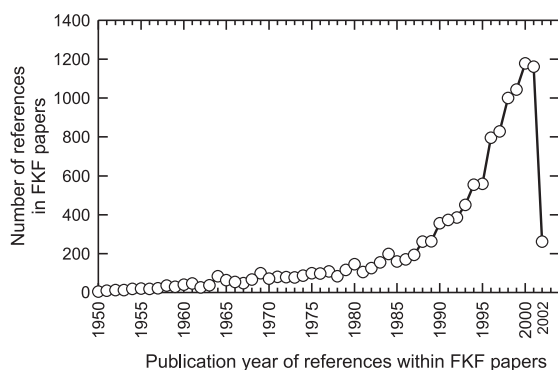


Figure A: Distribution of references within the FKF papers from publication year 2002 on their publication years.

Figure A shows the reference age distribution of the almost 13.000 (12.787) references within the FKF papers from publication year 2002. The maximum is around the publication years 1999–2000, e.g. the two to three years old references are dominating. A small percentage of references was published before 1950 (outside the time frame of Fig. A), ranging back to 1777 as the oldest reference cited in an FKF paper from 2002 (Y. Ben-Ezra *et al.* cited G.C. Lichtenberg). The distribution of references is approximately a mirror image of the time dependent impact (citation history) of most publications in the natural sciences. The estimated *citing half-life* of the FKF papers published in 2002 is 7.2 years. See for comparison: the *citing half-life* of *Phys Rev B* is 7.0 years for publication year 2001 (ISI JCR-2001).

**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 selection of FKF papers by the authors of the citing papers and shows, how long FKF papers are remembered.

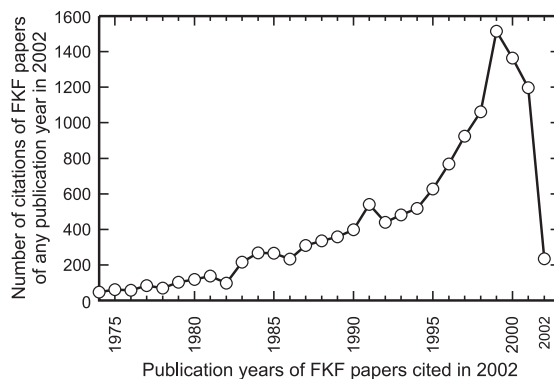


Figure B: Distribution of FKF papers from any publication year cited only in 2002 on their publication years.

Instead of analyzing the references cited by FKF papers, we may look at the FKF papers themselves, cited by other papers. FKF papers of any publication year (not only from publication year 2002) were cited almost 13.000 (12.838) times by other papers published in 2002 only. Figure B shows the publication year distribution of FKF papers, cited in 2002. The FKF papers cited are dominated by those published around 1999. The procedure used here was *citation matching*: Each of the FKF papers (about 15.000 papers up to now) was checked for the number of citations received by citing papers published in 2002 only. The estimated *cited half-life* of FKF papers in 2002 is 6.2 years. See for comparison: the *cited half-life* of *Phys Rev B* is 6.8 years for publication year 2001 (ISI JCR-2001). Within the SCI subject category *Condensed Matter Physics* the *cited half-lives* are ranging from 1.8 to  $> 10$  for that publication year.

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