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Citation Environment of *Angewandte Chemie*

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Abstract: Recently, aggregated journal-journal citation networks were made accessible from the perspective of each journal included in the *Science Citation Index* (see *http://www.leydesdorff.net/jcr05*). The local matrices can be used to inspect the relevant citation environment of a journal using statistical analysis and visualization techniques from social network analysis. The inspection gives an answer to the question what the local impact of this and other journals in the environment is. In this study the citation environment of *Angewandte Chemie* was analyzed. *Angewandte Chemie* is one of the leading chemistry journals in the world. Its environment was compared with that of the *Journal of the American Chemical Society*. The results of the environment analyses give a detailed insight into the field-embeddedness of *Angewandte Chemie*. The impacts of the German and international editions of this journal are compared.

Keywords: *Angewandte Chemie* · Citation environment · Citation network · Journal Citation Reports · Local impact

1. Introduction

In 1976 Eugene Garfield – the founder of the Institute for Scientific Information (ISI, now Thomson Scientific, Philadelphia, PA, USA) – introduced the Journal Citation Reports (JCR) as an instrument to evaluate the significance of scholarly journals.[1] Today, the most important journals (currently about 7,500 journals from more than 3,300 publishers in over 60 countries) are listed in the JCR with a series of bibliometric data and indicators (*e.g.* total citations, Journal Impact Factor, Journal Immediacy Index, Journal Cited Half-Life). Through the publication of the indicators, essentially the Journal Impact Factor (JIF), JCR has become an authority for evaluating scholarly journals.[2,3] To extract information from the JCR on journals within disciplines for interdisciplinary comparison, each journal is classified by using 172 subject categories. For chemistry, the categories analytical, applied, inorganic/nuclear, medicinal, multidisciplinary, organic, and physical are used (*Angewandte Chemie – International Edition* (*Angew. Chem., Int. Ed.*) is classified as multidisciplinary).

The JCR are an index of journal–journal links based on a grouping and summation of condensed citations using the journal name as the sorting key.[1] For each journal, there are two basic print-outs – cited and citing journals. Cited journal data show the number of times papers (original research and review articles) published in a certain year (in journals covered by JCR) cited papers (original research and review articles) published in a certain journal. Citing journal data show the number of times papers published in journals (covered by JCR) were cited in a certain journal in a certain year. Both data combined define a huge matrix of cited and citing journals.[4] From this huge matrix, local matrices can be extracted. Recently, local matrices were made accessible from the perspective of each journal covered by JCR (in 2004 from the perspective of 7,379 journals, see *http://www.leydesdorff.net/jcr04*). The local matrices can be used to inspect the relevant citation environment of one journal (*i.e.* the aggregated journal–journal citation network from the perspective of one journal) by using statistical analysis and visualization techniques from social network analysis.[5] The inspection may give answers to the following questions: what is the scientific impact of this and other journals in the environment (defined each by the number of published papers and their citations)? What is the share of the journal's self-citations among their local impact? Furthermore, and most importantly, environments can be divided in field-specific clusters by means of a journal's citation pattern; relationships between journals and clusters can be identified.

In this study the citation environment of *Angew. Chem.* (we refer to both the German and international edition with this abbreviation) was analyzed. *Angew. Chem.* is one of the leading chemistry journals in the world, with a JIF currently at 9.596 (JCR for 2005). The environment of *Angew. Chem.* was compared with that of the *Journal of the American Chemical Society* (*J. Am. Chem. Soc.*). *J. Am. Chem. Soc.* also belongs to multidisciplinary chemistry in the JCR with a JIF currently at 7.419 (JCR for 2005). Both *Angew. Chem.* and *J. Am. Chem. Soc.* are written and read primarily for the purpose of communication of original research findings.

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2. Data and Descriptive Statistics

The data for the analysis of the *Angew. Chem.* environment originated from the 2004 journal–journal citation database of the JCR. In addition to the JCR data, we extracted the number of citations that *Angew. Chem.* received from other journals from the *Expanded Science Citation Index* at Web of Science (Thomson Scientific). *Angew. Chem.* has been published since 1962 in the form of both a German and an international edition, which has led to a number of problems with respect to citation analyses.[6,7] Since *Angew. Chem.* papers are contained in different volumes and appear with different page numbers in the two editions, these papers are counted as if they were two completely different publications.[6] References to papers in *Angew. Chem.* relate to either one or the other edition or even both editions (double citations), as practiced, *e.g.* for references in papers in *Angew. Chem.* to other *Angew. Chem.* papers.[6] As double citations lead to an overestimation of the citations in JCR by the percentage of citations from both issues of the same paper,[8] we used *Angew. Chem.* data from the *Expanded Science Citation Index* that are corrected for double citations in this study.

The local citation environment for *Angew. Chem.* was determined by including all journals which cited the journal to the extent of 1% of its citation rate: 76,904 (total citations to *Angew. Chem., Int. Ed.*) – 7,512 (self-citations to *Angew. Chem., Int. Ed.*)/100 = 693 citations (on this, see the JCR for 2004). Among the 869 journals that cited Angew. Chem., Int. Ed. in 2004, only 22 cited it more than the 1% threshold of 693 times. Thus, the distribution of citations to the journal is highly skewed.[9] From the 22 journals that cited *Angew. Chem., Int. Ed.* more than 693 times all 852,008 references in 21,958 records were organized in a relational database. Among these 852,008 citations, 41,495 (5%) are to '*Angew. Chem.*' (both editions). One hundred and eleven of these records are incomplete (*e.g.* 'in press, *Angew. Chem.*'); 32,416 (78%) of the remaining 41,495 records cited '*Angew. Chem., Int. Ed.*' and the other 9,079 (22%) '*Angew. Chem.*' without the indication of the international edition. We assume that this represents the German edition. In 8,054 cases, two consecutive records in the same document cited both the German and the international editions. When two citations follow upon each other, one to the German and the other to the international edition and with the same author name and publication year we identified these citations as double citations. Among the 8,054 cases, we found 7,343 double citations and 702 citations solely to the German edition. On the basis of this calculation, the impact of *Angew. Chem.* is overrepresented in this journal set (due to double citations) to the

Table 1. Journals that cited *Angew. Chem.* in 2004 more than 693 times: publisher, subject categories and total number of articles (published in 2004)

Journal (abbreviated journal title)	Publisher	Subject category (from JCR and Ulrich's International Periodical Directory)	Number of articles
Advanced Synthesis & Catalysis (*Adv. Synth. Catal.*)	Wiley - VCH Verlag, Germany	applied, organic chemistry	223
Angewandte Chemie-International Edition (*Angew. Chem., Int. Ed.*)	Wiley - VCH Verlag, Germany	multidisciplinary chemistry	1,224
Chemical Communications (*Chem. Commun.*)	Royal Society of Chemistry, UK	multidisciplinary chemistry	1,321
Chemical Reviews (*Chem. Rev.*)	American Chemical Society, USA	multidisciplinary chemistry	183
Chemistry-A European Journal (*Chem.-Eur. J.*)	Wiley - VCH Verlag, Germany	multidisciplinary chemistry	679
Dalton Transactions (*Dalton Trans.*)	Royal Society of Chemistry, UK	inorganic/nuclear chemistry	614
European Journal of Inorganic Chemistry (*Eur. J. Inorg. Chem.*)	Wiley - VCH Verlag, Germany	inorganic/nuclear chemistry	577
European Journal of Organic Chemistry (*Eur. J. Org. Chem.*)	Wiley - VCH Verlag, Germany	organic chemistry	574
Inorganic Chemistry (*Inorg. Chem.*)	American Chemical Society, USA	inorganic/nuclear chemistry	1,146
Journal of The American Chemical Society (*J. Am. Chem. Soc.*)	American Chemical Society, USA	multidisciplinary chemistry	3,167
Journal of Organic Chemistry (*J. Org. Chem.*)	American Chemical Society, USA	organic chemistry	1,399
Journal of Organometallic Chemistry (*J. Organomet. Chem.*)	Elsevier, the Netherlands	organic, inorganic/ nuclear chemistry	565
Journal of Physical Chemistry B (*J. Phys. Chem. B*)	American Chemical Society, USA	physical chemistry	2,570
Organic & Biomolecular Chemistry (*Org. Biomol. Chem.*)	Royal Society of Chemistry, UK	organic, physical chemistry, biochemistry	519
Organic Letters (*Org. Lett.*)	American Chemical Society, USA	organic chemistry	1,252
Organometallics	American Chemical Society, USA	organic, inorganic/ nuclear chemistry	875
Synlett	Georg Thieme Verlag, Germany	organic, physical chemistry	648
Synthesis-Stuttgart	Georg Thieme Verlag, Germany	organic, physical chemistry	472
Tetrahedron	Pergamon, UK	organic chemistry	1,203
Tetrahedron Letters (*Tetrahedron Lett.*)	Pergamon, UK	organic chemistry	2,133
Tetrahedron: Asymmetry	Pergamon, UK	organic, inorganic/ nuclear, physical chemistry	555
Zeitschrift für Anorganische und Allgemeine Chemie (*Z. Anorg. Allg. Chem.*)	Wiley - VCH Verlag, Germany	inorganic/nuclear chemistry	426

Table 2. Number of times papers published in 2004 (in journals below) cited papers published in *Angew. Chem.* (international edition, German edition, sum of both editions (double citations included), and sum of both editions corrected for double citations) in all years. The percent value specifies the share of a journal's citations among 'Total citations'.

Journal	International edition		German edition		Sum of both editions (double citations included)		Sum of both editions corrected for double citations	
	abs	%	abs	%	abs	%	abs	%
J. Am. Chem. Soc.	4,757	15	264	3	5,021	12	4,846	14
Angew. Chem., Int. Ed.	3,485	11	3,451	38	6,936	17	3,991	12
Chem.-Eur. J.	2,157	7	2,126	24	4,283	10	2,460	7
J. Org. Chem.	2,315	7	203	2	2,518	6	2,378	7
Organometallics	1,866	6	276	3	2,142	5	1,942	6
Org. Lett.	1,903	6	113	1	2,016	5	1,938	6
Tetrahedron Lett.	1,845	6	96	1	1,941	5	1,874	6
Inorg. Chem.	1,801	5	140	2	1,941	5	1,872	6
Tetrahedron	1,705	5	269	3	1,974	5	1,776	5
Chem. Commun.	1,681	5	109	1	1,790	4	1,721	5
Eur. J. Inorg. Chem.	1,148	4	371	4	1,519	4	1,195	3
Dalton Trans.	1,047	3	138	2	1,185	3	1,092	3
Chem. Rev.	860	3	94	1	954	2	902	3
Eur. J. Org. Chem.	835	3	329	4	1,164	3	885	3
J. Phys. Chem. B	811	2	66	1	877	2	868	3
Synlett	814	3	124	1	938	2	845	2
J. Organomet. Chem.	610	2	143	2	753	2	680	2
Org. Biomol. Chem.	689	2	42	0	731	2	692	2
Tetrahedron: Asymmetry	618	2	67	1	685	2	641	2
Synthesis-Stuttgart	543	2	118	1	661	1	569	1
Z. Anorg. Allg. Chem.	452	1	407	4	859	2	502	1
Adv. Synth. Catal.	474	0	133	1	607	1	483	1
Total citations	32,416	100	9,079	100	41,495	100	34,152	100

extent of 21.5%: [7,343/(41,495 – 7,343)] × 100. In a previous study,[6] an overestimation of the (global) JIF with 15% was found, but the effect of 'double citations' is larger in the *Angew. Chem.* citation environment because journals published by German publishers are overrepresented.

Table 1 shows the publisher and the subject categories of the 22 journals that determine the local citation environment of *Angew. Chem.* as well as the total numbers of papers published in 2004 by each of the 22 journals. Seven journals are published by the American Chemical Society (Washington, DC, USA), five journals by Wiley - VCH Verlag (Weinheim, Germany), and three journals by the Royal Society of Chemistry (London, UK) and Pergamon (Amsterdam, The Netherlands), respectively. Most of the journals have been categorized by Thomson Scientific and Ulrich's International Periodical Directory[10] in the fields of multidisciplinary (five journals), inorganic/nuclear (seven journals), and organic (12 journals) chemistry (many journals have been categorized in more than one field in both databases). Table 1 further shows that the number of papers published by the 22 journals averaged about 1,015 with the highest number for *J. Am. Chem. Soc.* (3,167) and the lowest for *Chem. Rev.* (183).

Table 2 shows the number of papers published in 2004 by the 22 journals that cited papers published in *Angew. Chem.* (international edition, German edition, sum of both editions (double citations included), and sum of both editions corrected for double citations) in all years. The separated numbers (row 'Total citations') indicate that the international edition contributed about 70% (32,416) and the German edition about 30% (9,079) to the total number of citations.[6] However, there is a large number of double citations, especially in *Angew. Chem., Int. Ed.* (n = 2,945) and *Chem.-Eur. J.* (n = 1,823). The Table (column 'sum of both editions corrected for double citations') shows that *Angew. Chem.* was cited 3,991 times (12%) by papers published in the same journal. That means about one tenth of citations from journals which contributed more than 1% to the *Angew. Chem.* impact are those of authors who published in *Angew. Chem.* This within-journal citation rate of 12% is lower than, *e.g.* the rate of *J. Am. Chem. Soc.* (it has a share of about 20% within-journal citations among those journals that cited it more than 1% in the same year), but it is definitely higher than the within-journal citation rate of *e.g. Chem. Commun.* (with much less than 10%). Although within-journal citations are often not self-citations by authors, they can be considered as an indicator of the inwardness of a community supporting a journal.[11] As Table 2 shows, 14% of citations to *Angew. Chem.* resulted from papers published in *J. Am. Chem. Soc.* and 7% from ones published in *Chem.-Eur. J.* and *J. Org. Chem.*, respectively. The remaining 60% of citations were provided by the other 18 journals listed in Table 2 (on average 1,138 citations per journal).

3. Results

For our set with journals that cited *Angew. Chem.* to the extent of 1% of its citation rate a 22 × 22 citation matrix was composed with two dimensions: one in the 'cited' (columns) and another in the 'citing' (rows). Both dimensions represent the relevant *Angew. Chem.* citation environment (corrected for double citations) covering the (local) impact of the most important journals. Each journal is represented in the matrix with the number of citations that it received from each of the other 22 journals ('cited' dimension) and with the number of citations that each of the other 22 journals received from this journal ('citing' dimension). The matrix was firstly imported into SPSS – a statistical analysis software[12] – for 'decomposition' of the environment with a reduction scheme, and secondly read into Pajek – a program for large network analysis[13] – for visualization of the environment (the visualization is based on the algorithm of Tomihisa Kamada and Satoru Kawai).[14]

3.1. *'Decomposition' of the Environment*

With exploratory factor analysis we tried to find a reduction scheme that indicates how the citation patterns ('being cited') of the 22 journals in the *Angew. Chem.*

Table 3. Factor loadings resulting from a four factor solution (four factors explain 80% of the variance in the data)

Journal	Factor 1: Organic chemistry	Factor 2: Multidisciplinary chemistry	Factor 3: Inorganic chemistry	Factor 4: Organometallic chemistry
Tetrahedron Lett.	**0.940**	0.134	–0.194	–0.125
Tetrahedron	**0.933**	0.148	–0.206	–0.132
Synthesis-Stuttgart	**0.929**	0.031	–0.202	–0.129
Synlett	**0.920**	0.061	–0.242	–0.135
J. Org. Chem.	**0.895**	0.264	–0.203	–0.125
Eur. J. Org. Chem.	**0.830**	0.202	–0.266	–0.156
Org. Lett.	**0.814**	0.365	–0.244	–0.119
Tetrahedron: Asymmetry	**0.530**	–0.123	–0.427	0.028
J. Am. Chem. Soc.	0.081	**0.948**	–0.062	–0.004
Chem. Rev.	0.215	**0.946**	–0.044	0.075
Angew. Chem.	0.168	**0.915**	0.019	0.080
Chem.-Eur. J.	0.053	**0.882**	0.056	0.094
Chem. Commun.	0.189	**0.867**	0.241	0.225
Adv. Synth. Catal.	0.346	**0.429**	–0.565	0.313
Inorg. Chem.	–0.284	0.327	**0.772**	0.211
Dalton Trans.	–0.346	0.197	**0.714**	**0.461**
Eur. J. Inorg. Chem.	–0.345	0.219	**0.664**	**0.545**
Z. Anorg. Allg. Chem.	–0.285	–0.168	**0.568**	–0.005
J. Organomet. Chem.	–0.173	0.170	0.073	**0.882**
Organometallics	–0.210	0.288	0.031	**0.863**
J. Phys. Chem. B	–0.481	0.350	–0.248	–0.450
Org. Biomol. Chem.	0.304	0.142	–0.200	–0.319

Extraction method: principal component analysis; rotation method: Varimax with Kaiser Normalization. Factor loadings greater than 0.4 are printed in bold, because they indicate a strong positive Pearson's correlation between the journal's citation pattern and the factor.[15]

citation environment cluster or hang together. By the use of principal components in the factor analysis our set of correlated variables (the journals' citation patterns) was transformed into a set of uncorrelated variables (components or factors). The goal of this analysis was that a small number of components would account for most of the variance (>75%) in the patterns.[15] One result of the calculated factor analyses with four components (eigenvalues larger than 1) explained 80% of the variance and was taken as the final result (see Table 3).

The categorization of the journals among the components by using factor loadings greater than 0.4 (these loadings are marked in Table 3) showed that the journals can be categorized in terms of disciplinary affiliations (see also Table 1). A first group of journals (*e.g. Tetrahedron Lett.* and *Synlett*) were cited in the environment according to a pattern of organic chemistry (factor 1 explains 40% of the variance in the matrix); a second and third pattern are specific for multidisciplinary chemistry (*e.g. J. Am. Chem. Soc.* and *Angew. Chem.*; also for applied chemistry: *Adv. Synth. Catal.*) and inorganic/nuclear chemistry (*e.g. Inorg. Chem.* and *Z. Anorg. Allg. Chem.*; factor 2 and factor 3 explain 25% and 9% of the variance, respectively). A fourth group can be designated to organometallic chemistry (*e.g. Z. Organomet. Chem.* and *Organometallics*; factor 4 explains 6% of the variance).

As *Dalton Trans.* and *Eur. J. Inorg. Chem.* embrace both aspects of the chemistry of inorganic and organometallic compounds, their citation patterns are not only specific for inorganic but also for organometallic chemistry. Because of low and negative factor loadings in Table 3, *J. Phys. Chem. B* and *Org. Biomol. Chem.* could not clearly be designated to one of the four factors. All in all, the results of the factor analysis show that the *Angew. Chem.* citation environment is determined by citation patterns that are characteristic for organic (factor 1), multidisciplinary (factor 2), and inorganic/nuclear (organometallic, factor 3 and 4) chemistry journals.

3.2. *Visualization of the Citation Environment*

Fig. 1 shows the citation environment of *Angew. Chem.* by using nodes to indicate a specific journal and solid lines for links between journals. The links are defined by a similarity measure: the cosine coefficient.[16] This coefficient is similar to the well-known Pearson's correlation coefficient and specifies each correlation between the citation patterns ('being cited') of the 22 journals.[11] Links between journals representing cosine values below 0.2 are suppressed in Fig. 1 in order to display only the most important correlations.

In agreement with the results of the factor analysis, Fig. 1 shows that *Angew. Chem.* is strongly embedded in a core group of five multidisciplinary chemistry journals (journals with red nodes). Organic and inorganic/nuclear (together with organometallic) journals are connected to this core group at specific sites: organic chemistry journals at the top of Fig. 1 (journals with green nodes) and inorganic/nuclear chemistry at the bottom (journals with blue nodes). Also in agreement with the factor analysis findings, *J. Phys. Chem. B* appears in the *Angew. Chem.* environment as a more or less isolated point. This journal presumably represents an environment according to a citation pattern of chemical physics and physical chemistry (surface chemistry, electrochemistry, and in particular the strongly increasing nanoscience). Almost 40% of *J. Phys. Chem. B* papers published in 2004 and citing *Angew. Chem.* (both editions) deal with topics related to nanoscience. At the bottom of Fig. 1, *Z. Anorg. Allg. Chem.* clearly belongs to the inorganic journal group, but the node also appears somewhat isolated. We assume that *Z. Anorg. Allg. Chem.* is still perceived in the scientific community as one of the traditional German chemistry journals (and is not perceived as an international chemistry journal), although the number of papers published in English is currently larger than the number of papers published in German.

The shape of the nodes in Fig. 1 is used to indicate the percentage contribution of each journal to the citation environment both including and excluding within-journal citations: the greater the vertical size of one node, the greater the share of received citations among the total number of citations in the environment. The share of received citations is not only dependent on the impact of the papers published by a certain journal but also by the total number of papers in the journal published in 2004; citations and number of articles strongly correlate (Spearman's rank correlation = 0.76). Whereas the vertical size of the nodes

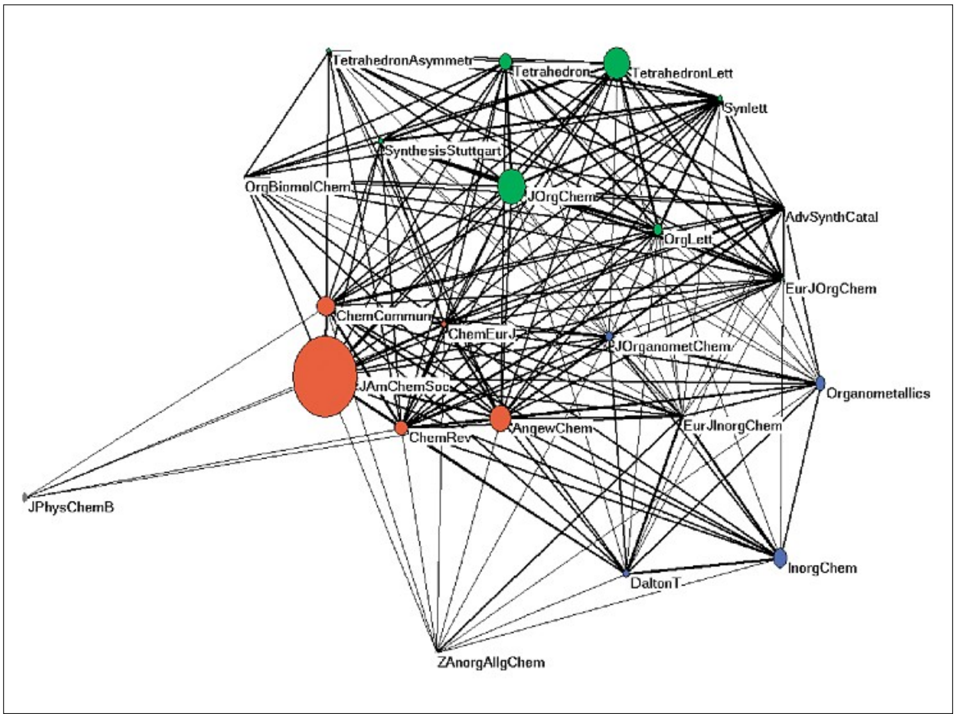

Fig. 1. Relevant citation environment of *Angew. Chem.* (corrected for double citations). Share of journal's citations (without self-citations in parentheses) among total citations: *J. Am. Chem. Soc.* 23.9% (19.0%); *J. Org. Chem.* 10.4% (8.5%); *Tetrahedron Lett.* 9.5% (7.9%); *Angew. Chem.* 8.1% (6.3%); *Chem. Commun*. 6.0% (5.6%); *Inorg. Chem.* 5.8% (4.1%); *Tetrahedron* 4.8% (4.1%); *Organometallics* 4.6% (3.0%); *Chem. Rev.* 4.3% (4.2%); *Org. Lett.* 3.6% (3.1%); *J. Organomet. Chem*. 3.0% (2.4%); *J. Phys. Chem. B* 2.8% (1.0%); *Dalton Trans.* 2.7% (2.2%); *Chem.-Eur. J.* 2.0% (1.8%); *Synthesis-Stuttgart* 1.9% (1.7%); *Synlett* 1.9% (1.7%); *Tetrahedron: Asymmetry* 1.7% (1.3%); *Eur. J. Org. Chem.* 1.0% (0.9%); *Eur. J. Inorg. Chem.* 0.8% (0.6%); *Z. Anorg. Allg. Chem*. 0.7% (0.4%); *Adv. Synth. Catal.* 0.3% (0.3%); *Org. Biomol. Chem.* 0.2% (0.2%)

in Fig. 1 indicates the share of citations including journal self-citations, self-citations are not considered for the horizontal size. The more 'stretched' a node in the longitudinal axis appears, the higher is the share of self-citations. By inspecting the shape of the nodes in the Fig. one is able to see how much a journal is dependent on an inner-circle of authors citing one another. Note that within-journal citations can be both self-citations of authors and citations among different authors publishing in the same journal.[11]

As the results in Fig. 1 show, most of the citations in this environment account for *J. Am. Chem. Soc*. with a share of 24% (19% without within-journal citations); about 8% account for *Angew. Chem.* (6% without within-journal citations). The high citation share for *J. Am. Chem. Soc.* compared to *Angew. Chem.* may especially be due to the fact that *J. Am. Chem. Soc*. published about 2.6 times more papers in 2004 than *Angew. Chem.* (see Table 1). Fig. 1 further shows that *J. Org. Chem*. and *Tetrahedron Lett*., respectively, received a share of about 10% (including within-journal citations). The shape of the nodes for these dominant journals in the environment indicates that the number of self-citations does not weight heavily: the citation patterns are not dominated by within-journal citation rates. The lowest number of citations in the *Angew. Chem.* citation environment account for *Org. Biomol. Chem.* (0.2% with or without within-journal citations). If we sum the shares of the journals' citations according to the field categorizations in Table 3, the following percentage values arise: 47% for multidisciplinary chemistry (citation rate received by 7,411 papers published in seven journals), 38% for organic chemistry (citation rate received by 8,801 papers published in nine journals), and 12% for inorganic/nuclear and organometallic chemistry (citation rate received by 3,024 papers published in four journals).

For the purpose of comparison with the *Angew. Chem.* citation environment, the environment of *J. Am. Chem. Soc*. is shown in Fig. 2. Among the 1,566 journals which cited *J. Am. Chem. Soc.* in 2004 at least once, 21 cited it above the citation threshold of 1%. Whereas sixteen of the 21 journals appear also in the citation environment of the *Angew. Chem*. (see Fig. 1), six journals drop out. Except for one journal (*Tetrahedron: Asymmetry*), these journals are published by German publishers (*Adv. Synth. Catal.*, *Eur. J. Inorg. Chem.*, *Synlett*, *Synthesis-Stuttgart*, and *Z. Anorg. Allg. Chem.*; see Table 1). Five journals in the citation environment of *J. Am. Chem. Soc.* are not able to exceed the 1% threshold value in the *Angew. Chem.* environment: *Journal*

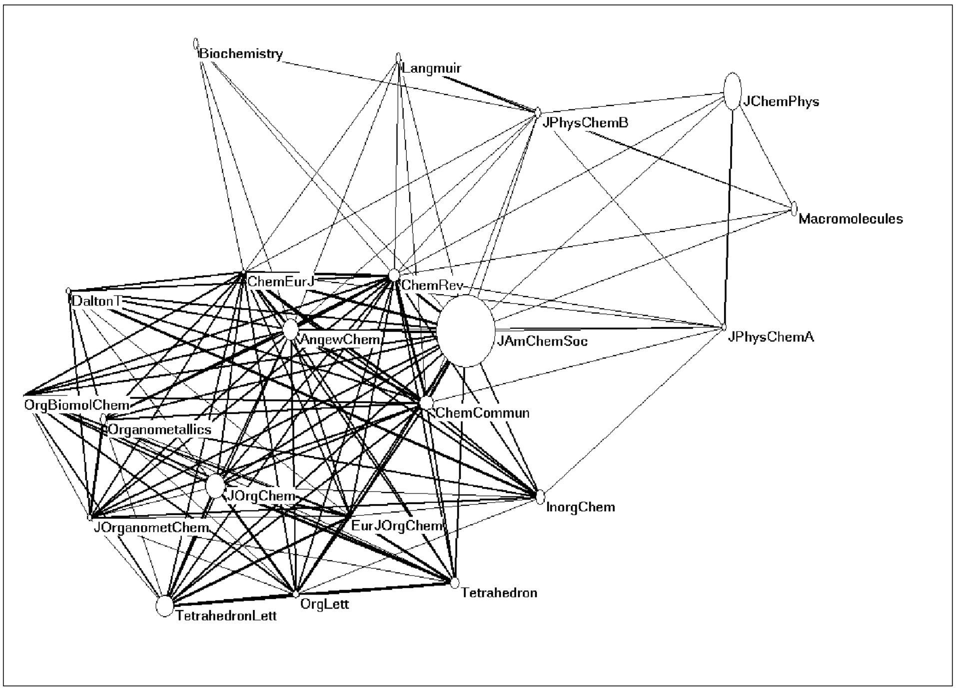

Fig. 2. Relevant citation environment of *J. Am. Chem. Soc.* (corrected for double citations of *Angew. Chem.*). Share of journal's citations (without self-citations in parentheses) among total citations: *J. Am. Chem. Soc.* 21.7% (17.5%); *J. Chem. Phys.* 11.4% (5.5%); *J. Org. Chem.* 7.5% (5.9%); *Tetrahedron Lett.* 6.7% (5.3%); *Angew. Chem.* 6.4% (4.9%); *Chem. Commun.* 4.7% (4.3%); *Inorg. Chem.* 4.4% (2.9%); *Macromolecules* 4.3% (1.8%); *Chem. Rev.* 3.8% (3.7%); *Biochemistry* 3.7% (1.5%); *Organometallics* 3.5% (2.2%); *J. Phys. Chem. B* 3.5% (2.0%); *Tetrahedron* 3.4% (2.8%); *Langmuir* 3.3% (1.6%); *J. Phys. Chem. A* 2.6% (1.6%); *Org. Lett.* 2.5% (2.1%); *J. Organomet. Chem.* 2.2% (1.7%); *Dalton Trans.* 1.9% (1.5%); *Chem.-Eur. J.* 1.6% (1.4%); *Eur. J. Org. Chem.* 0.7% (0.6%); *Org. Biomol. Chem*. 0.2% (0.1%)

of Physical Chemistry A (*J. Phys. Chem. A*), *Journal of Chemical Physics* (*J. Chem. Phys.*), *Macromolecules*, *Biochemistry* and *Langmuir*.

If we compare the visualizations for *Angew. Chem.* and *J. Am. Chem. Soc*. in Fig. 1 and Fig. 2 it is clearly visible that both citation environments are dominated by a strong core group of nearly the same journals with similar citation patterns. Journals which are each dropped out in the other citation environment are positioned in both figures primarily in the periphery around the core group. In the *Angew. Chem.* environment, the journals are to be found at different points in the periphery. However, in the *J. Am. Chem. Soc.* environment, these journals form a separate group beside the strong core group at the top in Fig. 2. This means that these journals are characterized by similar citation patterns which are (more or less) different from those of the core group (except for *Biochemistry*). According to the subject categories provided by JCR and Ulrich's International Periodical Directory,[10] *J. Chem. Phys.*, *J. Phys. Chem. A*, and *J. Phys. Chem. B* belong to the fields of physical chemistry and chemical physics. *Langmuir* is also strongly related to physical chemistry (*e.g.* surface and interface chemistry/physics) and *Macromolecules* includes papers on surface properties of polymers.

4. Discussion

The JCR publish annual updated publication and citation data to measure the performance of journals.[9] In this study the relevant citation environment of *Angew. Chem*. was analyzed by using these data (corrected for double citations). The most important journals and their impact as well as field-specific journal clusters were identified in the environment by means of statistical analysis and visualization techniques. The results of the environment analyses give a detailed insight into the field-embeddedness of *Angew. Chem.* JCR data for the year 2004 were analyzed. We assume that the results presented here for 2004 have time stability and can be extrapolated on 'flanking' years because a series of studies have shown remarkable time stabilities in journal citation patterns.[1,17]

The 'decomposition' of a citation environment remains sensitive to the choice of the seed journal (the 'point of entrance'). Journal citation patterns span a multidimensional space in which clouds can be distinguished, but the delineation of these clouds at the edges remains fuzzy and varies with the perspective chosen by the analyst.[18] Therefore, the analyses of (inter-)disciplinary links between and among certain citation environments will be topics of great interest in future journal citation network analyses.

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