Image of Analytical Chemistry As Reflected in the Analytical Abstracts Database: Journal Coverage, Concentration, and Dispersion of the Analytical Literature

T. Braun,*,†,‡ W. Glänzel,‡ Hajnalka Maczelka,‡ and S. Zsindely‡

Department of Inorganic and Analytical Chemistry, L. Eötvös University, P.O. Box 123, 1443 Budapest, Hungary, and Information Science and Scientometrics Research Unit, Library of the Hungarian Academy of Sciences, Budapest, Hungary

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Analytical Abstracts, a publication of the Royal Society of Chemistry, has been studied to determine how well it reflects the field of analytical chemistry. Its coverage is generally good, although one shortcoming was noted. Analytical Abstracts provides less than complete coverage of "titled" journals in analytical chemistry, i.e., those journals whose title includes "analytical chemistry" of the name of a subfield.

INTRODUCTION

Over 300 years ago, scientists found that keeping up with one another's current work had become too great a burden to handle by word of mouth and correspondence. As a result, the scientific paper was formalized and distributed by means of scientific journals, the first of these having been founded in 1665. Since that time, the number of scientific papers and the number of scientific journals have increased steadily and exponentially.[1,2] No longer could individual scientists rely on their own faculties to keep abreast of their field. As science grew and proliferated, so too did its record, and as a consequence a need arose for a methodological device to provide bibliographical control. The abstract journals were born to satisfy these needs. Nowadays, most printed abstract journals are being stored also on magnetic tapes and/or CD-ROM discs and made available for computer-aided information retrieval. The considerable costs of this manner of literature storage and searching oblige the searcher to use these tools as efficiently as possible. Therefore, a thorough knowledge of the contents of the abstract journals/databases which are available and the manner in which their content is made accessible is compulsory.

In the field of analytical chemistry, the unique, specialized abstract journal/database worldwide is the *Analytical Abstracts* (AA), founded in 1954 and published since then regularly by the Royal Society of Chemistry in London,[3] As stated in its subtitle, AA is "a monthly journal with worldwide coverage of the literature on all branches of analytical chemistry". The "Guide to AA" printed in each issue of the journal further mentions that "*Analytical Abstracts* is a journal providing a complete current awareness service covering all aspects of analytical chemistry. Over 400 core analytical journals are scanned regularly and items are seelcted from over 1500 other journals as well as books, technical proceedings. All items of interest to an analytical chemist are included except theoretical studies, biological or microbiological analysis, or structure determinations".[3]

As far as the present authors know, there is no detailed statistical evaluation available on the journal coverage aspects of the Analytical Abstracts database. That's why the present study is dedicated to such an evaluation for the 1980–1989 period. Additionally, the dispersion, respectively, the concentration of the journal literature of analytical chemistry in the AA database is also investigated, and some measurements, to answer the crucially important question on how true a mirror of the analytical literature the Analytical Abstracts database is, are also performed.

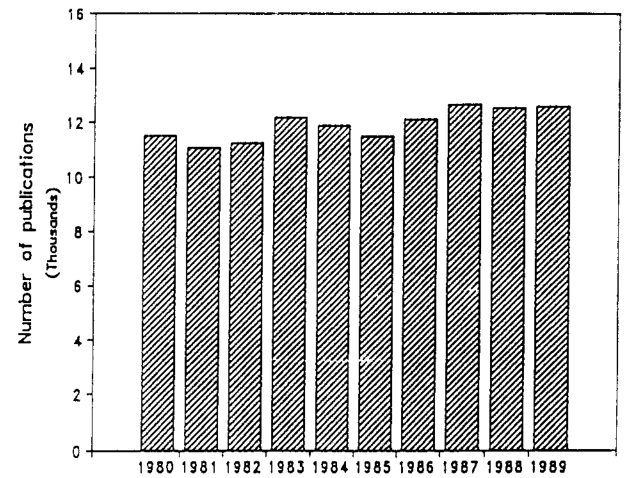

Figure 1. Time series of papers processed by the AA database.

METHODOLOGY

For the purpose of this analysis, two main data sources were utilized:

- the Analytical Abstracts database (on CD-ROM discs), for the period 1980–1989
- the Science Citation Index database (on CD-ROM discs) for the period 1980–1989

In all our investigations, only journal papers were taken into account. For the 10-year period examined, this meant a total of 119 125 articles processed, which represented 94% of the total items included in the AA database. The remaining 6% are books, reports, etc.

RESULTS

Figure 1 illustrates the time series of the article coverage in the AA database during the 1980–1989 period. As shown, there is no direct link between the growth of the analytical literature in periodicals and the coverage in AA, since probably administrative and funding considerations preclude proportionate growth. Indeed, the total articles coverage in AA has shown a very modest growth from 11 507 in 1980 to 12 566 in 1989.

† L. Eötvös University.
‡ Library of the Hungarian Academy of Sciences.

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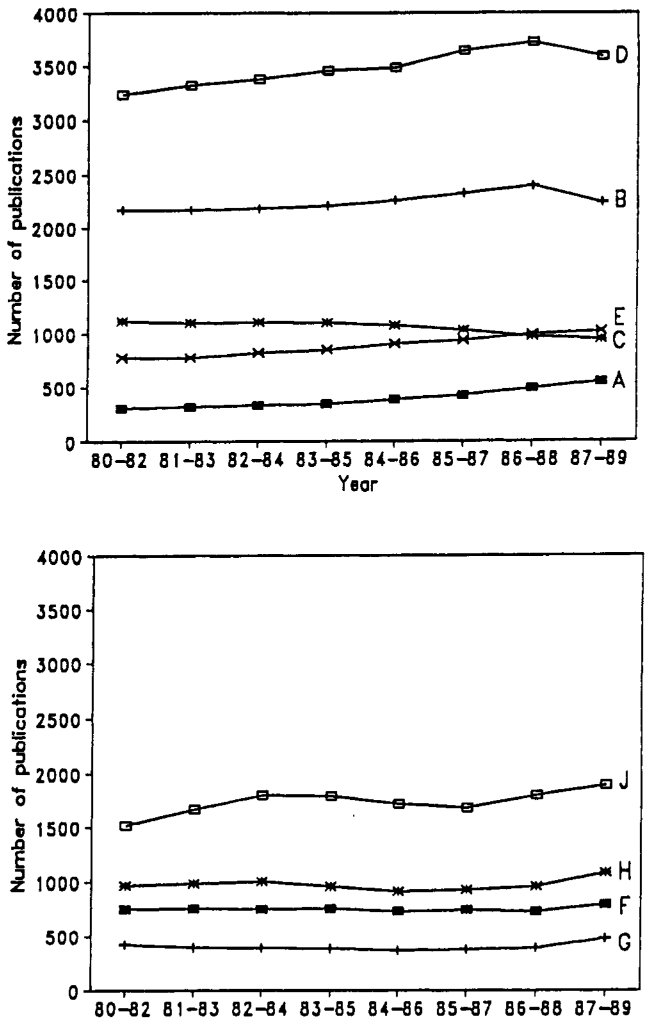

Figure 2. Moving average data on the articles processed in the nine sections of the AA database. A, general analytical chemistry; B, inorganic chemistry; C, organic chemistry; D, biochemistry; E, pharmaceutical chemistry; F, food; G, agriculture; H, environmental chemistry; J, apparatus and techniques.

Thus, there is no direct way to know from AA to what degree total journal publications in the area of analytical chemistry have increased in absolute terms. However, we could presume that items in *Analytical Abstracts* do accurately reflect the makeup of the analytical journal literature as a whole. That is, that *Analytical Abstracts* randomly includes analytical chemistry journal references without bias. It could also be presumed that growth or decay trends may be readily analyzed by determining the percentage shares of journal articles in *Analytical Abstracts* relating to a particular topic. According to this general approach, one may use *Analytical Abstracts* to gauge the relative growth or decay trends of analytical chemistry subfields and topics within the analytical literature. How correct the above-mentioned presumptions are will be examined during an analysis of the journal coverage and inclusion rates of papers from different journals into the AA database. However, as visible in Figure 2, the above-mentioned presumptions were not fulfilled in the case of the broad sections of the database. The 3-year moving average data on the number of journal papers and percentages shares in the nine sections of AA show a pattern very similar to that in Figure 1, which implies that in this case either proportionate growth or decline is impossible to be traced.

During the 10-year period investigated, the AA database extracted articles from a total of 3568 journals. The rank-frequency distribution of papers in the first 150 journals is presented in Figure 3. As shown, the distribution is very

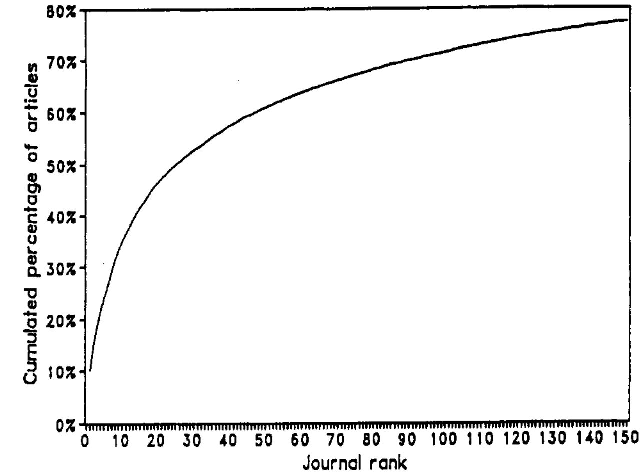

Figure 3. Rank-productivity distribution of journals in the AA database (see also Table II).

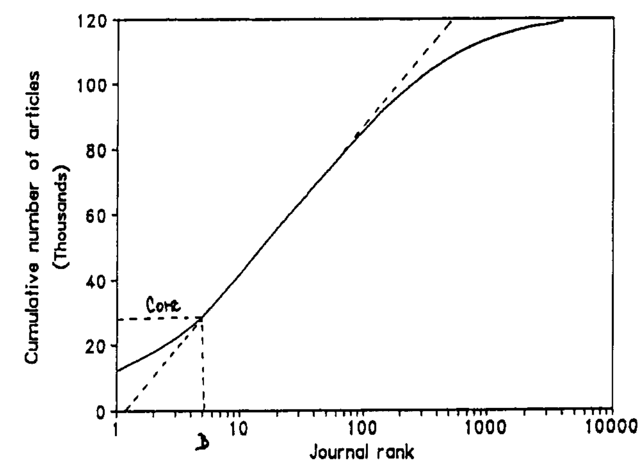

Figure 4. Bradford graph of rank-productivity distribution of journals in the AA database (see also Table I).

skewed with about 78% of total journal articles processed by the AA database concentrated in a mere 4% of the journals. As the total articles and journals data spanned over several orders of magnitude, it was easier to display data on semilogarithmic coordinates. Thus, the cumulative number of journal articles processed by the database has been plotted against the logarithm of the journal's rank as visible in Figure 4. This type of graph is sometimes referred to as the Bradford graph reflecting Bradford's law of literature scatter or dispersion.[4]

Bradford's law[4] is well-known and widely used in the information sciences for ranking a set of journals and for determining core journals lists. If Bradford's law is followed for the corpus of the literature, the curve has the classic S-shape, as shown in Figure 4. The core is made up of those journals on the initial part of the curve, up to the point it becomes linear (B in Figure 4). A substantial number of papers on Bradford's law have appeared in the literature, including some presenting alternative formulations and others discussing the meaning of the departure from linearity at the upper end of the curve.[4]

In fact, Bradford's law is one of several statistical laws which try to describe the working mechanism of science by mathematical means. It tends to demonstrate that a few (journals) account for the many (articles). In practical terms, this means that there are diminishing returns in trying to do anything exhaustively.

For the sake of the present study, we will take a simplified view and consider that the first upward curved part of the Bradford graph in Figure 4 represents the concentration and

Table I. Bradford Ranking of Analytical Chemistry Journals

rank	journal	no. of papers in AA database	total no. of papers (in SCI)	no. of papers not processed by AA	% of papers not processed by AA
1	*J. Chromatogr.*	12144	13799	1655	12.0
2	*Anal. Chem.*	5641	7205	1564	21.7
3	*Clin. Chem. (Winston-Salem, NC)*	4109	6859	2750	40.1
4	*Anal. Chim. Acta*	3816	4321	505	11.7
5	*Anal. Biochem.*	3173	5844	2671	45.7
6	*Zh. Anal. Khim.*	3141	0		
7	*Fresenius' Z. Anal. Chem.*	2924	3436	512	14.9
8	*Analyst (London)*	2625	2820	195	6.9
9	*Bunseki Kagaku*	2044	2086	42	2.0
10	*Fenxi Huaxue*	2033	0		
11	*J. Assoc. Off. Anal. Chem.*	1923	2471	548	22.2
12	*Talanta*	1709	2112	403	19.1
13	*J. Liq. Chromatogr.*	1538	1932	394	20.4
14	*Zavod. Lab.*	1464	0		
15	*Anal. Lett.*	1405	1630	225	13.8
16	*Chromatographia*	1310	1789	479	26.8
17	*Clin. Chim. Acta*	1228	3387	2159	63.7
18	*HRC&CC*	1214	0		
19	*J. Radioanal. Nucl. Chem.*	1127	2590	1463	56.5
20	*Mikrochim. Acta*	951	1232	281	22.8
21	*Appl. Spectrosc.*	913	1920	1007	52.4
22	*Nucl. Instrum. Methods Phys. Res.*	857	14813	13956	94.2
23	*J. Chromatogr. Sci.*	848	992	144	14.5
24	*Chem. Anal. (Warsaw)*	809	923	114	12.4
25	*Microchem. J.*	806	947	141	14.9
26	*Anal. Proc. (London)*	774	0		
27	*Spectrochim. Acta*	758	3157	2399	76.0
28	*Fenxi Shiyanshi*	716	0		
29	*J. Pharm. Sci.*	617	3436	2819	82.0
30	*Analusis*	604	787	183	23.3
31	*J. Anal. Toxicol.*	598	755	157	20.8
32	*J. Radioanal. Chem.*	596	904	308	34.1
33	*J. Agric. Food Chem.*	591	3188	2597	81.5
34	*J. Pharm. Biomed. Anal.*	576	492		
35	*Ann. Clin. Biochem.*	565	989	424	42.9
36	*Yaowu Fenxi Zazhi*	532	0		
37	*J. Clin. Chem. Clin. Biochem.*	516	1108	592	53.4
38	*Anal. Sci.*	508	0		
39	*J. Anal. At. Spectrom.*	506	530	24	4.5
40	*Z. Lebensm. Unters. Forsch.*	501	1022	521	51.0
41	*Int. Lab.*	482	0		
42	*Indian Drugs*	469	0		
43	*Int. J. Environ. Anal. Chem.*	455	680	225	33.1
44	*Lihua Jianyan*	448	0		
45	*Chem. Pharm. Bull.*	428	7443	7015	94.2
46	*J. Indian Chem. Soc.*	401	2473	2072	83.8
47	*Farmatsiya (Moscow)*	390	0		
48	*Huaxue Shiji*	388	0		
49	*At. Spectrosc.*	376	61		
50	*J. Immunol. Methods*	373	3505	3132	89.4
51	*Khim. Prom-st.*	372	0		
52	*TrAC*	364	466	102	21.9
53	*Chem. Listy*	361	952	591	62.1
54	*Gig. Sanit.*	360	0		
55	*Ther. Drug Monit.*	358	811	453	55.9
56	*Pharmazie*	346	3189	2843	89.2
57	*Biomed. Mass Spectrom.*	337	646	309	47.8
58	*Lab. Pract.*	331	0		
59	*GIT Fachz. Lab.*	317	0		
60	*Bull. Chem. Soc. Jpn.*	316	8347	8031	96.2
61	*Indian J. Chem.*	314	7620	7306	95.9
62	*Biomed. Environ. Mass Spectrom.*	309	637	328	51.5
63	*Electrophoresis (Weinheim)*	305	874	569	65.1
64	*An. Quim.*	294	2077	1783	85.8
65	*Rev. Chim. (Bucharest)*	285	0		
66	*X-ray Spectrom.*	277	386	109	28.2
67	*Am. Ind. Hyg. Assoc. J.*	277	1449	1172	80.9
68	*Sepu*	272	0		
69	*Farm. Zh. (Kiev)*	265	0		
70	*Eisei Kagaku*	253	0		
71	*Nippon Kagaku Kaishi*	246	3476	3230	92.9
72	*Yankuang Ceshi*	245	0		
73	*JAOCS*	238	2032	1794	88.3
74	*Chemosphere*	238	2115	1877	88.7
75	*Radiochem. Radioanal. Lett.*	235	794	559	70.4
76	*Shokuhin Eiseigaku Zasshi*	235	0		
77	*Commun. Soil Sci. Plant Anal.*	232	1042	810	77.7

Table I (Continued)

rank	journal	no. of papers in AA database	total no. of papers (in SCI)	no. of papers not processed by AA	% of papers not processed by AA
78	*J. Autom. Chem.*	232	240	8	3.3
79	*Fen Hsi Hua Hsueh*	223	0		
80	*Environ. Sci. Technol.*	222	2184	1962	89.8
81	*Guangpuxue Yu Guangpu Fenxi*	219	0		
82	*J. Food Sci.*	218	4740	4522	95.4
83	*Ukr. Khim. Zh. (Russ. Ed.)*	216	3305	3089	93.5
84	*J. Electroanal. Chem. Interfacial Electrochem.*	215	4862	4647	95.6
85	*Dtsch. Lebensm. Rundsch.*	214	456	242	53.1
86	*Bull. Environ. Contam. Toxicol.*	206	2653	2447	92.2
87	*Int. J. Appl. Radiat. Isot.*	200	1161	961	82.8
88	*Ann. Chim. (Rome)*	194	617	423	68.6
89	*Zentralbl. Pharm.*	193	0		
90	*Yakugaku Zasshi*	191	1575	1384	87.9
91	*Cesk. Farm.*	190	0		
92	*LC-GC*	188	138		
93	*Afinidad*	182	489	307	62.8
94	*J. Sci. Food Agric.*	181	1722	1541	89.5
95	*J. Lipid Res.*	181	1636	1455	88.9
96	*Clin. Biochem. (Ottawa)*	180	673	493	73.3
97	*J. Inst. Chem. (India)*	180	0		
98	*Lipids*	180	1676	1496	89.3
99	*Atmos. Environ.*	179	2701	2522	93.4
100	*Yaoxue Xuebao*	173	0		
101	*Quim. Anal. (Barcelona)*	171	0		
102	*Collect. Czech. Chem. Commun.*	170	3411	3241	95.0
103	*Huaxue Tongbao*	170	0		
104	*Int. J. Mass Spectrom. Ion Phys.*	169	1940	1771	91.3
105	*Zh. Prikl. Spektrosk.*	169	0		
106	*Yaoxue Tongbao*	167	0		
107	*Agric. Biol. Chem.*	166	5743	5577	97.1
108	*Spectrosc. Lett.*	165	818	653	79.8
109	*Magy. Kém. Foly.*	161	994	833	83.8
110	*Bunseki*	161	0		
111	*Lebensmittelchem. Gerichtl. Chem.*	160	0		
112	*Vysokochist. Veshchestva*	159	0		
113	*Spectra 2000*	159	0		
114	*SIA*	157	0		
115	*Acta Pol. Pharm.*	157	509	352	69.2
116	*Khim. Farm. Zh.*	154	3393	3239	95.5
117	*Izv. Vyssh. Uchebn. Zaved.*	153	0		
118	*Forensic Sci. Int.*	153	471	318	67.5
119	*Pure Appl. Chem.*	151	1855	1704	91.9
120	*J. Forensic Sci.*	146	336	190	56.5
121	*Z. Chem.*	146	2576	2430	94.3
122	*Riv. Ital. Sostanze Grasse*	145	0		
123	*Sep. Sci. Technol.*	141	960	819	85.3
124	*J. Planar Chromatogr. Mod. TLC*	140	0		
125	*Mitt. Geb. Lebensmittelunters. Hyg.*	140	0		
126	*Biochem. Soc. Trans.*	139	1341	1202	89.6
127	*Isotopenpraxis*	138	1029	891	86.6
128	*Appl. Radiat. Isot.*	136	697	561	80.5
129	*Chem. Lett.*	134	5728	5594	97.7
130	*Farmaco*	131	75		
131	*J. Steroid Biochem.*	131	3076	2945	95.7
132	*Rocz. Panstw. Zakl. Hig.*	127	0		
133	*Chem. Prum.*	127	0		
134	*Water Res.*	126	2061	1935	93.9
135	*J. Biochem. Biophys. Methods*	126	619	493	79.6
136	*J. Pharm. Pharmacol.*	125	2483	2358	95.0
137	*Nahrung*	125	1249	1124	90.0
138	*Huaxue Xuebao*	122	0		
139	*Radiokhimiya*	121	0		
140	*Latv. PSR Zinat. Akad. Vestis*	121	0		
141	*Indian J. Pharm. Sci.*	117	0		
142	*Pharm. Weekbl.*	115	424	309	72.9
143	*Farm. Pol.*	115	0		
144	*Biomed. Chromatogr.*	115	50		
145	*Org. Mass Spectrom.*	112	2551	2439	95.6
146	*Sci. Total Environ.*	110	1975	1865	94.4
147	*LaborPraxis*	108	0		
148	*Arzneim. Forsch.*	105	3889	3784	97.3
149	*J. Inst. Brew.*	104	503	399	79.3
150	*Fuel*	103	2822	2719	96.4

that the last downward curved part shows the dispersion of the literature of analytical chemistry as included into the AA database. Table I presents a ranked list of journals as represented in Figure 3 and in the first part of Figure 4.

Although Bradford's law has often been successfully used in the construction of core journal lists,[5] it has the shortcoming

Table II. Percentage Ranking of Analytical Chemistry Journals

rank	journal	total no. of papers (in SCI)	no. of papers in AA	% of articles in AA	Bradford rank
1	*Bunseki Kagaku*	2086	2044	98.0	9
2	*J. Autom. Chem.*	240	232	96.7	78
3	*J. Anal. At. Spectrom.*	530	506	95.5	39
4	*Analyst (London)*	2820	2625	93.1	8
5	*Anal. Chim. Acta*	4321	3816	88.3	4
6	*J. Chromatogr.*	13799	12144	88.0	1
7	*Chem. Anal. (Warsaw)*	923	809	87.6	24
8	*Anal. Lett.*	1630	1405	86.2	15
9	*J. Chromatogr. Sci.*	992	848	85.5	23
10	*Microchem. J.*	947	806	85.1	25
11	*Fresenius' Z. Anal. Chem.*	3436	2924	85.1	7
12	*Talanta*	2112	1709	80.9	12
13	*J. Liq. Chromatogr.*	1932	1538	79.6	13
14	*J. Anal. Toxicol.*	755	598	79.2	31
15	*Anal. Chem.*	7205	5641	78.3	2
16	*TrAC*	466	364	78.1	52
17	*J. Assoc. Off. Anal. Chem.*	2471	1923	77.8	11
18	*Mikrochim. Acta*	1232	951	77.2	20
19	*Analusis*	787	604	76.7	30
20	*Chromatographia*	1789	1310	73.2	16
21	*X-ray Spectrom.*	386	277	71.8	66
22	*Int. J. Environ. Anal. Chem.*	680	455	66.9	43
23	*J. Radioanal. Chem.*	904	596	65.9	32
24	*Clin. Chem. (Winston-Salem, NC)*	6859	4109	59.9	3
25	*Ann. Clin. Biochem.*	989	565	57.1	35
26	*Anal. Biochem.*	5844	3173	54.3	5
27	*Biomed. Mass Spectrom.*	646	337	52.2	57
28	*Z. Lebensm. Unters. Forsch.*	1022	501	49.0	40
29	*Biomed. Environ. Mass Spectrom.*	637	309	48.5	62
30	*Appl. Spectrosc.*	1920	913	47.6	21
31	*Dtsch. Lebensm. Rundsch.*	456	214	46.9	85
32	*J. Clin. Chem. Clin. Biochem.*	1108	516	46.6	37
33	*Ther. Drug Monit.*	811	358	44.1	55
34	*J. Radioanal. Nucl. Chem.*	2590	1127	43.5	19
35	*J. Forensic Sci.*	336	146	43.5	120
36	*Chem. Listy*	952	361	37.9	53
37	*Afinidad*	489	182	37.2	93
38	*Clin. Chim. Acta*	3387	1228	36.3	17
39	*Electrophoresis (Weinheim)*	874	305	34.9	63
40	*Forensic Sci. Int.*	471	153	32.5	118
41	*Ann. Chim. (Rome)*	617	194	31.4	88
42	*Acta Pol. Pharm.*	509	157	30.8	115
43	*Radiochem. Radioanal. Lett.*	794	235	29.6	75
44	*Pharm. Weekbl.*	424	115	27.1	142
45	*Clin. Biochem. (Ottawa)*	673	180	26.7	96
46	*Spectrochim. Acta*	3157	758	24.0	27
47	*Commun. Soil Sci. Plant Anal.*	1042	232	22.3	77
48	*J. Inst. Brew.*	503	104	20.7	149
49	*J. Biochem. Biophys. Methods*	619	126	20.4	135
50	*Spectrosc. Lett.*	818	165	20.2	108
51	*Appl. Radiat. Isot.*	697	136	19.5	128
52	*Am. Ind. Hyg. Assoc. J.*	1449	277	19.1	67
53	*J. Agric. Food Chem.*	3188	591	18.5	33
54	*J. Pharm. Sci.*	3436	617	18.0	29
55	*Int. J. Appl. Radiat. Isot.*	1161	200	17.2	87
56	*J. Indian Chem. Soc.*	2473	401	16.2	46
57	*Magy. Kém. Foly.*	994	161	16.2	109
58	*Sep. Sci. Technol.*	960	141	14.7	123
59	*An. Quim.*	2077	294	14.2	64
60	*Isotopenpraxis*	1029	138	13.4	127
61	*Yakugaku Zasshi*	1575	191	12.1	90
62	*JAOCS*	2032	238	11.7	73
63	*Chemosphere*	2115	238	11.3	74
64	*J. Lipid Res.*	1636	181	11.1	95
65	*Pharmazie*	3189	346	10.8	56
66	*Lipids*	1676	180	10.7	98
67	*J. Immunol. Methods*	3505	373	10.6	50
68	*J. Sci. Food Agric.*	1722	181	10.5	94
69	*Biochem. Soc. Trans.*	1341	139	10.4	126
70	*Environ. Sci. Technol.*	2184	222	10.2	80
71	*Nahrung*	1249	125	10.0	137
72	*Int. J. Mass Spectrom.-Ion Phys.*	1940	169	8.7	104
73	*Pure Appl. Chem.*	1855	151	8.1	119
74	*Bull. Environ. Contam. Toxicol.*	2653	206	7.8	86
75	*Nippon Kagaku Kaishi*	3476	246	7.1	71
76	*Atmos. Environ.*	2701	179	6.6	99
77	*Ukr. Khim. Zh. (Russ. Ed.)*	3305	216	6.5	83
78	*Water Res.*	2061	126	6.1	134

Table II (Continued)

rank	journal	total no. of papers (in SCI)	no. of papers in AA	% of articles in AA	Bradford rank
79	*Nucl. Instrum. Methods Phys. Res.*	14813	857	5.8	22
80	*Chem. Pharm. Bull.*	7443	428	5.8	45
81	*Z. Chem.*	2576	146	5.7	121
82	*Sci. Total Environ.*	1975	110	5.6	146
83	*J. Pharm. Pharmacol.*	2483	125	5.0	136
84	*Collect. Czech. Chem. Commun.*	3411	170	5.0	102
85	*J. Food Sci.*	4740	218	4.6	82
86	*Khim. Farm. Zh.*	3393	154	4.5	116
87	*J. Electroanal. Chem. Interfacial Electrochem.*	4862	215	4.4	84
88	*Org. Mass Spectrom.*	2551	112	4.4	145
89	*J. Steroid Biochem.*	3076	131	4.3	131
90	*Indian J. Chem.*	7620	314	4.1	61
91	*Bull. Chem. Soc. Jpn.*	8347	316	3.8	60
92	*Fuel*	2822	103	3.6	150
93	*Agric. Biol. Chem.*	5743	166	2.9	107
94	*Arzneim. Forsch.*	3889	105	2.7	148
95	*Chem. Lett.*	5728	134	2.3	129
96	*J. Pharm. Biomed. Anal.*	492	576		34
97	*LC-GC*	138	188		92
98	*Farmaco*	75	131		130
99	*At. Spectrosc.*	61	376		49
100	*Biomed. Chromatogr.*	50	115		144
101	*Guangpuxue Yu Guangpu-Fenxi*	0	219		81
102	*Huaxue Tongbao*	0	170		103
103	*Riv. Ital. Sostanze Grasse*	0	145		122
104	*Farm. Zh. (Kiev)*	0	265		69
105	*Yankuang Ceshi*	0	245		72
106	*Rocz. Panstw. Zakl. Hig.*	0	127		132
107	*Chem. Prum.*	0	127		133
108	*Yaoxue Xuebao*	0	173		100
109	*Fenxi Huaxue*	0	2033		10
110	*Fenxi Shiyanshi*	0	716		28
111	*Mitt. Geb. Lebensmittelunters. Hyg.*	0	140		125
112	*J. Planar Chromatogr. Mod. TLC*	0	140		124
113	*GIT Fachz. Lab.*	0	317		59
114	*Yaowu Fenxi Zazhi*	0	532		36
115	*Eisei Kagaku*	0	253		70
116	*Labor Praxis*	0	108		147
117	*Latv. PSR Zinat. Akad. Vestis*	0	121		140
118	Vysokochist. *Veshchestva*	0	159		112
119	*Izv. Vyssh. Uchebn. Zaved.*	0	153		117
120	*Indian J. Pharm. Sci.*	0	117		141
121	*HRC&CC*	0	1214		18
122	*Sepu*	0	272		68
123	*Lab. Pract.*	0	331		58
124	*Quim. Anal. (Barcelona)*	0	171		101
125	*Zentralbl. Pharm.*	0	193		89
126	*Radiokhimiya*	0	121		139
127	*Farm. Pol.*	0	115		143
128	*Lihua Jianyan*	0	448		44
129	*Yaoxue Tongbao*	0	167		106
130	*Bunseki*	0	161		110
131	*Anal. Sci.*	0	508		38
132	*Indian Drugs*	0	469		42
133	*Cesk. Farm.*	0	190		91
134	*Int. Lab.*	0	482		41
135	*Zh. Prikl. Spektrosk.*	0	169		105
136	*Anal. Proc. (London)*	0	774		26
137	*Farmatsiya (Moscow)*	0	390		47
138	*J. Inst. Chem. (India)*	0	180		97
139	*Huaxue Shiji*	0	388		48
140	*Gig. Sanit.*	0	360		54
141	*Zavod. Lab.*	0	1464		14
142	*Fen Hsi Hua Hsueh*	0	223		79
143	*Lebensmittelchem. Gerichtl. Chem.*	0	160		111
144	*Zh. Anal. Khim.*	0	3141		6
145	*Shokuhin Eiseigaku Zasshi*	0	235		76
146	*Khim. Prom-st.*	0	372		51
147	*Huaxue Xuebao*	0	122		138
148	*Rev. Chim. (Bucharest)*	0	285		65
149	*Spectra 2000*	0	159		113
150	*SIA*	0	157		114

that it favors journals with a large number of papers because it is based on an absolute number of relevant articles. Journals publishing a large number of papers, therefore, tend to rank higher on lists arranged according to Bradford's ranking.

As mentioned, one reason for our applying Bradford's graph to the body of analytical literature is to determine the core analytical chemistry journals. It is, therefore, appropriate to consider briefly the definition of such a journal. A core

Table III. Journals in the Tail of the Distribution

no. of articles included in AA (1980–1989)	no. of journals	total no. of articles (1980–1989)
1	1371	1371
2	490	980
3	319	957
4	187	748
5	141	705
6	93	558
7	66	462
8	67	635
9	48	432
10	40	400
total	2822	7149

analytical journal is usually considered to be one central to analytical chemistry. Journals publishing a large number of analytical papers are, therefore, included in this definition and belong to the core. Bradford rankings, depending on numbers of papers, tend to exclude smaller analytical journals from the core. However, journals devoting their major portion to analytical chemistry, even though they be smaller, also belong to the core. One way to overcome the bias toward large journals is to rank the journals according to the percentage of their contents[6] that is relevant to analytical chemistry. Since percentage is a size-independent measure, it is possible for smaller but analytically significant journals to be included in the core.

Table II is an example of the use of percentage distribution. It lists analytical chemistry journals included in the AA database ranked by percentage of papers on analytical chemistry. The table shows the number of papers from the journals included into the database beside the total number of papers published in the respective journal. This later number has been extracted for each journal from the Science Citation Index (SCI) database which, as known, includes the contents of refereed journals cover-to-cover. The table also shows the rank of the journal according to Bradford's graph.

Let us now concentrate on the tail of the distribution of journals included in the AA database (see Figure 4). As shown in Table III, there are 1371 journals, the database has processed only one article between 1980 and 1989, 490 journals contributed two papers during the same period, 319 journals gave three papers, and so on. This means that at the upper end (tail) of the Bradford distribution 79% of the total number of journals processed by the AA database contributed only 6% of the total processed articles.

DISCUSSION

Table IV shows a ranked list of 19 journals holding "analytical chemistry" or the name of an analytical subfield in the title. This means that these journals are totally and exclusively dedicated to the publication of papers reporting original results on analytical chemistry. All of them are peer-reviewed journals. Some of them can be considered the best in the field by any measure of quality and significance. We suggest the expression "titled" analytical chemsitry journals to characterize these journals. However, as shown in Table IV, a substantial number of papers in "titled" journals were not processed by the AA database during the investigated 10-year period. The figures in Table IV indicate that the amount of excluded items represents about 19% of the total of papers the 19 "titled" analytical chemistry journals published during 1980–1989. We were interested in details on the quality of the above-mentioned 10 142 papers not processed by AA during the 1980–1989 period. Quality being a commodity hard to define, we considered that the citation rate of those papers reflecting their impact could be used as a proxy to their quality. It is known[7] that if a paper is multiply cited, it can be considered that the content has had an impact on the citing authors. We have made a computer search in the SCI database of the citation rate of the 10 142 nonprocessed articles. As a "significant" value, we considered a citation rate which exceeded five times the average citation of all papers in the journal in question. As a citation period, we always considered the time lapsing from the year of publication of the respective papers to 1989. Table V presents the results. As shown, a substantial number (285) of high-impact papers published in the 19 "titled" analytical chemistry journals were not included in by the AA database during the 1980–1989 period.

Table VI presents the complete bibliographic data of the five highest impact papers published in the journals from Table IV but not processed by the AA database. As their titles indicate, all of them are analytical chemistry papers of fundamental significance, with their omission from the AA database hard to justify.

In the introduction of this paper we have already mentioned that the "Guide to AA" states that "*Analytical Abstracts* is a journal providing a complete current awareness service covering all aspects of analytical chemistry. Over 400 core analytical journals are scanned regularly .... All items of interest to an analytical chemist are included except theoretical studies, biological or microbiological analysis, or structure determinations".[3] Let us now examine how far our data presented in Figures 1–4 and Tables I–VI are fitting these statements.

Taking into account the list of journals in Figure 4, the topical coverage of the different subfields and aspects of analytical chemistry in the AA database can be considered really complete. This is, however, less true as far as coverage by quantity of the analytical chemistry journal literature the world produces is concerned. As table IV indicates, about 19% of the papers published in the "titled" analytical journals are excluded from the AA database. Some omissions could perhaps be understood on the basis of the statements in the "Guide to AA" as e.g., 45.7% of the papers published by *Analytical Biochemistry* being not processed. But 21.7% of the papers omitted from the unanimously accepted world's best analytical journal (*Analytical Chemistry*) is hard to explain. The same stands for *Talanta* (19.1%), *Analytical Chimica Acta* (11.7%), *Analytical Letters* (13.8%), *TrAC* (21.9%), etc. Chromatography, one of the most important subfields of analytical chemistry is especially hardly hit by exclusions (pretty high percentages from *Journal of Chromatography*, *Chromatographia*, *Journal of Chromatographic Sciences*, etc.), but environmental analysis (*International Journal of Environmental Analytical Chemistry*) is also no exception. The inclusion and, respectively, exclusion of papers from national analytical chemistry journals is also very different. Japan seems privileged (with only 2% omitted from *Bunseki Kagaku*), but France (23.3% omitted from *Analusis*) and Poland (12.4% left out from *Chemiczna Analyticzna*) appear less favored. Glancing at the Bradford graph in Figure 4 (especially at its tail) and at Tables III and IV, we see that compared to the 10 142 papers left out from 19 "titled" analytical journals (Table IV), the AA database includes 7149 papers dispersed in 2822 journals of only marginal analytical importance (how much analytical importance can a journal have publishing one analytical-oriented paper during a 10-year period? The database has processed 1371 such journals). Another question is how the core list of analytical journals is

Table IV. Ranking of "Titled" Analytical Chemistry Journals[a]

rank	journal	no. of articles in AA	no. of articles total published (SCI database)	no. of articles not processed by AA	% of articles not processed
1	*J. Chromatogr.*	12144	13799	1655	12.0
2	*Anal. Chem.*	5641	7205	1564	21.7
3	*Anal. Chim. Acta*	3816	4321	505	11.7
4	*Anal. Biochem.*	3173	5844	2671	45.7
5	*Fresenius' Z. Anal. Chem.*	2924	3436	512	14.9
6	*Analyst (London)*	2625	2820	195	6.9
7	*Bunseki Kagaku*	2044	2086	42	2.0
8	*J. Assoc. Off. Anal. Chem.*	1923	2471	548	22.7
9	*Talanta*	1709	2112	403	19.1
10	*J. Liq. Chromatogr.*	1538	1932	394	20.4
11	*Anal. Lett.*	1405	1630	225	13.8
12	*Chromatographia*	1310	1789	479	26.9
13	*J. Chromatogr. Sci.*	848	992	144	14.5
14	*Chem. Anal. (Warsaw)*	809	923	114	12.4
15	*Analusis*	604	787	183	23.3
16	*J. Anal. Toxicol.*	598	755	157	20.9
17	*J. Anal. At. Spectrom.*	506	530	24	4.5
18	*Int. J. Environ. Anal. Chem.*	455	680	225	33.1
19	*TrAC*	364	466	102	21.9
	total	44456	54578	10142	18.6

[a] "Titled" analytical chemistry journals not processed by the SCI database (e.g., *Fenxi Huaxue*; *Zhurnal Anal. Khim.*) are not included here.

Table V. High-Impact Analytical Chemistry Papers Not Processed by Analytical Abstracts Database

journal	total no. of articles not processed by the AA database (1980–1989)	no. of high-impact articles not processed by the AA database (1980–1989)
Anal. Lett.	225	1
Analyst	195	6
Anal. Biochem.	2671	48
Anal. Chem.	1564	28
Anal. Chim. Acta	505	8
Chromatographia	479	6
J. Liq. Chromatogr.	394	5
Talanta	403	6
Fresenius' J. Anal. Chem.	512	1
J. Chromatogr.	1655	176
total	8603	285

defined. The "Guide to AA" mentions 400 analytical core journals, but no definition of what is meant by a core journal and no lists are given. The data in the present study show that there are at least four different ways to define a core journal list:

1. According to Bradford's graph (Figure 4). The strictly Bradfordian list of core analytical journals (up to point B on the graph) would contain only five journals (the top five ones in Table I).
2. According to percentage distribution[6] as shown in Table II and putting the threshold of inclusion in the core at 50%. This would mean 27 journals (Table II).
3. Considering that core analytical journals are those publishing about 75% of the world's analytical literature. According to Figure 3 and Table I, there are about 150 such journals (see Table I).
4. Considering that core analytical journals are those ones having "analytical chemistry" or the name of one of the analytical subfields in their title (see Table IV).

Of course, there is considerable overlapping between the above-mentioned definitions, and the decision on which one to accept is an open question.

Trying to outline and encompass the literature of analytical chemistry leads inevitably to the need to define the field itself. That is why we have tried to find out how analytical chemistry as a science field, i.e., its object, preoccupations, aims, and goals, is defined in the literature. As frequently a differentiation between analytical chemistry and chemical analysis is made, the same dichotomy is followed here with the definitions presented in Tables VII and VIII.

Let us accentuate that the list of definitions outlined in Tables VII and VIII is not exhaustive and that the only aim of the selections presented is to demonstrate the diversity, complexity, and multidimensionality of the different approaches. It is our feeling that based on any of those definitions or on any combination of them, even more, based on any other definition available but not mentioned in Tables VII and VIII, it is impossible to base a database inclusion–exclusion policy on it. That is why we think that for such a policy at least one basic policy component could rely on a very simple definition as follows: "Analytical chemistry is basically the knowledge included in peer-reviewed primary journals having analytical chemistry or the name of a subfield of analytical chemistry in their title" (i.e., "titled" analytical journals). It is considered that there is no more competent gremium for evaluating what belongs to the field of analytical chemistry and what does not belong to it than the editorial advisory boards which are keeping the gates[8] of the above-mentioned journals.

Of course, the coverage of analytical chemistry extends by far farther than the journals having the words "analytical chemistry" in their title, as nicely stated by Bradford's law, i.e., articles of interest to specialists must occur not only in periodicals specializing in their subject but also, from time to time, in other periodicals which grow in number as the relation of their field to that of their subject lessens and the number of articles on their subject diminishes. But the contents of "titled" analytical journals belong without a doubt cover-to-cover (as far as their articles, notes, short communications, letters to the editor, and reviews are concerned) to the inner circle of basic analytical knowledge and would have to be included without omissions into the AA database.

CONCLUSIONS

Our analysis has shown that the Analytical Abstract database is in general terms a correct reflection of the field of analytical chemistry as far as topical coverage and processed journal comprehensiveness is concerned. Some slight dis-

Table VI. Bibliographic Data of Highly Cited Articles Omitted from the AA Database:[a] Selected Examples from "Titled" Analytical Journals

title	author(s)	source	*A*	*B*
Investigations on Atomization Mechanisms of Volatile Hydride-Forming Elements in a Heated Quartz Cell. 1. Gas-Phase and Surface Effects—Decomposition and Atomization of Arsine	Welz, B.; Melcher, M.	*Analyst* **1983**, *108*, 213–224	50	7.98
Fibre-Optic pH Probe Based on the Use of an Immobilized Colorimetric Indicator	Kirkbright, G. F.; Narayanaswamy, R.; Welti, N. A.	*Analyst* **1984**, *109*, 1025–1028	47	6.76
Standardized Thin-Layer Chromatographic Systems for the Identification of Drugs and Poisons—A Review	Stead, A. H.; Gibbs, J. P.; Gill, R.; Moffat, A. C.; Wright, T.	*Analyst* **1982**, *107*, 1106–1168	44	8.58
An Echelle Monochromator System for the Measurement of Sensitive Carbon Furnace Atomic-Emission Signals	Ottaway, J. M.; Bezur, L.; Marshall, J.	*Analyst* **1980**, *105*, 1130–1133	35	8.66
Rapid Flow-Analysis with Inductively Coupled Plasma Atomic-Emission Spectroscopy Using a Micro-Injection Technique	Alexander, P. W.; Finlayson, R. J.; Smythe, L. E.; Thalib, A.	*Analyst* **1982**, *107*, 1335–1342	33	8.58
Catalysis of Electrode Processes by Multiply-Charged Metal-Complexes Electrostatically Bound to Poly-Electrolyte Coatings on Graphite-Electrodes, and the Use of Polymer-Coated Radiating-Disk Electrodes in Diagnosing Kinetic and Conduction Mechanisms	Oyama, N.; Anson, F. C.	*Anal. Chem.* **1980**, *52*, 1192–1198	196	19.29
Equations for Calculation of Chromatographic Figures of Merit for Ideal and Skewed Peaks	Foley, J. P.; Dorsey, J. G.	*Anal. Chem.* **1983**, *55*, 730–737	98	13.95
Electrochemical Pretreatment of Glassy-Carbon Electrodes	Engstrom, R. C.	*Anal. Chem.* **1982**, *54*, 2310–2314	97	16.46
Principles of Environmental-Analysis	Keith, L. H.; Crummett, W.; Deegan, J.; Libby, R. A.; Taylor, J. K.; Wentler, G.	*Anal. Chem.* **1983**, *55*, 2210–2218	92	13.95
Pulse Voltammetry with Microvoltammetric Electrodes	Ewing, G.; Dayton, M. A.; Wightman, R. M.	*Anal. Chem.* **1981**, *53*, 1842–1847	89	18.28
Axial-Dispersion and Flow Phenomena in Helically Coile Tubular Reactors for Flow-Analysis and Chromatography	Tijssen, R.	*Anal. Chim. Acta* **1980**, *114*, 71–89	71	13.13
Some Theoretical Aspects of Flow-Injection Analysis	Reijn, J. M.; Poppe, H.; Vanderlinden, W. E.	*Anal. Chim. Acta* **1980**, *114*, 105–118	41	13.13
Theoretical Considerations on the Performance of Electro-chemical Flow-Through Detectors	Hanekamp, H. B.; Vannieuwkerk, H. J.	*Anal. Chim. Acta* **1980**, *121*, 13–22	40	13.13
Membrane Separation in Flow-Injection Analysis—Gas-Diffusion	Vanderlinden, W. E.	*Anal. Chim. Acta* **1983**, *151*, 359–369	38	8.83
An Examination of Chemically-Modified Silica Surfaces Using Fluorescence Spectroscopy	Lochmuller, C. H.; Marshall, D. B.; Wilder, D. R.	*Anal. Chim. Acta* **1981**, *130*, 31–43	36	11.84
Stationary Phase Effects in Reversed-Phase Chromatography. 2. Substituent Selectivities for Retention on Various Hydrocarbonaceous Bonded Phases	Melander, W. R.; Horvath, C.	*Chromatographia* **1982**, *15*, 86–90	36	9.85
Correlations Between Retention Data of Isomeric Alkylbenzenes and Physical Parameters in Reversed-Phase Micro High-Performance Liquid-Chromatography	Jinno, K.; Kawasaki, K.	*Chromatographia* **1983**, *17*, 337–340	33	9.34
Characterization of Glass, Quartz, and Fused-Silica Capillary Column Surfaces from Contact-Angle Measurements	Bartle, K. D.; Lee, M. L.; Wright, B. W.	*Chromatographia* **1981**, *14*, 387–397	32	8.92
The Solubility Parameter As a Tool in Understanding Liquid-Chromatography	Schoenmakers, P. J.; Billet, H. A. H.; Degalan, L.	*Chromatographia* **1982**, *15*, 205–214	32	9.85
Factors Affecting the Retention of Polycyclic Aromatic-Hydrocarbons in Gas-Chromatography	Bartle, K. D.; Lee, M. L.; Wise, S. A.	*Chromatographia* **1981**, *14*, 69–72	28	8.92
Optimization of Solvent Strength and Selectivity for Reversed-Phase Liquid-Chromatography Using an Interactive Mixture-Design Statistical Technique	Glajch, J. L.; Kirkland, J. J.; Minor, J. M.; Squire, K. M.	*J. Chromatogr.* **1980**, *199*, 57–79	218	13.31
Surface Silanols in Silica-Bonded Hydrocarbonaceous Stationary Phases. 2. Irregular Retention Behavior and Effect of Silanol Masking	Bij, K. E.; Horvath, C.; Melander, W. R.; Nahum, A.	*J. Chromatogr.* **1981**, *203*, 65–84	169	14.50
Surface Silanols in Silica-Bonded Hydrocarbonaceous Stationary Phases. 1. Dual Retention Mechanism in Reversed-Phase Chromatography	Nahum, A.; Horvath, C.	*J. Chromatogr.* **1981**, *203*, 53–63	158	14.50
Mechanism of Ion-Pair Liquid-Chromatography of Amines, Neutrals, Zwitterions and Acids Using Anionic Heterons	Knox, J. H.; Hartwick, R. A.	*J. Chromatogr.* **1981**, *204*, 3–21	139	14.50
Mechanism of Solute Retention in Liquid-Solid Chromatography and the Role of the Mobile Phase in Affecting Separation—Competition Versus Sorption	Snyder, L. R.; Poppe, H.	*J. Chromatogr.* **1980**, *184*, 363–413	108	31.31
Molecular Theory of Liquid Adsorption Chromatography	Martire, D. E.; Boehm, R. E.	*J. Liq. Chromatogr.* **1980**, *3*, 753–774	42	12.96
Evaluation of a Simple HPLC Correlation Method for the Estimation of the Octanol-Water Partition-Coefficients of Organic-Compounds	Haky, J. E.; Young, A. M.	*J. Liq. Chromatogr.* **1984**, *7*, 675–689	30	7.25
Hydrophobicity and Retention in Reversed Phase Liquid-Chromatography	Damboise, M.; Hanai, T.	*J. Liq. Chromatogr.* **1982**, *5*, 229–244	27	6.89
General-Approach for the Estimation of Octanol Water Partition-Coefficient by Reversed-Phase High-Performance Liquid-Chromatography	Valko, K.	*J. Liq. Chromatogr.* **1984**, *7*, 1405–1424	24	7.25

Table VI (Continued)

title	author(s)	source	*A*	*B*
Purification of Radioiodinated Cholecystokinin Peptides by Reverse Phase HPLC	Fourmy, D.; Antoniotti, H.; Esteve, J. P.; Pradayrol, L.; Ribet, A.	*J. Liq. Chromatogr.* **1982**, *5*, 757–766	23	6.89
Laminar Dispersion in Flow-Injection Analysis	Vanderslice, J. T.; Higgs, D. J.; Rosenfeld, A. G.; Stewart, K. K.	*Talanta* **1981**, *28*, 11–18	82	6.92
The Use of Glass Electrodes for the Determination of Formation-Constants. 1. A Definitive Method for Calibration	May, P. M.; Linder, P. W.; Torrington, R. G.; Williams, D. R.	*Talanta* **1982**, *29*, 249–256	39	7.63
Ionic-Strength Dependence of Formation-Constants. 1. Protonation Constants of Organic and Inorganic Acids	Daniele, P. G.; Rigano, C.; Sammartano, S.	*Talanta* **1983**, *30*, 81–87	32	4.94
Metal-Complexes of Cyclic Tetra-Azatetra-Acetic Acids	Delgado, R.; Dasilva, J. J. R. F.	*Talanta* **1982**, *29*, 815–822	31	7.63
The Cation-Chelation Mechanism of Metal-Ion Sorption by Polyurethanes	Hamon, R. F.; Chow, A.; Khan, A. S.	*Talanta* **1982**, *29*, 313–326	26	7.63

[a] *A* = no. of citations, *B* = average citation rate of journal.

Table VII. Selected Definitions of Analytical Chemistry

definition	source
Analytical chemistry is the science of the production and interpretation of signals.	Pungor, E. *TrAC* **1992**, *21*, 8
Analytical chemistry is a distinct field of endeavor, dealing with the strategies and tactics of chemical measurements.	Kissinger, P. T. *TrAC* **1992**, *21*, 54
Analytical chemistry is the branch of chemistry concerned with the knowledge of the components, composition, or structure of a material system in order to understand it.	Goshi, Y. *TrAC* **1991**, *20*, 202
Analytical chemistry is concerned with providing qualitative and quantitative information about the chemical and structural composition of a sample of matter .... The field is founded on the conversion of a measured physical property of the species being examined to a usable signal.	Krull, U. J.; Thomson, M. *Analytical Chemistry*. In *Encyclopedia of Physical Sciences and Technology*; Myers, R. A., Ed.; Academic Press: Orlando, 1987; Vol. 12, pp 286–313.
Analytical chemistry may be defined as the science and art of determining the composition of materials in terms of the elements or compounds contained in them.	Ewing, G. W. *Instrumental Methods of Chemical Analysis*; McGraw Hill: New York, 1985
Analytical chemistry is the chemical discipline that uses statistical and other methods employing formal logic (a) to design or select optimal measurement procedures and experiments and (b) to provide maximum chemical information by analyzing chemical data.	Massart, D. L.; Hopke, P. K. *J. Chem. Inf. Comput. Sci.* **1985**, *25*, 308
Analytical chemistry is the science of measurement and characterization of systems. To develop an analytical technique we need physics and computer science.	Meites, L.; Thomas, C. *Advanced Analytical Chemistry*; McGraw Hill: New York, 1963
Analytical chemistry is that branch of chemical research which has the development and improvement of practical analytical procedures as its goal.	Bard, A. J. *ChemTech* **1985**, *15*, 377
Analytical chemistry is a point of view, an intellectual attitude, a way of attacking problems, a discipline in its own right.	Hume, D. W. *Anal. Chem.* **1963**, *35*, 294
The specific purpose of analytical chemistry is the resolution of a compound or a mixiture into its constituents, parts, or elements, which are qualitative when the nature only of the constituents is determined, or quantitative when their actual quantity or proportion is ascertained.	Ellis, B. A. In *Encyclopaedia Britannica*; Encyclopaedia Britannica Inc.: London and New York, 1929; Vol. 5, p 309.

Table VIII. Selected Definitions of Chemical Analysis

definition	source
Chemical analysis always involves measurement (physics) and much of the time some inorganic and organic chemistry. An alliterative "6M" summary might be "the *m*eans and *m*ethods of *m*aking *m*eaningful *m*easurements on *m*aterials".	Mellon, M. G. *J. Chem. Inf. Comput. Sci.* **1986**, *26*, 149
Chemical analysis is the determination of the qualitative and/or quantitative composition of substances and materials.	Cosidine, M. D., Ed. *Van Nostrand's Scientific Encyclopedia*; Van Nostrand: New York, 1976
Chemical analysis are information processes planned ... with the aim of obtaining knowledge about the composition of substances under investigation.	Kaiser, H. *Methodicum Chimicum*; Academic Press: New York, 1974; Vol. 1
Chemical analysis is the art of recognizing different substances and determining their constituents.	Oswald, W. *Die Wissenschaftlichen Grundlagen der Analytischen Chemie*; Engelmann: Leipzig, 1894
Chemical analysis is the determination of composition of substances.	Robert Boyle, 1627–1691

tortions of the reflecting mirror have been, however, also revealed. The main distortion we have found is the only partial coverage of the contents of "titled" analytical chemistry journals (see Table IV). It is our conviction that there is no better group of people to decide what does belong to analytical chemistry and what does not than the gatekeepers of "titled" analytical journals. That is why we consider that a substantial improvement of the AA database could be achieved by covering the scientific content of those journals (i.e., the articles, notes, short communications, letters to the editor, and reviews they publish) comprehensively, i.e., without selection.

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