History and Development of Chemical Periodicals in the Field of Organic Chemistry: 1877–1949[1]

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CONSIDERABLE INTEREST has recently been shown by chemists in periodical literature, the amount and quality of chemical publication in the various countries of the world, and the relative importance of the several languages employed. Another point of interest is the effect of the two world wars on scientific activity in the different countries and on the languages used for publication (*1*). Studies have been made by various investigators in years past (*1–16*), but the very nature of the problem requires periodic investigation to obtain a clear picture of the trends.

Perhaps the easiest way to study a problem of this sort is to make a statistical analysis of the articles abstracted by leading abstract journals. Since the time involved in such a study is considerable, it is necessary to narrow the field covered, by choosing one specific field of chemistry. Thus it was decided to investigate organic chemistry and to collect data from the Organic Section of *Chemical Abstracts* at intervals as far back as its beginning in 1907 and also to collect data at intervals from the Organic Section of *Chemisches Zentralblatt* from 1907 back to 1877.

The years chosen were 1949, 1948, 1947, 1937, 1927, 1917, and 1907 from *Chemical Abstracts*; and 1907 (for comparison), 1897, 1887, and 1877 from *Chemisches Zentralblatt*. The 1877 data indicated that inclusion of 1867 data would add nothing to the general picture.

Collection of Data

The data collected included name of journal, years in which the journal was published, country of publication, language of the article abstracted (in the case of a polylingual journal the language was determined whenever possible), total number of journals, and total number of abstracts, by country and language (Figs. 1–4). Abstracts of obituary notices and polemic discussions were omitted from the count.

A statistical analysis is not entirely satisfactory, although it seems to be the only practical way to attack the problem. One objection is that it puts a premium on quantity of production, rather than quality. A particular journal may publish many relatively unimportant articles and be considered "important" from a quantitative viewpoint, whereas a second journal, of universally recognized importance, limits itself to publication of a few articles of definite value and suffers from quantitative comparison with the first. However, in a study such as this, which covers a relatively long span of years, the journals of lesser importance may show a good record for a time but tend to fall by the wayside eventually.

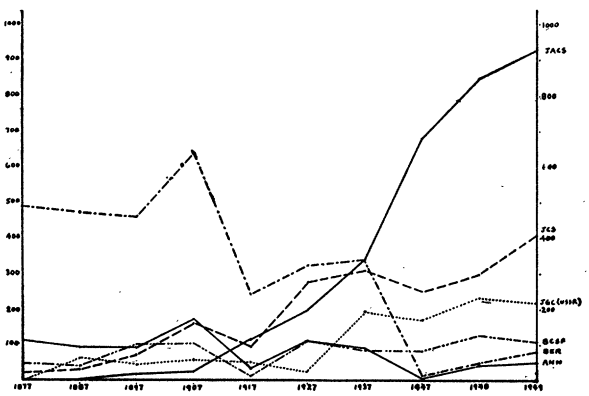

FIG. 1. Production of leading journals (number of abstracts).

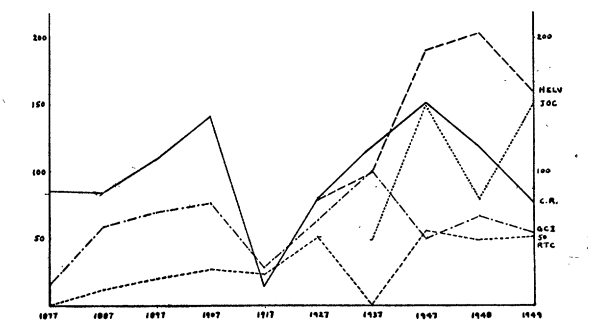

FIG 2. Production of other journals (number of abstracts).

To forestall possible criticism as to the usefulness of quantitative surveys of scientific literature as compared with qualitative analyses, Margery Bedinger

[1] Based on an address presented at the joint meeting of the History of Chemistry and Chemical Literature sections, Chicago meeting of the American Chemical Society, Sept. 3–8, 1950.

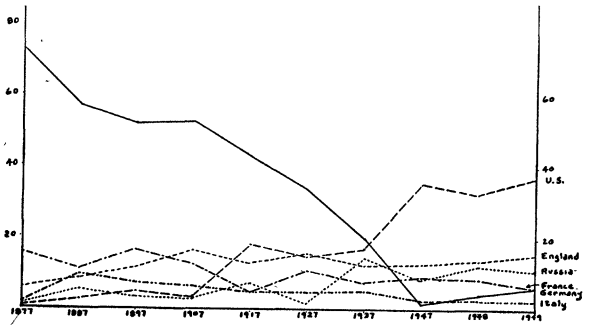

FIG. 3. Percentage of abstracts by country.

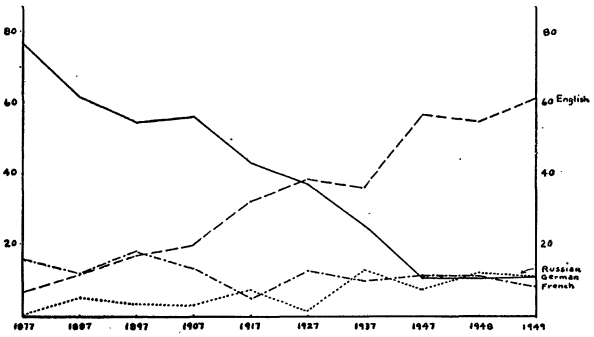

FIG. 4. Percentage of abstracts by language.

(*17*), head of the Science and Engineering Department of the Denver Public Library, was asked for her opinion on this point. Her reply indicated that, since the potential number of requests for a journal will be a function of the number of papers appearing in it, the value of a quantitative analysis would seem to be self-evident. "Our budgets are always limited and we are forced to make a selection, choosing what periodicals we subscribe to carefully. In this difficult choice, amount of use is a very important factor" (*17*).

A second objection to a statistical analysis is the problem of availability of some journals for abstracting. However, the importance of a journal is measured at least partially by its availability, regardless of the quality of its content. This, of course, borders on the philosophical and leaves much room for argument. In the early years of *Chemical Abstracts* the coverage was naturally not as complete as the long-established *Chemisches Zentralblatt,* but today *Chemical Abstracts* is recognized to be the most complete of the abstracting journals. In spite of this, the coverage in some areas, and notably in the case of Russian publications, is incomplete (*1, 16, 18, 19*). In the earlier years *Chemisches Zentralblatt* did not cover the field thoroughly, for a close analysis of the abstracts reveals that certain foreign journals of importance were very poorly covered, whereas the native German publications were exhaustively abstracted. This situation, of course, leads to a slightly distorted picture in the earlier years of this study.

The data have been assembled in 5 tables and accompanying graphs, which indicate the situation very clearly. Table 1 lists the most heavily abstracted journals, their years of publication, the number of abstracts from each journal in each of the years studied, and their relative importance from a quantitative viewpoint, as well as the total number of contributing journals and the total number of abstracts for each of the years studied. Table 2 gives an analysis of the number of abstracts by country of publication, and Table 3, by language of publication. Table 4 presents the data in terms of percentages by country, and Table 5, in terms of percentages by language.

Herman H. Fussler (*11*), director of the University of Chicago libraries, surveyed the literature used by chemists and physicists, tabulating the references cited by the authors of papers published in *Physical Review* and the *Journal of the American Chemical Society.* The results obtained agree in general with our observations, except that the Russian journals suffer in Dr. Fussler's survey, probably because of the language barrier.

INTERPRETATION OF THE DATA

Table 1 shows that, of the leading 15 journals in 1949, six were in the first ten in 1877, whereas six are "newcomers" in the past twenty years or so. Four of the first ten in 1877 have been discontinued or have had a change of name. *Journal of the American Chemical Society* had no abstracts in *Chemisches Zentralblatt* in 1877 or 1887, but in 1897 it was in eighteenth position and by 1917 was second in *Chemical Abstracts.* In 1937 it was tied with the German *Berichte,* but since World War II it has gone far out in front. *Journal of the Chemical Society* of London was eighth in *Chemisches Zentralblatt* in 1877, gradually increased in importance, and attained second place in *Chemical Abstracts* in 1927, where it is at present. *The Journal of General Chemistry USSR* started publication in 1931 and has risen rapidly to third place. *Helvetica Chimica Acta* of Switzerland started publication in 1918 and rapidly assumed a leading position in the field, now being a fixture in fourth place. The American *Journal of Organic Chemistry* (1936) has had a rapid growth and is now in fifth place. *Bulletin of the Chemical Society of France* (1858) had already demonstrated its importance by 1877 (fourth) and has retained its importance despite declines in two world wars. The *Berichte* of Germany (1867) was the leader in 1877 and retained this lead even during the first world war, was tied in 1937 by the *Journal of the American Chemical Society,* then suffered a catastrophic decrease during the second world war but has since climbed to seventh position. The *Comptes rendus* of France is primarily a general science journal but has been an important contributor ever since it started publication in 1835. Other important journals of long standing include *Nature, Gazzetta chimica italiana, Recueil des travaux chimiques* (Holland), the well-known *Annalen,* and the Austrian *Monatshefte.* Important newcomers include *Doklady Akademii Nauk SSSR,* the American

TABLE 1

NUMBER OF ABSTRACTS BY PERIODICALS

Journal	Years	*Chemical Abstracts*												*Chemisches Zentralblatt*							
		1949		1948		1947		1937		1927		1917		1907		1907		1897		1887		1877	
J. Am. Chem. Soc.	1876–	1	927	1	848	1	682	1†	337	3	196	2	115	12	18	18	23	17	17	—	0	—	0
J. Chem. Soc. (London)	1847–	2	406	2	297	2	254	3	307	2	278	3	94	5	88	4	160	6	70	11	29	8	19
J. Gen. Chem. USSR	1931–	3	219	3	233	5	170	4	213	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Helv. Chim. Acta	1918–	4	160	4	203	4	190	7	98	7	78	—	—	—	—	—	—	—	—	—	—	—	—
J. Org. Chem.	1936–	5	150	10	79	7	149	12	49	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Bull. soc. chim. France	1858–	6	107	6	126	8	81	9	83	5	109	11	13	4	97	6	104	3	100	8	40	4	42
(Chem.) Berichte	1867–	7	79	13	51	25	15	1†	337	1	321	1	240	1	539	1	637	1	456	1	468	1	486
Compt. rend.	1835–	8	77	7	118	6	151	5	118	6	80	9	15	3	125	5	141	2	109	3	84	3	85
Nature	1869–	9	72	9	80	13	41	25	19	—	6	—	0	—	0	—	0	—	0	—	0	—	0
Doklady Akad. Nauk SSSR	1933–	10	64	23	22	—	0	—	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Gazz. chim. ital.	1871–	11	55	11	67	12	50	6	100	9	64	6	28	13	12	7	76	7	69	7	58	9	16
Rec. trav. chim.	1882–	12	52	14	49	11	56	—	0	12	52	7	23	11	25	17	27	16	20	—	12	—	0
Annalen	1832–	13	48	15	42	—	3	8	88	4	110	5	32	6	81	3	172	4	91	2	93	2	107
Org. Syntheses	1921–	14	45	—	1	16	28	20	30	17	30	—	—	—	—	—	—	—	—	—	—	—	—
Izvest. Akad. Nauk SSSR		15	44	8	88	—	0	—	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
J. Biol. Chem.	1905–	16	44	19	30	14	36	13	46	15	44	10	15	—	0	—	13	—	—	—	—	—	—
Monatshefte	1880–	17	41	24	22	—	9	—	15	11	61	12	11	9	37	8	70	14	29	9	40	—	—
J. Applied Chem. (USSR)	1928–	18	41	20	28	19	25	14	43	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Acta Chem. Scand.	1947–	19	40	25	21	—	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ind. Eng. Chem.	1909–	20	40	16	41	10	63	—	10	—	8	—	1	—	—	—	—	—	—	—	—	—	—
J. Indian Chem. Soc.	1924–	21	39	12	55	17	27	15	38	14	46	—	—	—	—	—	—	—	—	—	—	—	—
Proc. Indian Acad. Sci.	1924–	22	36	21	25	26	15	—	15	—	0	—	—	—	—	—	—	—	—	—	—	—	—
Can. J. Research	1929–	23	32	17	37	22	19	—	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—
J. Soc. Chem. Ind. Japan	1898–	25	23	5*	128	—	0	—	16	—	9	—	0	—	0	—	0	—	—	—	—	—	—
Collection Czech. Chem. Communs.	1929–	28	17	18	34	—	5	—	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—
J. Chem. Soc. Japan	1880–	—	10	—	2	3*	219	21	19	—	1	—	0	—	1	—	0	—	0	—	0	—	—
Bull. Chem. Soc. Japan	1926–	—	2	—	8	9*	75	19	30	16	31	—	—	—	—	—	—	—	—	—	—	—	—
Arkiv Kemi, Mineral. Geol.	1902–	—	9	—	17	15	31	—	9	—	2	—	1	—	0	—	5	—	—	—	—	—	—
Compt. rend. acad. sci. URSS	1828–	—	2	—	13	18	26	—	17	—	0	—	0	—	0	—	0	—	0	—	0	—	0
Anales fis. y quim.	1902–	—	6	—	14	20	23	—	2	—	4	—	3	—	0	—	0	—	—	—	—	—	—
Z. physiol. Chem.	1877–	—	4	—	2	—	5	16	38	8	77	—	1	—	1	11	50	—	6	—	6	—	0
J. prakt. Chem.	1834–	—	0	—	0	—	0	11	60	10	61	8	22	8	39	9	61	5	77	4	70	6	30
J. Pharm. Soc. Japan	1881–	—	0	—	0	—	0	10	71	13	47	13	11	—	0	—	0	—	0	—	0	—	—
J. Russ. Phys. Chem. Soc.	1869–1930	—	—	—	—	—	—	—	—	18	25	4	54	7	69	10	57	10	41	6	62	—	0
Roczniki Chem.	1921–39	—	5	—	9	—	0	17	37	25	13	—	—	—	—	—	—	—	—	—	—	—	—
Proc. Chem. Soc. (England)	1841?–?	—	—	—	—	—	—	—	—	—	0	—	0	2	146	2	180	8	63	—	0	—	0
American Chem. J.	1879–1914	—	—	—	—	—	—	—	—	—	—	—	—	10	27	15	37	9	50	10	31	—	—
Chem. News	1859–1932	—	—	—	—	—	—	—	—	—	4	—	2	—	2	—	7	13	32	5	63	5	32
Sitzber. Akad. Wiss. Wien	1848–1923	—	—	—	—	—	—	—	—	—	—	—	0	—	1	—	0	—	1	—	0	7	21
Total journals			235		236		205		222		148		50		53		110		93		94		30
Total abstracts			3,530		3,388		2,961		3,048		2,119		785		1,402		2,364		1,542		1,303		904

* These figures represent a six-year period, 1941–46.
† Tied.

TABLE 2

NUMBER OF ABSTRACTS BY COUNTRY

	Chemical Abstracts													*Chemisches Zentralblatt*								
	1949		1948		1947		1937		1927		1917		1907		1907		1897		1887		1877	
United States	1	1302	1	1101	1	1057	2	524	3	307	2	141	5	53	5	86	5	76	7	35	7	6
England	2	550	2	462	2	374	4	369	2	331	3	101	2	240	2	382	3	175	4	110	3	53
Russia	3	386	3	422	5	250	3	432	10	41	4	57	4	75	7	67	6	50	5	67	6	9
France	4	225	4	285	4	267	5	232	4	219	6	38	3	236	3	288	2	250	2	142	2	137
Germany	5	219	7	147	10	57	1	611	1	714	1	336	1	736	1	1232	1	801	1	747	1	654
Switzerland	6	185	5	216	6	204	9	99	7	78	—	—	—	2	—	4	—	3	—	5	—	2
India	7	138	8	118	8	74	8	103	9	50	—	—	—	—	—	—	—	—	—	—	—	—
Japan	8	97	6	175	3*	329	6	205	5	116	8	16	—	3	—	—	—	1	—	—	—	—
Italy	9	92	9	93	7	76	7	156	6	97	7	38	8	12	4	144	4	109	3	119	5	16
Sweden	10	73	11	51	11	39	17	15	13	8	9	6	—	—	—	6	—	—	—	—	—	—
Holland	11	62	10	55	9	62	10	67	8	63	5	42	6	29	8	39	8	26	8	13	—	—
Canada	12	33	12	40	14	20	19	12	18	4	—	1	—	—	—	—	—	—	—	—	—	—
Spain	13	20	14	25	12	36	22	7	19	4	10	3	—	—	—	—	—	—	—	—	—	—
Belgium	14	17	21	11	16	12	15	18	11	35	—	—	7	12	9	23	9	14	11	3	—	—
Czechoslovakia	15	17	13	37	17	6	13	21	—	2	—	—	—	—	—	—	—	2	9	8	—	—
China	16	14	16	19	—	1	12	35	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Poland	17	14	15	20	—	6	11	5[illegible]	[illegible]	17	—	—	—	—	10	10	—	—	—	—	—	—
Rumania	18	14	—	6	—	0	—	3	17	5	—	—	—	2	—	3	—	1	—	—	—	—
Argentina	19	9	17	16	—	5	20	8	—	2	—	—	—	—	—	—	—	—	—	—	—	—
Mexico	20	8	—	4	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Brazil	21	6	—	3	—	3	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ireland	22	5	—	3	—	—	—	1	—	2	11	3	—	—	—	—	—	—	—	—	—	—
Australia	23	4	19	14	—	5	21	8	21	2	—	—	—	—	—	—	—	—	—	—	—	—
Austria	24	4	—	1	15	12	14	19	14	7	—	—	—	1	6	77	7	30	6	49	4	27
Hungary	25	4	22	11	—	5	18	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Finland	26	3	18	16	13	32	16	15	16	6	—	2	—	—	—	—	10	3	—	—	—	—
Jugoslavia	27	3	20	14	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	1	—	—
Israel	28	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Turkey	—	2	24	5	—	3	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Uruguay	—	2	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Norway	—	1	—	2	—	2	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Peru	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Siam	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Denmark	—	0	—	4	—	1	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—
Bulgaria	—	0	—	3	—	0	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Philippines	—	—	—	—	—	—	—	2	15	7	—	—	—	—	—	2	—	—	—	—	—	—
Total abstracts		3,530		3,388		2,961		3,048		2,119		785		1,402		2,364		1,542		1,303		904
Total countries		33		36		31		35		24		13		13		15		15		12		8

* These figures represent a six-year period.

TABLE 3

NUMBER OF ABSTRACTS BY LANGUAGE

	Chemical Abstracts										*Chemisches Zentralblatt*					
	1949	1948	1947	1937	1927	1917	1907	1907	1897	1887	1887	1877	1877			
English	1 2169	1 1864	1 1691	1 1098	1 811	2 252	2 296	2 470	3 257	3 149	3 59					
German	2 391	4 344	3 305	2 773	2 804	1 338	1 737	1 1326	1 837	1 805	1 687					
Russian	3 386	2 409	5 222	3 395	6 33	3 57	4 75	5 67	5 50	5 62	— 0					
French	4 293	3 373	2 339	4 301	3 260	5 38	3 250	3 315	2 277	2 152	2 142					
Italian	5 94	6 95	6 76	6 156	4 98	6 38	6 12	4 144	4 109	4 119	4 16					
Japanese	6 88	5 164	4 238	5 171	5 62	7 11	— 1	— —	— —	— —	— —					
Spanish	7 40	7 46	7 48	10 17	10 6	9 3	— —	— —	— —	— —	— —					
Polish	8 14	8 20	— —	7 7	7 15	— —	— —	— —	— —	— —	— —					
Swedish	9 10	11 11	10 8	13 8	9 7	8 6	— —	— 1	— —	— —	— —					
Dutch	10 7	— 5	9 10	8 24	8 11	4 42	5 29	6 38	6 10	7 6	— —					
Portuguese	— 6	— —	— 3	— 1	— —	— —	— —	— —	— —	— —	— —					
Hungarian	— 4	— 11	— 5	11 12	— —	— —	— —	— —	— —	— —	— —					
Chinese	— 2	— 4	— 0	— 6	— —	— —	— —	— —	— —	— —	— —					
Hebrew	— 2	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —					
Rumanian	— 2	— —	— —	— —	— 5	— —	— 2	— —	— —	— —	— —					
Finnish	— 1	— 7	— 8	— 11	— 2	— —	— —	— —	— —	— —	— —					
Norwegian	— 1	— 1	— 1	— —	— 2	— —	— —	— —	— —	— 8	— 1					
Serbian (Croatian)	— 1	— 9	— 12	— —	— 3	— —	— —	— —	— —	— —	— —					
Turkish	— 1	— 4	— 4	— 0	— 2	— —	— —	— 1	— —	— —	— —					
Danish	— 0	— —	— 4	— 1	— —	— —	— —	— —	— 7	— 2	— 6	— 8				
Czech	— 0	— —	— 3	— 3	— 10	— —	— —	— —	— —	— —	— —					
Bulgarian	— 0	— —	— 3	— 0	— 2	— —	— —	— —	— —	— —	— —					
Ukrainian	— —	— —	— —	— —	— 23	— —	— —	— —	— —	— —	— —					
Greek	— —	— —	— —	— 9	— 2	— —	— —	— —	— —	— —	— —					
Lettish	— —	— —	— —	— —	— 1	— —	— —	— —	— —	— —	— —					
Total languages	— 19	— 20	— 15	— 22	— 14	— 9	— 8	— 9	— 7	— 8		— 4				
Total abstracts	— 3,530	— 3,388	— 2,961	— 3,048	— 2,119	— 785	— 1,402	— 2,364	— 1,542	— 1,303		— 904				

Organic Syntheses (1921), and the *Journal of Biological Chemistry* (1905).

A glance at the figures in Table 1 will show that there is now about 50 per cent more publication in organic chemistry than in 1907, and the number of contributing journals has greatly increased. Publication was drastically curtailed during both wars, although the decline in World War II is masked in the figures for 1947 because publication in the United States increased tremendously and, also, at this time *Chemical Abstracts* was busily engaged in bringing up to date the abstracting of Japanese and Italian wartime publications covering a six-year period (*1*). These two factors almost compensated for the decreased publication in countries affected by the war, principally Germany, Russia, and Italy. Table 1 has been compiled with the 23 leading publications in 1949 listed in order. Beginning with the *Journal of the Society of Chemical Industry of Japan,* 16 additional journals are listed which have enjoyed a measure of importance at some time in the past.

Analysis of Table 2, showing the relative importance of publication by countries through the years, reveals the rapid growth of publication in the United States, from seventh in 1877 to second in 1917 and 1937, and first since 1947. Germany was the undisputed leader even during the first world war, when its output declined considerably but not quite enough to lose first place. The second world war, however, put an end to German leadership, and in 1949 it had come back to only fifth place. England and France have consistently held leading positions, and since 1927 Russia has rapidly forged ahead into third place in spite of admittedly incomplete coverage (*1, 16, 18, 19*), for which the Russian government is directly responsible.

Table 3, showing the number of abstracts by language, indicates that German was the leading language until shortly after the first world war, when English took the lead. Reference to Table 3 indicates that no Russian articles were abstracted in the 1877 *Chemisches Zentralblatt,* but by 1887 Russian was in fifth place among the languages, although it did not rate too highly from the standpoint of number of abstracts. The two world wars resulted in a decrease in Russian publication, but now it appears to be running a close race with German for second place. The French language was at one time second in importance, with German in the lead, but it was first displaced by English and then by Russian, so that today it ranks fourth. The increasing importance of the Russian language is a point which universities should note, with regard to language requirements for the Ph.D. degree. Only a few universities accept Russian in partial fulfillment of the language requirements for that degree, yet Russian is as useful to a chemist as French where current literature is concerned.

The Italian language has been of importance to the scientific world. In 1877 it was fourth, continuing in fourth place until the first world war, when it dropped to sixth place. At the present time it is competing

TABLE 4

PERCENTAGE OF ABSTRACTS BY COUNTRY

	Chemical Abstracts												*Chemisches Zentralblatt*							
	1949		1948		1947		1937		1927		1917		1907		1907		1897		1887		1877	
United States	1	37.0	1	32.5	1	35.6	2	17.1	3	14.5	2	18.0	5	3.9	5	3.6	5	4.9	7	2.7	7	0.7
England	2	15.6	2	13.6	2	12.6	4	12.1	2	15.6	3	12.9	2	17.1	2	16.2	3	11.4	4	8.5	3	5.9
Russia	3	10.9	3	12.4	5	8.4	3	14.2	10	1.9	4	7.3	4	5.4	7	2.8	6	3.2	5	5.2	6	1.0
France	4	6.4	4	8.4	4	9.0	5	7.6	4	10.7	6	4.8	3	16.8	3	12.2	2	16.2	2	10.9	2	15.2
Germany	5	6.2	7	4.3	10	1.9	1	20.0	1	33.7	1	42.8	1	52.5	1	52.1	1	52.0	1	57.1	1	72.4
Switzerland	6	5.2	5	6.4	6	7.0	9	3.3	7	3.7	—	—	—	0.1	—	0.2	—	0.2	10	0.4	8	0.2
India	7	3.9	8	3.5	8	2.5	8	3.4	9	2.4	—	—	—	—	—	—	—	—	—	—	—	—
Japan	8	2.7	6	5.2	3	11.1	6	6.7	5	5.5	8	2.0	—	0.2	—	—	—	—	—	—	—	—
Italy	9	2.6	9	2.7	7	2.6	7	5.1	6	4.6	7	4.8	8	0.9	4	6.1	4	7.1	3	9.2	5	1.8
Sweden	10	2.1	11	1.5	11	1.3	—	0.5	—	0.4	9	0.7	—	—	—	0.3	—	—	—	—	—	—
Holland	11	1.8	10	1.6	9	2.1	10	2.2	8	3.0	5	5.4	6	2.1	8	1.7	8	1.7	8	1.0	—	—
Canada	12	0.9	12	1.2	14	0.7	—	0.4	—	0.2	—	0.1	—	—	—	—	—	—	—	—	—	—
Spain	13	0.6	14	0.7	12	1.2	—	0.2	—	0.2	10	0.4	—	—	—	—	—	—	—	—	—	—
Belgium	14	0.5	—	0.3	—	0.4	15	0.6	11	1.7	—	—	7	0.9	9	1.0	9	0.9	11	0.2	—	—
Czechoslovakia	15	0.5	13	1.1	—	0.2	13	0.7	—	0.1	—	—	—	—	—	—	—	0.1	9	0.6	—	—
China	—	0.4	16	0.8	—	—	12	1.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Poland	—	0.4	15	0.8	—	—	11	1.6	12	0.8	—	—	—	—	10	0.4	—	—	—	—	—	—
Rumania	—	0.4	—	0.2	—	—	—	—	—	0.2	—	—	—	0.1	—	0.1	—	—	—	—	—	—
Austria	—	—	—	—	—	—	14	0.6	—	0.3	—	—	—	—	6	3.2	7	1.9	6	3.8	4	3.0

TABLE 5

PERCENTAGE OF ABSTRACTS BY LANGUAGE

	Chemical Abstracts												*Chemisches Zentralblatt*							
	1949		1948		1947		1937		1927		1917		1907		1907		1897		1887		1877	
English	1	61.2	1	55.0	1	57.0	1	36.1	1	38.4	2	32.1	2	21.1	2	19.9	3	16.7	3	11.5	3	6.5
German	2	11.0	4	10.2	3	10.3	2	25.4	2	37.0	1	43.1	1	52.5	1	56.0	1	54.1	1	61.8	1	76.1
Russian	3	10.9	2	12.1	5	7.5	3	12.9	6	1.6	3	7.3	4	5.4	5	2.8	5	3.2	5	4.8	—	0
French	4	8.2	3	11.0	2	11.4	4	9.9	3	12.3	5	4.8	3	17.8	3	13.3	2	19.0	2	11.7	2	15.7
Italian	5	3.3	6	2.8	6	2.6	6	5.1	4	4.6	6	4.8	6	0.9	4	6.1	4	7.1	4	9.2	4	1.8
Japanese	6	3.1	5	4.8	4	8.0	5	5.6	5	2.9	7	1.4	—	—	—	—	—	—	—	—	—	—
Spanish	7	1.1	7	1.4	7	1.6	10	0.6	10	0.3	9	0.4	—	—	—	—	—	—	—	—	—	—
Polish	8	0.4	8	0.6	—	—	7	1.2	7	0.7	—	—	—	—	—	—	—	—	—	—	—	—
Swedish	9	0.3	10	0.3	10	0.3	13	0.3	9	0.3	8	0.8	—	—	—	—	—	—	—	—	—	—
Dutch	10	0.2	11	0.1	9	0.3	8	0.8	8	0.5	4	5.4	5	2.1	6	1.6	6	0.7	7	0.5	—	—
Portuguese	11	0.2	12	0.1	—	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Hungarian	12	0.1	9	0.3	—	0.1	11	0.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—

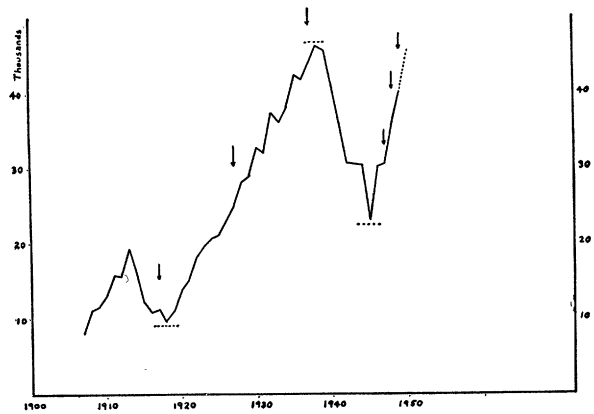

FIG. 5. Abstracts of papers vs years. (From E. J. Crane. *Chem. Eng. News*, **27**, 529 [1949]).

with Japanese for fifth place. The Japanese language is the only other language of importance.

Contributions by country and by language have also been investigated from the standpoint of percentage of total output. These figures are given in Table 4, which shows percentages of all abstracts by country, and also in Table 5, which presents percentages of all abstracts by language. These figures have also been interpreted by means of graphs, which indicate clearly the changes in relative importance since 1877.

Fig. 3 reveals how the importance of Germany as a publisher of scientific articles in the field of organic chemistry has decreased and how that of the United States has risen. Fig. 4 exhibits conclusively the decline of German as a scientific language and the rapid increase in importance of the English language, which in 1949 accounted for over 60 per cent of all articles abstracted in *Chemical Abstracts*. Similarly, as in Fig. 3, Russian shows increased importance, whereas French and Italian show corresponding decreases.

In order to obtain a clearer picture of how total publication (total abstracts for *all* fields) has developed over the years, Fig. 5 has been included. This has been borrowed from E. J. Crane (*9, 10*). The general decline in total publication during 1913–18 was followed by a period of increased productivity until the peak year of 1938. A steady decline in productivity followed, reaching its low point in 1945. Since 1945 a sharp increase in publication has taken place, and there is a possibility that in 1950 the peak of 1938 may have been reached.

CONCLUSIONS

From the data collected, it appears that the ten leading journals in the field of organic chemistry at the present time (from a total production standpoint) are, in order: *Journal of the American Chemical Society* (1876), *Journal of the Chemical Society* (1847), *Journal of General Chemistry of the U.S.S.R.* (1931), *Helvetica Chimica Acta* (1918), *Journal of Organic Chemistry* (1936), *Bulletin of the Chemical Society of France* (1858), *Chem. Berichte* (1867), *Comptes rendus* (1835), *Nature* (1869), and *Doklady Akad. Nauk S.S.S.R.* (1933). In 1877 four of these journals were in the leading ten: *Journal of the Chemical Society, Bulletin of the Chemical Society of France, Chem. Berichte,* and *Comptes rendus.*

An analysis of countries contributing to the literature of organic chemistry shows that the five leaders are now the United States, England, Russia, France, and Germany. In 1877 the order was Germany, France, England, Austria, and Italy. The United States was seventh at that time. In 1897 the United States was fifth, second in 1937, and has been first since 1947.

An analysis of languages of publication reveals that the languages in order of importance are now English, German, Russian, French, and Italian. In 1877 the order was German, French, English, and Italian.

Graphical representation, where percentage of total abstracts by country and language are plotted against years, reveals that about 1927 the English language replaced German as the leading language in the field of organic chemistry, and about 1938 the United States took over the lead in publication from Germany.

Investigation of total publication in *all* fields of chemistry reveals that world publication fell off from 1913–18 during the first world war, then increased until the peak year of 1938, and then rapidly declined during the period of the second world war from 1938–45. Since 1945 there has been a steady increase in world publication, and estimated figures for 1950 show that the 1938 total may have been reached in that year.

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