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A SURVEY OF AMERICAN BIOLOGICAL CHEMICAL LITERATURE[1]

ABOUT a year ago Sparks and Noyes[2] prepared a census of the periodical literature of chemistry published in the United States. They selected for their study the five American chemical journals:

American Chemical Journal
Journal of the American Chemical Society
Journal of Biological Chemistry
Journal of Industrial and Engineering Chemistry
Journal of Physical Chemistry

This study showed that during the five-year period, 1909–1910 to 1914–1915, the *Journal of Biological Chemistry* gained 150 per cent. in the number of published pages; the *Journal of Industrial and Engineering Chemistry,* 78 per cent.; the *Journal of the American Chemical Society,* 88 per cent.; while the *Journal of Physical Chemistry* showed a loss in published pages of only 2 per cent. (*The American Chemical Journal* was merged with the *Journal of the American Chemical Society* in 1914).

With this study as a model and an incentive, the writer has made a somewhat similar investigation of the biological-chemical literature during the period 1907–1916. The question as to what properly belongs under the heading biological chemistry is probably open to discussion. It seems fair, however, to accept the decision of the men who are in charge of the various sections of the Biological Chemical division of *Chemical Abstracts.* All papers which are found in

[1] This study was presented before the Second Annual Conference of Biological Chemists, held at the Chemist Club, New York City, December 31, 1917.

[2] Sparks, Marion E., and Noyes, W. A., SCIENCE, 1917, 45, 168 (February 16).

this division have been considered in this study.[3]

The first indication of the increased interest in biological research may be found in the large number of publications which have been founded and successfully continued during this period. The principal periodicals published prior to 1907 are given in Table I. The date indicates the year of the first publication.

TABLE I

Publications of Biological Chemical Interest Prior to 1907

American Journal of Medical Sciences	1827
Journal of the American Medical Association	1883
Science	1883
Journal of Experimental Medicine	1896
Journal of Medical Research	1896
American Journal of Physiology	1898
Biological Bulletin	1899
American Journal of Anatomy	1901
Journal of Infectious Diseases	1904
Journal of Experimental Zoology	1904
Journal of Biological Chemistry	1905
Anatomical Record	1906

Those journals founded during the period 1907–1916 are given in Table II.

TABLE II

Periodicals of Biological Interest Founded During the Period 1907–1916

Chemical Abstracts	1907
Archives of Internal Medicine	1908
Journal of Pharmacology and Experimental Therapeutics	1909
Biochemical Bulletin	1911
American Journal of Diseases of Children	1911
Journal of Agricultural Research	1913
American Journal of Tropical Diseases	1913
Journal of Laboratory and Clinical Medicine.	1915
Journal of Parasitology	1915
Journal of the Association of Official Agricultural Chemists	1915
Journal of Cancer Research	1916
Journal of Bacteriology	1916
Journal of Immunology	1916
Quarterly Cumulative Index to Current Medical Literature	1916
American Journal of Syphilis	1917
Abstracts of Bacteriology	1917
American Review of Tuberculosis	1917
Journal of Urology	1917

[3] It should be remarked in this connection that chemistry is only one of the sciences which have been used in the study of biological phenomena. A similar study might be made for each of the other sciences, especially physics.

The number of journals which have sprung into existence since 1914 is very noticeable. Many of these probably owe their existence, in part at least, to the fact that publication in German magazines was cut off by the war. It is to be hoped that they may survive after the war, when many scientific investigators will again be tempted to publish in German.

Special attention should be directed to the two abstract journals. *Chemical Abstracts* is by far the most complete abstract journal published in any language. It covers nearly 700 periodicals (671 titles are given in the 1915 list; many have been added since then, as the 1917 list, shortly to appear, will show. Still others are covered through other abstract journals, about a dozen of which are regularly checked). The *Biological Abstracts,* so well organized by Professor Gies, and carefully edited by his staff, are especially complete. Very few, if any articles of biological interest are missing. The fact that about 10,000 copies are in circulation must add to the value of American scientific research. *Abstracts of Bacteriology* covers a similar field for the bacteriologist and appears to be equally well organized. And finally, the *Cumulative Index of Current Medical Literature,* issued quarterly, gives in one index the current medical and biological literature. We are grateful for these publications, whether we express it or not. They lighten very much the burden of reference hunting.

The following journals have been used in the study recorded here:

American Journal of the Diseases of Children
American Journal of Medical Sciences
American Journal of Physiology
Archives of Internal Medicine
Journal of Agricultural Research
Journal of the American Chemical Society
Journal of Bacteriology

Journal of Biological Chemistry
Journal of Cancer Research
Journal of Experimental Medicine
Journal of Immunology
Journal of Infectious Diseases
Journal of Medical Research
Journal of Pharmacology

TABLE III

Relation of the Biological Articles to the Total Number of Articles Published, 1907–1916

Periodical	Pages	Articles		
		Total	Biological	Per Cent.
Am. J. Dis. Children	5,844	399	119	30
Am. J. Med. Sci.	—	1,351	168	12
Am. J. Phys.	12,135	864	500	58
Arch. Int. Med.	—	1,112	349	31
J. Agr. Res.	4,851	329	75	23
J. Am. Chem. Soc.	—	2,164	383	17
J. (Org. and Biol.)	—	994	383	40
J. Bact.	477	37	15	40
J. Cancer Res.	460	24	5	20
J. Biol. Chem.	14,384	1,304	1,304	100
J. Exp. Med.	11,648	885	398	45
J. Immunology	556	34	21	61
J. Infect. Dis.	—	692	289	42
J. Med. Res.	—	589	176	30
J. Pharm.	5,040	304	254	80

These were selected as most likely to contain the more important literature of biological-chemical interest. They do not contain all, by any means, as it is met with in the most unexpected places. It would be of interest to compile a complete list of all the work of biological chemistry published by the various American laboratories in all the periodicals, American and foreign. This the writer must leave to some one else.

Table III. contains a list of the total number of articles and the number of those of biological-chemical nature, and in some cases, the number of pages. As Sparks and Noyes pointed out, and as many others have remarked in discussing the subject, the number of pages has no real significance in many instances. Many short articles are of more value, scientifically, than other articles with their hundreds of pages. The length of an article depends too much upon the nature of the subject and the personality of the writer, and not enough upon its scientific value.

Table IV. contains a comparison of the number of articles (and pages in some instances) in those periodicals published during the periods 1907–1908 and 1915–1916. In those cases where the periodical was not published in 1907, the figures for the later period are given for comparison.

These tables bring out, rather forcibly, first, the large amount of biological work which is being carried out in this country, and second, the marked increase in this kind of research during the past decade. The curve will drop

TABLE IV

Showing Per Cent. Increase During the Ten-Year Period

Periodical	Pages			Articles Total			Articles Biological		
	1907–1908	1915–1916	% Increase	1907–1908	1915–1916	% Increase	1907–1908	1915–1916	% Increase
Am. J. Dis. Children	—	1,610	—	—	113	—	—	39	—
Am. J. Med. Sci.	—	—	—	257	275	7	18	49	17
Am. J. Physiol.	2,522	3,198	23	199	237	20	134	137	2
Arch. Int. Med.	2,468*	4,071	65	149*	252	69	38*	142	274
J. Agr. Res.	—	3,596	—	—	218	—	—	61	—
J. Am. Chem. Soc.	—	—	—	402	584	45	86	88	0.2
J. Bact.	—	477	—	—	37	—	—	15	—
J. Biol. Chem.	1,556	5,384	246	121	435	259	121	435	259
J. Cancer Res.	—	460	—	—	24	—	—	5	—
J. Exp. Med.	1,421	3,052	114	95	223	134	55	93	70
J. Immunology	—	556	—	—	34	—	—	21	—
J. Infect. Dis.	1,290	2,560	99	91	213	134	44	86	95
J. Med. Res.	2,881	2,062	—	125	128	2.5	35	55	57
J. Pharm.	—	1,715	—	—	117	—	—	103	—

* For the period 1908–1909.

somewhat during the period of the duration of the war, because of the large numbers of biological chemists and physicians who have already entered, and who will enter the government service. However, we may look for a return to the highest point of the curve as soon as normal conditions exist again. It would seem that one of the lessons we must learn from this terrible conflict is the national value of scientific research.

TABLE V

Institutions which Have Published Ten or More Papers in Any One Periodical

	Am. J. Physiol.	*J. Biol. Chem.*	*J. Exp. Med.*	*J. Pharm.*
Armour and Co.		10		
California	13	89	12	
Carnegie Nutrition	17	10		1
Exptl. Evolution	7	5		
Chicago	70	40	13	11
Columbia	21	23	30	6
Conn. Agr. Expt. Station	30	26		
Cornell Medical	25	46	3	7
Harvard	38	95	10	9
Health Dept., N. Y. City		3	10	
Herter Lab.		77		
Illinois	12	20	10	
Johns Hopkins	34	39	37	51
Mass. Gen. Hospital	1	16	1	7
Michigan	2	3	2	10
Missouri	4	14	2	3
N. Y. Agr. Expt. Station		35		
N. Y. Post Graduate		14		
Montefiore Home	2	13	1	
Northwestern	10	3		13
Pennsylvania	8	53	20	10
Rockefeller	16	135	114	8
Roosevelt		13		
U. S. Fisheries	5	19		
U. S. Hygienic Lab.		7		10
Vanderbilt	2		12	
Washington Univ.	6	18		6
Western Reserve	24	15	15	37
Wisconsin	14	57	7	9
Yale	35	117	11	8

Table V. contains a list of those institutions which have published ten or more papers (biological) in any one of the four periodicals tabulated, with the number of papers published in the others. (Lack of time prevented a complete classification of all the periodicals). Table VI. classifies the articles in these four periodicals according to the scheme used in *Chemical Abstracts*.

These tables and figures, incomplete as they are, give us an idea of the large amount of biological material which is being published yearly. As Professor Vaughan remarks about medical literature, some is good, some is bad, and much of it is indifferent.[4] While the direct responsibility for the quality of the work published depends upon the investigator himself, some of this responsibility must be laid upon the teachers of biochemistry of this country. This responsibility may even be carried back still farther, as Dr. Hammett[5] has recently pointed out, and may in part be placed on the shoulders of the teachers of the fundamentals of chemistry. It is a hopeful sign, in view of this responsibility, to see so large a number of the leaders of biological chemistry gathered in this conference for the improvement of its teaching. May the inspiration which is gathered here send us back to our desks and our laboratories with the determination to do our best the coming year to build deep and strong the foundations upon which the future biological publications will be based.

TABLE VI

Classification of Articles

	Am. J. Physiol.	*J. Biol. Chem.*	*J. Exp. Med.*	*J. Pharm.*
Organic	34	213	2	4
General Biology	58	196	2	1
Methods	16	180	8	14
Botany	0	17	1	4
Bacteriology	257	121	61	2
Physiology	29	171	69	62
Metabolism	63	265	24	2
Pharmacology	40	6	33	144
Pathology	21	38	166	17
Zoology	3	10	2	3

Clarence J. West
The Rockefeller Institute for Medical Research

THE AGE AND AREA HYPOTHESIS

Professors Sinnott and Berry[1] express themselves unfavorably to my hypothesis of "age and area," which Professor de Vries

[4] Editorial, *J. Lab. and Clin. Med.*, 1915–16, 1, 59.

[5] Hammett, F. S., Science, 1917, 46, 504 (Nov. 23); *Medical Record*, 1916, 90, 503 (Sept. 16).

[1] Science, N. S., Vol. 46, p. 457, November 9, 1917; p. 539, November 30, 1917.