THE PRESENT STATUS OF THE PUBLICATION OF LITERATURE IN THE MEDICAL AND BIOLOGICAL SCIENCES

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During the last few years it has become more and more apparent that we are facing a crisis in regard to the conditions which exist in the publication of medical and biological literature. Evidence of this has appeared in the reaction of scientific societies, of individual scientists, of librarians, and of library associations. Numerous publications have appeared analyzing various phases of the situation and proposing a variety of remedies. Criticisms have been heard from many sources indicating dissatisfaction with existing conditions. The tremendous number of journals being published and the continued increase in the cost of yearly subscriptions have made it increasingly difficult for libraries to maintain adequate subscription lists. At the same time libraries have been facing a marked decrease in budgets, gifts and other forms of financial support.

A comprehension of the present unbalanced status between the demand for opportunities of publications, the pages available, the budgets of libraries, and the policies of editors and publishers has become of such import to everyone concerned that the most serious thought must be directed towards the analysis of this complicated problem. This unbalanced condition is obviously made up of two major phases: (1) the problem of adequate opportunity for the publication of all important results of medical and biological research, and (2) the availability of these published results to all the scientists of the world.

With the idea in mind of obtaining more accurate data on the subject, a survey of the current medical and biological publications was undertaken. Veterinary, dental, pharmaceutical and nursing journals were excluded, as were those published by commercial firms and medical cults. No chemical journals have been included except those which deal directly with biochemistry.

It is not possible to regard the figures given as absolutely accurate. A journal is discontinued in one country, in another a new journal is launched; and it may take months for these changes to be reflected in bibliographic lists. There has not been time to send the list to each country for verification. I therefore apologize in advance for any misstatements in regard to any given country, and hope that anyone who can assist in correcting these figures or who can furnish a more accurate list of current medical and biological periodicals for any given country will kindly do so. We believe, however, that these figures are sufficiently accurate to furnish a working basis for discussion. The Union List of Serials, the two supplement volumes to the Union List, the list of jour-

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nals indexed by the Quarterly Cumulative Index Medicus, and the Index-Catalogue of the Library of the Surgeon General's Office have been carefully studied.

A glance at the total number shows that there are approximately 2,221 publications current at the present time in medicine and the biological sciences. Undoubtedly there are many publications included in these figures which are only of ephemeral value, others which are chiefly of local interest and some which consist of material reprinted from other publications.

Turning to Table I, which shows an analysis of the current periodicals under country and subject*, we find that in the United States 511 are being published at present. Here we must consider several factors: size and population, and the fact that this list was compiled in the United States from bibliographic material and lists available there. It is therefore possible that more titles of purely local interest have been included than is true in the case of the other countries. The analysis shows 288 German publications, 248 French, 198 Italian and 137 British (English, Scotch and Irish), 70 Japanese, 62 Spanish, and 59 Scandinavian.

The survey has also shown that approximately 67 new periodicals in the medical and biological sciences began publication or were announced during 1933-34 and to date in 1935.

Under subjects we find 690 publications in general medicine, 154 in public health and hygiene, 126 in neurology and psychiatry, 69 in pediatrics and 58 in tuberculosis. While public health and hygiene shows only 154 publications, this is undoubtedly misleading because many of the publications in the groups just mentioned deal in some measure with preventive medicine. Such a wealth of material is certainly significant in showing the trend of modern developments in public hygiene.

The analysis shows certain tendencies toward overproduction, since in most of the large countries there are several journals covering the same special field. In just what degree this represents real overproduction, however, it is difficult to say, as the subject classification is necessarily artificial. A journal falling under a certain subject may treat that subject from a totally different angle than another journal included in the same subject classification; from this viewpoint both journals would be necessary in order to give the subject adequate representation. It is obviously extremely difficult to draw any hard and fast conclusions.

If we analyze the figures from still another angle, we find that of all the publications surveyed, 351 are reports, proceedings or transactions of societies. This does not mean that these figures represent the number of societies in the medical sciences. The number is undoubtedly far greater. No journal sponsored by a society is included in this count unless it published chiefly material presented before the society. Nevertheless the classification is only approximate. The countries having the greatest number of such publications are the United States and France, 115 and 61 respectively.

Unquestionably much of the vast amount of published material has been the result of increased interest in the subjects, and the greater production which naturally follows. In the preface to the 5th edition of Cattell's *American Men of Science*, published in 1933, the following statement appears: "This work of reference contains about 22,000 biographical sketches, a more than five-fold increase over the first edition published in 1906." Dr. Cattell interprets this great increase in the number of scientific workers in America as representative of the enlarged place of scientific research in the modern world. It is generally conceded that the number of individuals engaged in scientific work has been and is increasing, and this results in a greater output of material for publication.

Let us now turn to the first phase of our problem: increasing demands for publication facilities. We must admit that the increase in the amount of investigative results being produced in the medical and biological sciences has been great. Very naturally the question also arises: does this represent the natural, healthy growth of subjects in which an increasing amount of active research work is taking place, or have other, and possibly undesirable, factors entered in, which have resulted in an increased production of published material? One must ask: does *all* of the mass of published literature represent *chiefly* the result of investigative data concerning fundamental discoveries? It is regrettable that the answer must be *no*. Unquestionably other factors have entered in, and certain of them seem of particular importance.

In some countries institutional appointments and promotions have been to a certain extent dependent upon the number of titles that are included in a candidate's bibliography. The natural result has been a stimulation to split papers into more and more units, and since each of these units usually contains introduction, bibliographic analysis and discussion, the total number of pages published is automatically increased. Bibliographic and abstract journals are flooded with more and more titles; and finally, the dispersion of results makes necessary a final republication in monographic form. All of which results in a duplication of publication.

In other countries, a different, but equally as pernicious, custom has developed. Emphasis has been placed upon the length of publications as the basis for promotion, with the result that unnecessary detail, elaborate discussion, and hence overproduction, have resulted.

A more critical attitude in this regard on the part of educational leaders in medicine, and emphasis placed upon the *content* of individual contributions as a criterion for appointment and advancement rather than on the number of titles or the number of words, would be of value in controlling the character and number of papers offered to the journals for publication.

In certain countries, and this is particularly true in the United States, there has been slowly developing a large series of journals whose major reason for existence lies in presenting an opportunity for local physicians to express their opinions and record their cases. Much of this material is duplicated in the larger publications (*i.e.*, the more general clinical journals), and represents therefore, in large part, an ex-

pression of local interest and local endeavor. Might not many of these journals be combined and the funds spent by these state, city and county associations be pooled, so that one publication would represent several localities and groups?

This survey has shown that there are many publications in which only a few of the articles represent original work, and in which the majority, or all of the material, is reprinted from other sources. Certain series published by institutions and medical schools are striking examples of this type of publication. Experience has shown that the reprinted material is rarely asked for under the institutional series title, due to the fact that it is not indexed under these titles in bibliographic indices and abstract journals. Nevertheless, libraries must, even when these publications are furnished gratis, bind, catalog, and house them with an expenditure of time and money equal to that required for original material. This does not include any consideration of the original expense borne by the institution in the republication of this material, the funds for which might much more wisely be utilized in the financing of original publications or even of research itself.

The publication of reprinted material seems to be taking place in all countries to a greater or less degree. From a study of titles alone it is extremely difficult to determine which publications consist chiefly of reprinted material. Of the publications issued in the United States, 73 were frankly of this type. Studies should be carried out in each country where the journals will be more accessible in order to determine the exact number of publications which are made up entirely, or in large part, of reprinted material.

Germany publishes 27 abstract and bibliographic journals, the largest number found for any one country, and also leads in the publication of supplements, of which there are approximately 22. In France there is a good deal of abstract material published, but this is usually combined with original contributions, these journals containing about fifty per cent abstract material; this is also true in Italy. The "Revues" and "Rivistas" are notable examples of this type of journal. A careful study of the overlapping in the publication of abstracts in each country would have to be done to determine its exact extent. Certainly bibliographic journals (*i.e.*, journals containing references only) and, to some extent, abstract journals, when published separately for each special subject, cause duplication of material and needless expense to libraries.

In countries where honoraria are paid to authors, there has been in the past a very definite tendency toward encouraging, by this means, an increase in the length of published articles. Obviously many scientists are not only glad of an opportunity to describe and discuss their results at greater length than necessary, but have found both stimulation and excuse for length by the fact that larger honoraria were paid for longer articles.

Another serious difficulty has been encountered in the publication of dissertations and theses, as Dr. Leyh (16) has so ably demonstrated in his recently published article. It is well known that most universities require, and rightly so, that each candidate prepare, as a part of the

requirement for the degree of doctor of philosophy, an elaborate analysis of the subject in which he is carrying on investigation. In many instances these theses have been published in full in medical and biological journals, and have thereby enormously increased the number of pages issued. The expression of the student's labors in analyzing and reviewing the literature has been a wholly unnecessary burden upon the publication facilities of the world. If only concisely stated, original, experimental findings were published, obviously this burden would be markedly lessened.

Clearly, therefore, it has been demonstrated that medical and biological literature has increased in quantity, both because there has been an increase in important contributions and because there has been a growing tendency towards the publication of unnecessary material. The continued publication of unnecessary material may, if uncontrolled, fill all the available pages and preclude the publication of really sound and original results. Therefore, even with a greater number of periodicals, the scientist faces increasing difficulties in obtaining facilities for the publication of his work, and the mass of unimportant data recorded obscure the more important contributions and make it almost impossible to review the literature even in his special field.

We turn now to the second phase of the problem to which we have referred above: the availability of medical and biological publications. The distribution, and consequent accessibility to scientists, of these periodicals is directly related to their cost. Since 1929 in the United States, and before that time in many countries, libraries and educational institutions have been facing reductions in budgets, discontinuations of grants and special funds, decreases in gifts and increased burdens due to unstabilized currencies. The difficulties faced by libraries have been discussed from various angles by Dr. Munthe (24, 25), Mr. Charles H. Brown (5, 6), Mr. Wilfrid Bonser (1, 2, 3), Dr. Leyh (15, 17), M. Bultingaire (7, 8), Dr. Holmberg (13), and others (10, 11, 4). No one can predict the ultimate outcome, but it may well be that the future will have to shape itself more in line with present conditions than on the pattern of the golden days of 1925-1929. Even the most optimistic feel that more care must be utilized in regard to the administration and expenditure of those funds which are available for educational purposes than has ever been necessary before.

A survey of subscription lists shows that there are many journals, particularly in some of the specialties, to which only a few libraries in the United States subscribe. That medical libraries can maintain subscriptions to all of the important medical periodicals is an impossibility, and, under present conditions, there is no hope of their being able to do so. Librarians attempting to provide the material which will prove of the greatest aid to the users of the libraries, find it extremely difficult to apportion the limited funds at their disposal so that the most important publications will be available.

The realization of the fact that periodicals represent the most important asset of a medical library has resulted in every effort being made to maintain subscriptions in spite of decreased funds; this has meant

that, to a large extent, the funds usually spent for books and monographs have been used to meet the deficits in current periodical budgets. Obviously this is an emergency measure which should not be indefinitely continued.

The high cost of "handbooks" has also proved a tremendous burden on library budgets, sometimes the unforeseen cost of a single volume taking almost the entire annual appropriation for books. It often happens that many libraries are too impoverished to buy the remaining volumes needed to complete their sets. The fact that the publication of a single handbook is carried on over a period of many years, so that before the last volume is issued, the first volumes are out of date, and the final volume is followed speedily by the announcement of a new edition of the work, renders librarians very loath to contract for the purchase of such publications.

There seems to be no doubt about the fact that scientists are keenly aware of the need for reform in rendering published material more accessible for investigators at lower costs. It is obvious that this realization of the need for reform has been the direct result of the high cost of medical literature. It is clear that libraries and scientists face serious difficulties. Limited funds cannot maintain the expensive journals; consequently, scientists working in localities where there are no heavily endowed libraries are seriously handicapped. As a result, they are naturally seeking some solution of their difficulties.

How real the difficulties are, and how serious is the consideration being given them, is shown by the fact that from time to time articles have appeared written by investigators working in widely different fields, advocating reforms in the publication of scientific literature which, from the librarian's viewpoint, cannot be looked upon as other than radical.

Dr. Mansfield Clark (9), in his presidential address delivered before the Society of American Bacteriologists, and entitled "Evolution toward a mature scientific literature," lifts the curtain of time, and assuming that development will continue along the same lines as in the past, has sketched the future. No one who reads this delightful address can fail to realize that the situation he so whimsically depicts would be unfortunate if realized. The warning is a timely one, and Dr. Clark concludes his paper on a hopeful note. He believes ways will be found to attain a maturity in the development of scientific literature which is befitting the highest grounds of intellectual endeavor.

Dr. Atherton Seidel (27), of the National Health Institute, in his article on the photomicrographic reproduction of documents, suggests the application of photographic methods to the making of copies of printed articles on motion picture film, and the adaptation of the strips of film so that they can be mounted on filing cards.

Dr. M. B. Visscher (28), of the College of Medicine of the University of Illinois, maintains that there are many journals to which libraries now subscribe in order to obtain a small percentage of the material they contain. Therefore he suggests that, if all of this material were made available by some cheap photolithographic process as separate publica-

tions at low cost, it would lighten the financial burden now imposed on individuals and institutions by the high cost of subscriptions to the entire journal. Such a plan would eventually mean the financial ruin of the journals, as the number of subscribers would, almost certainly, decrease below the point where publication could be maintained.

Dr. Visscher carries his idea still further, and suggests that some central scientific organization in each country take over the supervision of the publication of scientific material. Such an organization would serve as a clearing house and depository for original documents. At stated intervals, a list of titles and abstracts of each manuscript would be sent out and libraries and individuals could check the titles wanted and copies would be furnished by lithoprinting at comparatively low cost.

Some central scientific organization in each country, or group of countries, to supervise medical publication, such as proposed by Dr. Visscher, might be advisable, provided such organizations worked in cooperation with the journals rather than by supplanting them. Could this be accomplished by having charts, tables, protocols of experimental findings, case reports and exhaustive reviews of literature eliminated from the published articles, and deposited with the central organization or with the publisher, at the time of publication? This additional data could be reproduced by some cheap method for those investigators who actually needed the material. The fact that such material is obtainable could be stated in the published paper, the work would receive the widespread recognition and circulation of periodical distribution, the expense of publication would be greatly diminished, yet the investigators actually working on the subject would be able to obtain extensive experimental data for use in conjunction with the published article. Work not sufficiently important for publication could be abstracted in the journal and the manuscript filed away for reproduction for investigators requesting it, and as a result more investigative findings would be rendered available than would otherwise be possible.

Another plan which was the direct outcome of the high cost of medical and biological publications was the so-called zoning plan recommended by the Medical Library Association. In 1924 the Association passed a resolution (18) (19), through its committee, of which Mr. Charles Frankenberger was chairman, deploring the high cost of German publications. Since that time the Association has taken an active part in attempting to obtain reductions in the cost of medical publications. In 1932 Colonel Fielding H. Garrison (12) and the late Mr. Alfred Robert (26), published analyses of conditions existing in the field of medical and biological literature.

During 1932 a committee was again appointed to study the question. In January 1933 a letter (21) was sent jointly by the Medical Library Association and the American College of Physicians to German editors and scientists requesting their aid in the matter. In June 1933 the Medical Library Association recommended (22) that libraries subscribe only to journals having fixed yearly prices, and that the United States and Canada be divided into ten zones, one library in each zone being expected to subscribe to high-priced journals and to function as a lending

center for other libraries in that zone. This action was taken because it seemed inevitable that the continued high prices would force a large number of cancellations and hence make many important journals unavailable to many readers. By a system of zoning it seemed possible to guarantee availability of all important journals to the investigators of the country.

As a result of the appeals from interested groups in many countries, and from the International Federation of Library Associations, substantial reductions in the cost of German periodicals were effected during 1934. For this reason the zoning system was not put into effect, as the Medical Library Association recognized that a period of reorganization was necessary to carry out the reforms promised in the publication of scientific literature.

The reduction in prices for the journals published by the firm of Julius Springer in the medical and biological sciences containing original work, amounted to RM 4,187.55 during 1934, or a reduction of 41.8 per cent in relation to the prices paid in 1932. The prices of abstract journals and review journals (Ergebnisse) were not markedly changed, but some showed slight increases in price. If the reduction is figured with the abstract journals included, the total reduction for 1934 is RM 4,079.10, and the per cent reduction drops to a total of 31.5.

Additional reductions from other German firms amount to RM 980.30, making a total reduction for 1934 of RM 5,059.40 for the German publications in medicine and the allied sciences.

An analysis of 25 German journals was made at the New York Academy of Medicine by Miss Janet Doe in which a total of the 68,094 pages published in 1932 were counted, and compared in price with the 35,098 pages published in 1934 (Table 2). Of these journals, 20 showed an increase in the cost per page, 4 a decrease, and 1 no change. In these 25 journals, the total reduction in the number of pages published amounted to 48.45 per cent. For the same journals, the total cost in 1932 was RM 7,899.12 as compared with a total cost of RM 4,400.79 in 1934, a reduction of 44.28 per cent. The average decrease in pages exceeded the reduction in cost by 4.17, or, in other words, the publishers have gained 4.17 per cent (Table 6). Expressed in another way, the average price per page for these journals in 1932 was 11.6 pfennigs, and in 1934 it was 12.5 pfennigs, or an increase of 7.7 per cent. Obviously the methods in such a readjustment as the publishing firms have had to face, particularly the necessary changes in personnel and overhead, might well represent a greater differential than this. While there has been this small increase in the per page cost of these journals, the fact that page reduction and total cost reduction have so closely paralleled each other is extremely hopeful for the future.

In order to carry the analysis further, 25 American, 25 French and 25 British journals published during 1934 were studied in the same way (Tables 3, 4, 5 and 6). These journals covered approximately the same subjects as those in the German list. The journals selected included some of the most expensive journals published in these subjects. In order to make the comparisons as fair as possible, the cost of the German, French

and English journals were computed on the basis of the lowest value of their currencies for the year 1934 in relation to the American dollar. The average cost per page for the German journals was 4.5 cents; for the British journals, 1.5 cents; for the French, 0.8 cents, and for the American, 0.7 cents (Table 7).

We have seen that a definite decrease in the total cost of the high-priced German periodicals has been accomplished. We assume that the journals have improved in character as a result of the acceptance of more carefully edited and selected material. This point is, of course, difficult to prove, but we believe it is true, as we have the greatest faith in the editors and publishers of the journals in question. They are to be congratulated. Medical librarians and scientists throughout the world deeply appreciate their efforts, and it is extremely gratifying that during 1934 the decrease in the number of pages has so closely paralleled the price reduction. Nevertheless, as we have seen, there has been no price reduction per page, and the libraries in the United States paid in 1934 an average of more than four times as much for German journals per page as for comparable French and English journals, and over six times as much for German as for American journals. As further progress is made in this program of reconstruction, it is to be hoped that some method will be found whereby prices can be still further lowered until an average more closely in line with that of other countries can be achieved. Obviously this cannot be accomplished at once, and the various factors involved must receive sympathetic and careful study.

At their meeting in April 1934 the Federation of American Societies for Experimental Biology passed certain resolutions with reference to the high cost of medical periodicals which were sent to the Medical Library Association: "It is the opinion of this association that some effort should be made to obtain a per page reduction in cost, as well as a reduction in total cost dependent upon a reduction in materials published. It is obvious that a reduction in per page cost will be essential if scientific production published in the German journals is to be permanently kept in the medical libraries of this country."

The Federation is composed of the American Physiological Society, American Society for Experimental Pathology, American Society of Biological Chemists and American Society for Pharmacology and Experimental Therapeutics. Other scientific societies in the United States which have passed similar resolutions are the American Association of Anatomists, American Association of Pathologists and Bacteriologists, and the American Society for the Control of Cancer.

A letter recently received from the Bodleian Library of Oxford University states that: "the Radcliffe Library Advisory Committee, whose duties are to make suggestions to the Bodleian Curators as to the purchase of scientific books and periodicals and as to other matters pertaining to the Radcliffe Library known as the scientific department of the Bodleian, at their meeting on December 3 last, expressed its full agreement with the opinion of the Federation of American Societies for Experimental Biology quoted in the report that 'some effort should be made to obtain a per page reduction in cost' of German medical period-

icals, and further laid emphasis on the need for a similar reduction in German periodicals in all branches of science. The Committee requested the Curators of the Bodleian to transmit their views to the Medical Library Association of America."

From a survey of current periodicals in medicine and biology, it seems obvious that the tendency to overproduction is restricted to no one country. A desire to accept as far as possible everything submitted for publication seems widespread. There is also a tendency to publish work in several small papers rather than as a concisely presented whole. This involves an introduction and a review of literature in each paper, hence repetition. Repetitions have also crept in, due to uncorrelated investigations. A tendency toward increased prices has been evident in the publications of most countries. And finally, the question of the publication of dissertations in periodicals represents another difficulty.

Certain unfortunate conditions which obtain at present in the publication of medical literature have resulted in various proposals, none of which seems ideal. It is impossible not to realize that some of them strike at the very foundation of the structure of periodical publication. Are we ready at the moment to tear that structure down? Cannot some less radical methods be found to correct existing evils? As a librarian, I do not feel that we are ready at present to do without medical periodicals or to completely change their character on any extensive scale. What then can be done to improve the situation in regard to the publication of medical literature?

The problem is not a simple one, and numerous difficulties lie in the path of its satisfactory solution; nevertheless, the solution is of great importance because it seems certain that, unless the entire field of publication in the medical and allied sciences is placed on as non-commercial a basis as possible, radical and perhaps regrettable changes are inevitable.

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*These statistics were compiled with the aid of Mrs. Dorinda Knopp, Assistant Librarian Vanderbilt University Medical School.

EXPLANATION OF TABLE I

Subject Headings

The heading Bacteriology and Parasitology includes all publications on Malaria.

The heading Institutional Publications includes only those publications issued by institutions and which are too general to be listed under any specific subject heading.

The heading Neurology and Psychiatry includes all journals relating to Mental Hygiene.

The heading Public Health and Hygiene includes all journals dealing with Industrial Hygiene and Social Hygiene.

Country Headings

Australia and New Zealand are combined.

The heading International has been used to include those journals which are international in scope, but does not include all of those which have the term international in their titles.

It will also be noted that under countries the last classification is Miscellaneous, which includes the 13 countries which publish less than 5 journals each.

	ANAT., HISTOL. & CYTOL.	ANESTHESIA	ANTHROPOLOGY	BACT. & PARASIT.	BIOCHEM. & BIOPHYS.	BIOLOGY	CANCER	DERMAT. & VEN. DIS.	DIGESTIVE SYS.	EMBRYOLOGY	ENDOCRINOLOGY	EUGENICS & GENET.	GYN. & OBS.	CIRCULATION & BLOOD	HIST. OF MED.	HOSPITALS	IMMUNITY & ALLERGY	INFECT. DIS.	INSTITUT. PUBL.
AFRICA				2															
ARGENTINA			1	2	1	2			1		1		1			1			2
AUSTRALIA & N.Z.	1						1												1
AUSTRIA			1			1									2			1	
BELGIUM	1		1	1			1												
BRAZIL				2		2		1					1	1				1	2
BRITISH ISLES	4	1	1	4	1	4	2	3				6	4	1		1		1	12
CANADA	1				1	2										1			4
CENTRAL AMER.																			
CHILE				1					1				1						1
CHINA	1																	1	
COLOMBIA																		1	1
CUBA							1	1	1										1
CZECHOSLOVAKIA			1					2											
EGYPT																			
FRANCE	6		8	5	4	6	2	7	3		1		5	2	3	2	1		4
GERMANY	15	1	7	9	5	8	3	7	3	2	1		10	5	10	4	2	1	
HOLLAND												2	2		1				
HUNGARY			1				1	1			1		1						
INDIA			1	1															
INTERNATIONAL																		3	
ITALY	3		1	4	5	7	2	4	1		2	1	9	2	1	1			7
JAPAN	4			2	3	1	1	5	2		1	1	1						
MEXICO						2								1					1
PALESTINE				1															
PERU																			
POLAND	1					2	1		1				1		1				
PORTUGAL	1		1	2						1									1
RUMANIA																			
SCANDINAVIA			1				1	1				1	4			1			4
SPAIN	1							3	1				2	1				1	1
SWITZERLAND			1										1		2				1
U.S.A.	9	1	4	2	4	12	9	7	5	1	3	7	3	2	5	16	2	3	42
U.S.S.R.	2		3	5	1			1			1		1	1					
URAGUAY																			
VENEZUELA															1	1			
YUGOSLAVIA																			
MISCELLANEOUS				2															
TOTALS	50	3	33	45	25	49	25	43	19	4	11	18	47	16	26	28	5	13	85

TABLE I

LEGAL MEDICINE	MEDICAL EDUCATION	MEDICINE, EXPER.	MEDICINE, GEN.	MEDICINE, MILIT.	MISCELLANEOUS	NEUROL. & PSYCHIAT.	NUTRITION	OPHTHALMOLOGY	ORTHOPEDICS	OTOLARYNGOLOGY	PATHOLOGY	PEDIATRICS	PHARM. & THER.	PHYSICAL THER.	PHYSIOLOGY	PUB. HEALTH & HYG.	RADIOLOGY	SEX	SURGERY	TROPICAL MED.	TUBERCULOSIS	UROLOGY	TOTALS
		1	10							1													14
2		1	13			3		4	1		1	1	2			1			2		3		46
		1	8													1			1	1			15
1			11			4							2			1	1	1					26
		1	10	1	1	3		1					2	1	1	2	1		4	1		1	34
2		2	26	2		2		1		1	1		1			5			3		1	1	58
1		2	33	2	2	7	2	3		1	5	3	1	1	5	11	1		1	6	4	1	137
			17		1	3				1				2		3	1				1		38
			3													3							6
			4									1							1				10
			7										1		2	1							13
			7													1							10
1			9			1		1				2				1	1		1				21
			8			1				1						1			1				15
			5					1								1				1			8
1	1		79	3	3	11	3	8	3	5	3	10	9	5	2	13	8		12	3	2	5	248
2		1	43	2	2	24	1	8	6	10	9	10	3	1	9	24	11	6	8	1	10	4	288
			6	1		2					1	1	1		5	3				1	2		28
			9										1				1						16
			17									1						1		2			23
			5			4			1					1			8			1	1	1	25
1		1	43	2	2	9	2	8	4	10	6	12	5	1	3	10	7	1	6	1	9	3	198
1		3	18	2	1	5		2		1	4	1	2		2	2			3		2		70
			11	2				1					1			2			3				24
			2					1		1													5
			6	1		1																	8
			11			2			1			2			1		1		3				28
1			6								1					1				1			16
			8	1		1					1								2				13
			19	2		3		2	1	2	4	1	2		1	4	2		2		1		59
		2	31	1		2		1		1		3			1	4			3	1	2		62
			8			3	1							1		2							20
5	9	5	136	5	3	29	3	17	3	9	9	17	9	8	13	41	6		22	3	17	5	511
1		3	30	1		5		3	1	1	3	2		1	2	5	2		3		2	1	81
			4							1	1	2				1					1		10
			3																				5
			4	1												1							6
		1	20			1										1				1			26
19	10	24	690	29	15	126	12	62	21	46	49	69	42	22	47	146	51	9	83	24	58	22	2,221

TABLE I—Continued

COMPARISON OF REDUCTION IN PAGES AND PRICES OF GERMAN PERIODICALS

	Title	1932 Pages	1932 Price RM	1934 Pages	1934 Price RM	Per Cent Reduction in Pages	Per Cent Reduction in Price
1	Arch. f. Augenheilkunde	1184	197.60	386	68.40	67.4	65.3
2	Arch. f. Dermat. u. Syphilis	2049	279.40	954	145.60	53.4	47.8
3	Arch. f. exp. Path. u. Pharm.	3826	309.32	2152	164.29	43.7	46.8
4	Arch. f. d. ges. Phys. (Pfluger)	1807	155.60	1161	115.00	35.7	26.0
5	Arch. f. Gynakologie	3185	363.20	1855	235.80	41.7	35.0
6	Arch. f. klin. Chirurgie	4054	375.40	2079	202.60	48.7	46.0
7	Arch. f. Ophthalmologie (Graefes)	2670	136.60	710	102.00	27.5	25.3
8	Arch. f. Orthopad. u. Unf.-Chir.	1130	175.20	517	82.80	54.2	53.3
9	Arch. f. path. Anat. u. Phys. (Vir.)	4023	530.60	1808	238.40	55.0	55.0
10	Arch. f. Psy. u. Nervenkrank	2032	280.40	1009	159.60	50.0	43.0
11	Beitr. z. Klin. d. Tuberkulose	4099	343.40	2560	224.60	37.5	34.5
12	Biochemische Zeitschrift	6408	364.00	3408	205.30	46.8	43.6
13	Deutsche Zeitschr. f. Chir.	2795	232.00	1691	116.00	39.4	50.0
14	Deutsche Zeitschr. f. ger. Med.	1730	220.80	1206	162.80	30.2	26.2
15	Deutsche Ztschr. f. Nervenheilk.	1707	216.00	576	72.00	66.2	66.0
16	Ztschr. f. d. ges. Anat., Abt. I	2150	458.60	1318	309.00	38.6	32.6
17	Ztschr. f. d. ges. exp. Med.	4694	714.60	2020	355.80	56.9	50.2
18	Ztschr. f. d. ges. Neur. & Psy.	4426	523.00	1931	250.00	56.3	52.2
19	Ztschr. f. klin. Med.	2877	338.60	968	133.40	66.3	60.6
20	Ztschr. f. Krebsforschung	2586	290.20	1135	143.00	56.1	50.7
21	Ztschr. f. urol. Chirurgie	2138	269.80	1437	200.20	32.7	25.7
22	Ztschr. f. Parasitenkunde	868	127.00	626	85.20	27.9	32.9
23	Ztschr. f. Zellforschung	1833	374.00	1281	260.60	30.1	30.3
24	Ztschr. f. vergl. Physiolog.	2036	319.00	1096	149.80	46.1	53.0
25	Roux' Arch. f. Entwicklungsmech.	1787	304.80	1214	218.60	32.1	28.2
	Totals	68,094	7,899.12	35,098	4,400.79		

Average Reduction in Pages, 1932-1934 ..... 48.45 %

Average Reduction in Price, 1932-1934 ..... 44.28 %

Per Page Reduction Greater than Price Reduction by ..... 4.17 %

AMERICAN JOURNALS
1934

		Price	Pages	Cost Per Page Dollars
1	American Journal of Anatomy	$16.00	1,042	.015
2	American Journal of Cancer	11.50	3,108	.004
3	American Journal of Obstetrics & Gynecology	8.90	1,892	.005
4	American Journal of Ophthalmology	12.00	1,192	.010
5	American Journal of Pathology	9.00	834	.011
6	American Journal of Roentgenology	12.00	1,712	.007
7	American Journal of Surgery	12.00	1,484	.008
8	American Journal of Syphilis	10.80	590	.018
9	American Journal of Physiology	32.00	2,915	.011
10	American Review of Tuberculosis	8.00	1,608	.005
11	Anatomical Record	16.00	1,762	.009
12	Archives of Internal Medicine	6.00	1,974	.003
13	Archives of Ophthalmology	9.00	2,099	.004
14	Archives of Neurology & Psychiatry	9.50	2,736	.003
15	Archives of Pathology	7.00	1,804	.004

		Price	Pages	Cost Per Page Dollars
16	Archives of Surgery	9.00	2,274	.004
17	Journal of Bacteriology	11.00	1,277	.009
18	Journal of Biological Chemistry	21.00	3,340	.006
19	Journal of Bone & Joint Surgery	5.50	1,024	.005
20	Journal of Comparative Neurology	16.00	1,033	.015
21	Journal of Experimental Medicine	10.00	1,603	.006
22	Journal of Morphology	12.50	638	.019
23	Journal of Nervous & Mental Diseases	11.00	1,486	.007
24	Journal of Pharmacology & Experimental Therapeutics	16.50	1,459	.011
25	Journal of Urology	11.00	1,635	.007
	Total	$303.20	42,521	
	Average Cost per Page in Dollars	$0.007		

FRENCH JOURNALS
1934

		Price	Pages	Cost Per Page Francs
1	Annales d'Anat. Pathol.	Fr. 130	984	.132
2	Annales d'Oculistique	132	1,065	.124
3	Annales d'Hygiene Publique	100	758	.132
4	Annales de l'Institut Pasteur	120	1,416	.085
5	Annales des Maladies veneriennes	125	960	.130
6	Annales de Medecine	110	904	.122
7	Annales d'Otolaryngologie	150	1,352	.111
8	Annales de Parasitologie	120	591	.203
9	Arch. d'Anatomie, d'Histologie et d'Embryologie	155	396	.391
10	Arch. Internat. de Med. Experimentale	150	597	.251
11	Arch. d. Mal. de l'Appareil Dig. et de Nutrition	100	1,152	.086
12	Arch. de Maladies du Coeur	125	780	.160
13	Arch. de Medecine des Enfants	80	786	.102
14	Bull. de l'Institut Pasteur	105	1,256	.083
15	Bull. d'Histologie	100	419	.239
16	Encephale	170	740	.023
17	Gynecologie et Obstetrique	140	1,179	.119
18	Journal de Chirurgie	210	987	.213
19	Journal de Physiologie et de Pathologie	175	1,326	.132
20	Journal d'Urologie	125	1,168	.107
21	Nourrisson	80	416	.192
22	Rev. Francaise de Pediatrie	125	864	.145
23	Sang	180	1,178	.153
24	Soc. Nat. de Chirurgie., Bulletin	150	1,462	.103
25	Soc. de Pathol. Exotique, Bulletin	80	997	.080
	Total	Fr. 3,237	23,733	
	Average Cost per Page in Francs	Fr. 0.136		

BRITISH JOURNALS
1934

		Price	Pages	Cost Per Page Pence
1	Archives of Diseases of Children	£ 1/5/0	377	.79
2	Biochemical Journal	3/10/0	2,285	.37
3	Biological Reviews	2/2/0	488	1.03
4	Brain	1/4/0	540	.53

		Price	Pages	Cost Per Page Dollars
5	British Journal of Children's Disease	1/5/0	335	.90
6	British Journal of Dermatology & Syphilis	2/2/0	563	.90
7	British Journal of Experimental Pathology	2/2/0	400	1.26
8	British Journal of Medical Psychology	1/10/0	364	.98
9	British Journal of Ophthalmology	2/2/0	720	.70
10	British Journal of Radiology	2/2/0	780	.65
11	British Journal of Surgery	2/2/0	876	.58
12	British Journal of Tuberculosis	0/10/6	206	.61
13	British Journal of Urology	2/5/0	424	1.27
14	Clinical Sciences	2/0/0	413	1.16
15	Journal of Anatomy	2/0/0	584	.82
16	Journal of Experimental Biology	2/2/0	440	1.14
17	Journal of Helminthology	1/5/0	236	1.27
18	Journal of Hygiene	2/7/6	592	.96
19	Journal of Mental Science	1/10/0	824	.43
20	Journal of Obstetrics & Gynecology	2/15/0	1,063	.62
21	Journal of Pathology & Bacteriology	3/0/0	732	.98
22	Journal of Physiology	2/15/0	1,390	.47
23	Quarterly Journal of Experimental Physiology	2/2/0	395	1.27
24	Quarterly Journal of Medicine	1/15/0	624	.67
25	Royal Soc. of Trop. Med. & Hygiene, Transactions	1/15/0	628	.67
	Total	£ 49/7/0	16,279	
	Average Cost per Page in Pence	0.73		

GERMAN JOURNALS
1934

		Price	Pages	Cost Per Page RM
1	Arch. f. Augenheilkunde	RM 68.40	386	.177
2	Arch. f. Dermatologie u. Syphilis	145.60	954	.153
3	Arch. f. exp. Path. u. Pharm.	164.29	2,152	.076
4	Arch. f. d. ges. Physiologie	115.00	1,161	.099
5	Arch. f. Gynakologie	235.80	1,855	.127
6	Arch. f. klin. Chirurgie	202.60	2,079	.097
7	Arch. f. Ophthalmologie (Graefes)	102.00	710	.144
8	Arch. f. Orthopad. u. Unf.-Chir.	82.80	517	.160
9	Arch. f. path. Anat. u. Physiol. (Virchow)	238.40	1,808	.132
10	Arch. f. Psychiat. u. Nervenkrank	159.60	1,009	.158
11	Beitr. z. Klin. d. Tuberkulose	224.60	2,560	.088
12	Biochemische Zeitschrift	205.30	3,408	.060
13	Deutsche Zeitschr. f. Chir.	116.00	1,691	.069
14	Deutsche Zeitschr. f. ger. Med.	162.80	1,206	.135
15	Deutsche Zeitschr. f. Nervenheilkunde	72.00	576	.125
16	Zeitschr. f. d. ges. Anat., Abt. I	309.00	1,318	.234
17	Zeitschr. f. d. ges. exp. Med.	355.80	2,020	.176
18	Zeitschr. f. d. ges. Neur. & Psych.	250.00	1,931	.129
19	Zeitschr. f. klin. Med.	133.40	968	.138
20	Zeitschr. f. Krebsforschung	143.00	1,135	.126
21	Zeitschr. f. urol Chirurgie	200.20	1,437	.139
22	Zeitschr. f. Parasitenkunde	85.20	626	.136
23	Zeitschr. f. Zellforschung	260.60	1,281	.203
24	Zeitschr. f. vergl. Physiolog.	149.80	1,096	.136
25	Roux' Arch. f. Entwicklungsmech.	218.60	1,214	.180
	Total	RM 4,400.79	35,098	
	Average Cost per Page in Reichsmarks	0.125		

COMPARATIVE COST OF AMERICAN, FRENCH, ENGLISH AND GERMAN MEDICAL JOURNALS

	No. of Pages	*Total Cost*	*Aver. Cost Per Page*
25 German Journals	35,098	$1,593.09	$0.045
25 English Journals	16,279	240.33	.015
25 French Journals	23,733	196.81	.008
25 American Journals	42,521	303.20	.007

The cost of the German, English and French journals was computed on the basis of the lowest value of each currency for the year 1934 in terms of the American dollar—as follows:

English pound ..... $4.87 (high $5.18⅞)
French franc ..... 0.0608 (high $0.0669¾)
German mark ..... 0.3620 (high $0.4073)